PART SIX

# Growth, Development, and the Global Economy

CHAPTER

# Economic Growth

25

*The Industrial Revolution was not an episode with a beginning and an end. . . . It is still going on.*

E. J. Hobsbawm
*The Age of Revolution* (1962)

If you look at photographs of an earlier era, you will quickly recognize how dramatically the living standards of the average household have changed over past decades and centuries. Today's homes are stocked with goods that could hardly be imagined a century ago. Just think of entertainment before the era of plasma televisions, high-definition DVDs, and portable media devices. Similarly, the Internet has opened up a vast array of information that could be obtained only by going to the library, and even then only a small fraction of published knowledge was available in most libraries. Or consider the health care available today as compared to periods such as the U.S. Civil War, when soldiers died simply because they got an infection.

These changes in the array, quality, and quantity of goods and services available to the average household are the human face of economic growth. In macroeconomics, economic growth designates the process by which economies accumulate larger quantities of capital equipment, push out the frontiers of technological knowledge, and become steadily more productive. Over the long run of decades and generations, living standards, as measured by output per capita or consumption per household, are primarily determined by aggregate supply and the level of productivity of a country.

This chapter begins with a survey of the theory of economic growth and then reviews the historical trends in economic activity with particular application to wealthy countries like the United States. The next chapter looks at the other end of the income spectrum by examining the plight of the developing countries, struggling to reach the level of affluence enjoyed in the West. The two chapters that follow examine the role of international trade and finance in macroeconomics.

## The Long-Term Significance of Growth

A careful analysis of the economic history of the United States reveals that real GDP has grown by a factor of 35 since 1900 and by a factor of over 1000 since 1800. Rapid growth of output is the distinguishing feature of modern times and contrasts sharply with human history going back to its origins millions of years ago. This is perhaps the central economic fact of the century. Continuing rapid economic growth enables advanced industrial countries to provide more of everything to their citizens—better food and bigger homes, more resources for medical care and pollution control, universal education for children, better equipment for the military, and public pensions for retirees.

Because economic growth is so important for living standards, it is a central objective of policy. Countries that run swiftly in the economic-growth race, such as Britain in the nineteenth century and the United States in the twentieth century, serve as role models for other countries seeking the path to affluence. At the other extreme, countries in economic decline often experience political and social turmoil. The revolutions in Eastern Europe and the Soviet Union in 1989–1991 were sparked when those nations' residents compared their economic stagnation under socialism with the rapid growth experienced by their Western, market-oriented neighbors. Economic growth is the single most important factor in the success of nations in the long run.

## A. THEORIES OF ECONOMIC GROWTH

Let's begin with a careful definition of exactly what we mean by economic growth: **Economic growth** represents the expansion of a country's potential GDP or national output. Put differently, economic growth occurs when a nation's production-possibility frontier (*PPF*) shifts outward.

A closely related concept is the growth rate of *output per person*. This determines the rate at which the country's living standards are rising. Countries are primarily concerned with the growth in per capita output because this leads to rising average incomes.

What are the long-term patterns of economic growth in high-income countries? Table 25-1 shows the history of economic growth since 1870 for high-income countries including the major countries of North America and Western Europe, Japan, and Australia. We see the steady growth of output over this period. Even more important for living standards is the growth in output per hour worked, which moves closely with the increase in living standards. Over the entire period, output per hour worked grew by an average annual rate of 2.3 percent. If we compound this rate over the 136 years, output per person at the end was 22 times higher than at the beginning (make sure you can reproduce this number).

What were the major forces behind this growth? What can nations do to speed up their economic growth rate? And what are the prospects for the twenty-first century? These are the issues that must be confronted by economic-growth analysis.

Economic growth involves the growth of potential output over the long run. The growth in output per capita is an important objective of government because it is associated with rising average real incomes and rising living standards.

### THE FOUR WHEELS OF GROWTH

What is the recipe for economic growth? To begin with, many roads lead to Rome. There are many successful strategies on the road to self-sustained economic growth. Britain, for example, became the

| Period | Average Annual Growth Rate (percent per year) | | | |
|---|---|---|---|---|
| | GDP | GDP per hour worked | Total hours worked | Labor force |
| 1870–1913 | 2.5 | 1.6 | 0.9 | 1.2 |
| 1913–1950 | 1.9 | 1.8 | 0.1 | 0.8 |
| 1950–1973 | 4.8 | 4.5 | 0.3 | 1.0 |
| 1973–2006 | 2.6 | 2.2 | 0.4 | 1.0 |
| **Total period** | **2.8** | **2.3** | **0.5** | **1.0** |

**TABLE 25-1. Patterns of Growth in Advanced Countries**

Over the last century-plus, major high-income countries like the United States, Germany, France, and Japan have grown rapidly. Output has grown faster than inputs of labor, reflecting increases in capital and technological advance.

Source: Angus Maddison, *Phases of Capitalist Development* (Oxford University Press, Oxford, 1982), updated by authors. The data cover 16 major countries starting in 1870, while more recent data cover 31 advanced economies.

world economic leader in the 1800s by pioneering the Industrial Revolution, inventing steam engines and railroads, and emphasizing free trade. Japan, by contrast, came to the economic-growth race later. It made its mark by first imitating foreign technologies and protecting domestic industries from imports and then developing tremendous expertise in manufacturing and electronics.

Even though their individual paths may differ, all rapidly growing countries share certain common traits. The same fundamental process of economic growth and development that helped shape Britain and Japan is at work today in developing countries like China and India. Indeed, economists who have studied growth have found that the engine of economic progress must ride on the same four wheels, no matter how rich or poor the country. These four wheels, or factors of growth, are:

- Human resources (labor supply, education, skills, discipline, motivation)
- Natural resources (land, minerals, fuels, environmental quality)
- Capital (factories, machinery, roads, intellectual property)
- Technological change and innovation (science, engineering, management, entrepreneurship)

Often, economists write the relationship in terms of an *aggregate production function* (or *APF*), which relates total national output to inputs and technology. Algebraically, the *APF* is

$$Q = AF(K, L, R)$$

where $Q$ = output, $K$ = productive services of capital, $L$ = labor inputs, $R$ = natural-resource inputs, $A$ represents the level of technology in the economy, and $F$ is the production function. As the inputs of capital, labor, or resources rise, we would expect that output would increase, although output will probably show diminishing returns to additional inputs of production factors. We can think of the role of technology as augmenting the productivity of inputs. **Productivity** denotes the ratio of output to a weighted average of inputs. As technology ($A$) improves through new inventions or the adoption of technologies from abroad, this advance allows a country to produce more output with the same level of inputs.

Let's now see how each of the four factors contributes to growth.

### Human Resources

Labor inputs consist of quantities of workers and of the skills of the workforce. Many economists believe that the quality of labor inputs—the skills, knowledge, and discipline of the labor force—is the single most important element in economic growth. A country might buy fast computers, modern telecommunications devices, sophisticated electricity-generating equipment, and hypersonic fighter aircraft. However, these capital goods can be effectively used and maintained only by skilled and trained workers. Improvements in literacy, health, and discipline, and most recently the ability to use computers, add greatly to the productivity of labor.

### Natural Resources

The second classic factor of production is natural resources. The important resources here are arable land, oil, gas, forests, water, and mineral deposits. Some high-income countries like Canada and Norway have grown primarily on the basis of their ample resource base, with large output in oil, gas, agriculture, fisheries, and forestry. Similarly, the United States, with its fertile farmlands, is the world's largest producer and exporter of grains.

But the possession of natural resources is not necessary for economic success in the modern world. New York City prospers primarily on its high-density service industries. Many countries, such as Japan, had virtually no natural resources but thrived by concentrating on sectors that depend more on labor and capital than on indigenous resources. Indeed, tiny Hong Kong, with but a tiny fraction of the land and natural resources of Nigeria, actually has a larger GDP than does that giant country.

### Capital

Capital includes tangible capital goods like roads, power plants, and equipment like trucks and computers, as well as intangible items such as patents, trademarks, and computer software. The most dramatic stories in economic history often involve the accumulation of capital. In the nineteenth century, the transcontinental railroads of North America brought commerce to the American heartland, which had been living in isolation. In the twentieth century, waves of investment in automobiles, roads, and power plants increased productivity and provided the infrastructure which created entire new industries. Many

believe that computers and information technology will do for the twenty-first century what railroads and highways did in earlier times.

Accumulating capital, as we have seen, requires a sacrifice of current consumption over many years. Countries that grow rapidly tend to invest heavily in new capital goods; in the most rapidly growing countries, 10 to 20 percent of output may go into net capital formation. The United States shows a stark contrast with high-saving countries. The U.S. net national saving rate, after averaging around 7 percent during the first four decades after World War II, began to decline and actually fell to near-zero in 2008. The low saving rate was the result of low personal saving and large government fiscal deficits. The low saving was seen primarily in the large external (trade) deficit. Economists worry that the low saving rate will retard investment and economic growth in the decades to come and that the large foreign indebtedness may require major adverse changes in exchange rates and real wages.

When we think of capital, we must not concentrate only on computers and factories. Many investments that are necessary for the efficient functioning of the private sector will be undertaken only by governments. These investments are called **social overhead capital** and consist of the large-scale projects that precede trade and commerce. Roads, irrigation and water projects, and public-health measures are important examples. All these involve large investments that tend to be "indivisible," or lumpy, and sometimes have increasing returns to scale. These projects generally involve external economies, or spillovers that private firms cannot capture, so the government must step in to ensure that these social overhead or infrastructure investments are effectively undertaken. Some investments, such as transportation and communication systems, involve "network" externalities in which productivity depends upon the fraction of the population which uses or has access to the network.

### *Technological Change and Innovation*

In addition to the three classic factors discussed above, technological advance has been a vital fourth ingredient in the rapid growth of living standards. Historically, growth has definitely not been a process of simple replication, adding rows of steel mills or power plants next to each other. Rather, a never-ending stream of inventions and technological advances led to a vast improvement in the production possibilities of Europe, North America, and Japan.

We are today witnessing an explosion of new technologies, particularly in computation, communication (such as the Internet), and the life sciences. But this is not the first time that American society has been shaken by fundamental inventions. Electricity, radio, the automobile, and television also diffused rapidly through the American economy in an earlier age. Figure 25-1 shows the diffusion of major inventions of the twentieth century. This S-shaped pattern is typical of the diffusion of new technologies.

**Technological change** denotes changes in the processes of production or introduction of new products or services. Process inventions that have greatly increased productivity were the steam engine, the generation of electricity, antibiotics, the internal-combustion engine, the wide-body jet, the microprocessor, and the fax machine. Fundamental product inventions include the telephone, the radio, the airplane, the phonograph, the television, the computer, and the DVR.

The most dramatic developments of the modern era are occurring in information technology. Here, tiny notebook computers can outperform the fastest computer of the 1960s, while fiber-optic lines can carry 200,000 simultaneous conversations that required 200,000 paired copper-wire lines in an earlier period. These inventions provide the most spectacular examples of technological change. Nonetheless, technological advance is in fact a continuous process of small and large improvements, as witnessed by the fact that the United States issues over 100,000 new patents annually and that millions of other small refinements are routine activities in a modern economy.

Economists have long pondered how to encourage technological progress because of its importance in raising living standards. Technological progress is a complex and multifaceted process, and no single formula for success has been found.

Here are some historical examples: Toyota succeeded in instilling a workplace ethic of making continuous quality improvements from the bottom up; this propelled Toyota to the top of the automobile industry. Quite a different pattern arose in Silicon Valley's computer business. Here, technological change was fostered by an entrepreneurial spirit of free inquiry, light government regulation, free international trade in intellectual property products, and the lure of lucrative stock options. Economists

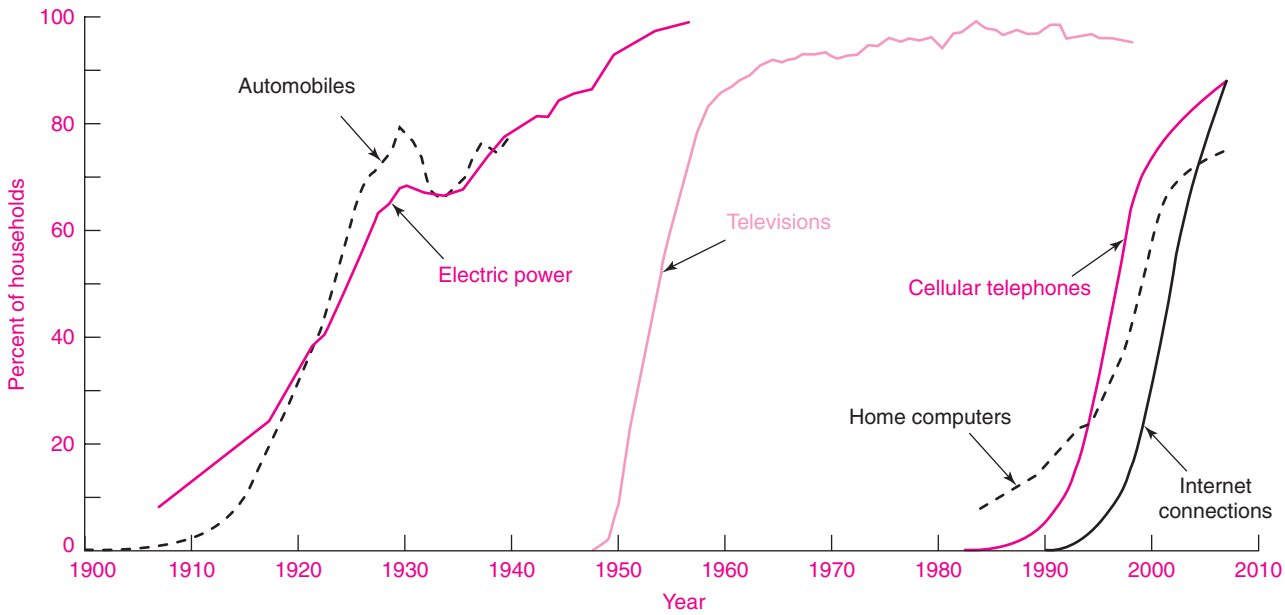


**FIGURE 25-1. Diffusion of Major Technologies**

Today's information technologies such as cellular telephones, computers, and the Internet are spreading rapidly through American society. Similar diffusion patterns were seen with other fundamental inventions in the past.

Source: *Economic Report of the President, 2000,* updated by authors.

| Factor in economic growth | Examples |
|---|---|
| **Human resources** | Size of labor force<br>Quality of workers (education, skills, discipline) |
| **Natural resources** | Oil and gas<br>Soils and climate |
| **Capital stock** | Homes and factories<br>Machinery<br>Intellectual property<br>Social overhead capital |
| **Technology and entrepreneurship** | Quality of scientific and engineering knowledge<br>Managerial know-how<br>Rewards for innovation |

**TABLE 25-2. The Four Wheels of Progress**

Economic growth inevitably rides on the four wheels of labor, natural resources, capital, and technology. But the wheels may differ greatly among countries, and some countries combine them more effectively than others.

recognize that some approaches seem to kill the spirit of innovation. Many sectors of the Soviet Union under central planning saw technological stagnation because of the heavy hand of state regulation, lack of profit motivation, an inefficient pricing mechanism, and widespread corruption.

Table 25-2 summarizes the four wheels of economic growth.

### Institutions, Incentives, and Innovation

In the very long run, the growth in the world's output and wealth has come primarily because of improvements in knowledge. Yet institutions to promote the creation and spread of knowledge, along with incentives to devote our human effort to that task, were developed late in human history—slowly in Western Europe over the last 500 years. This point was eloquently argued by William Baumol:

> The museum at Alexandria was the center of technological innovation in the Roman Empire. By the first century B.C., that city knew of virtually every form of machine gearing that is used today, including a working steam engine. But these seemed to be used only to make what amounted to elaborate toys. The steam engine was used to open and close the doors of a temple.[1]

Baumol and economic historian Joel Mokyr argue that innovation depends crucially on the development of incentives and institutions. They particularly point to the role of private ownership, the patent system, and a rule-based system of adjudicating disputes as devices for fostering innovation.

## THEORIES OF ECONOMIC GROWTH

Virtually everyone is in favor of economic growth. But there are strong disagreements about the best way to accomplish this goal. Some economists and policymakers stress the need to increase capital investment. Others advocate measures to stimulate research and development and technological change. Still a third group emphasizes the role of a better-educated workforce.

Economists have long studied the question of the relative importance of different factors in determining growth. In the discussion below, we look at different theories of economic growth, which offer some clues about the driving forces behind growth. Then, in the final part of this section, we see what can be learned about growth from its historical patterns over the last century.

[1] See Baumol in the Further Reading section at the end of this chapter.

### *The Classical Dynamics of Smith and Malthus*

Early economists like Adam Smith and T. R. Malthus stressed the critical role of land in economic growth. In *The Wealth of Nations* (1776), Adam Smith provided a handbook of economic development. He began with a hypothetical idyllic age: "that original state of things, which precedes both the appropriation of land and the accumulation of [capital] stock." This was a time when land was freely available to all, and before capital accumulation had begun to matter.

What would be the dynamics of economic growth in such a "golden age"? Because land is freely available, people would simply spread out onto more acres as the population increases, just as the settlers did in the American West. Because there is no capital, national output would exactly double as population doubles. What about real wages? The entire national income would go to wages because there is no subtraction for land rent or interest on capital. Output expands in step with population, so the real wage rate per worker would be constant over time.

But this golden age cannot continue forever. Eventually, as population growth continues, all the land will be occupied. Once the frontier disappears, balanced growth of land, labor, and output is no longer possible. New laborers begin to crowd onto already-worked soils. Land becomes scarce, and rents rise to ration it among different uses.

Population still grows, and so does the national product. But output must grow more slowly than does population. Why? With new laborers added to fixed land, each worker now has less land to work with, and the law of diminishing returns comes into operation. The increasing labor-land ratio leads to a declining marginal product of labor and hence to declining real wage rates.[2]

How bad could things get? The dour Reverend T. R. Malthus thought that population pressures would

[2] The theory in this chapter relies on an important finding from microeconomics. In analysis of the determination of wages under simplified conditions, including perfect competition, it is shown that the wage rate of labor will be equal to the extra or marginal product of the last worker hired. For example, if the last worker contributes goods worth $12.50 per hour to the firm's output, then under competitive conditions the firm will be willing to pay up to $12.50 per hour in wages to that worker. Similarly, the rent on land is the marginal product of the last unit of land, and the real interest rate will be determined by the marginal product of the least productive piece of capital.

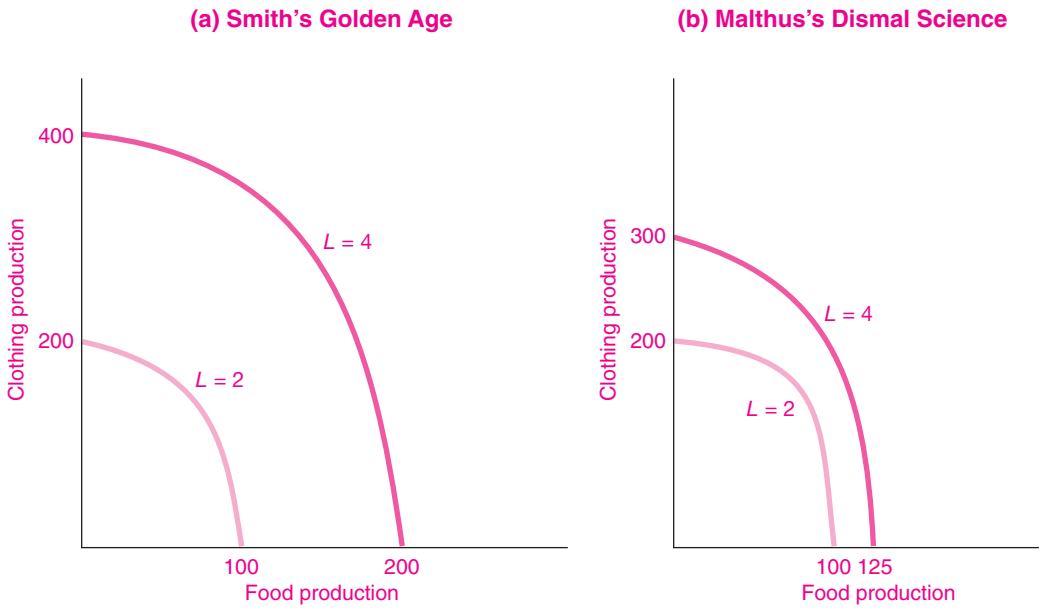


**FIGURE 25-2. The Classical Dynamics of Smith and Malthus**

In (**a**), unlimited land on the frontier means that when population doubles, labor can simply spread out and produce twice the quantity of any food and clothing combination. In (**b**), limited land means that increasing population from 2 million to 4 million triggers diminishing returns. Note that potential food production rises by only 25 percent with a doubling of labor inputs.

drive the economy to a point where workers were at the minimum level of subsistence. Malthus reasoned that whenever wages were above the subsistence level, population would expand; below-subsistence wages would lead to high mortality and population decline. Only at subsistence wages could there be a stable equilibrium of population. He believed the working classes were destined to a life that is brutish, nasty, and short. This gloomy picture led Thomas Carlyle to criticize economics as "the dismal science."

Figure 25-2(*a*) shows the process of economic growth in Smith's golden age. Here, as population doubles, the production-possibility frontier (*PPF*) shifts out by a factor of 2 in each direction, showing that there are no constraints on growth from land or resources. Figure 25-2(*b*) shows the pessimistic Malthusian case, where a doubling of population leads to a less-than-doubling of food and clothing, lowering per capita output, as more people crowd onto limited land and diminishing returns drive down output per person.

## *Economic Growth with Capital Accumulation: The Neoclassical Growth Model*

Malthus's forecast was dramatically wide of the mark because he did not recognize that technological innovation and capital investment could overcome the law of diminishing returns. Land did not become the limiting factor in production. Instead, the first Industrial Revolution brought forth power-driven machinery that increased production, factories that gathered teams of workers into giant firms, railroads and steamships that linked together the far points of the world, and iron and steel that made possible stronger machines and faster locomotives. As market economies entered the twentieth century, a second Industrial Revolution grew up around the telephone, automobile, and electricity industries. Capital accumulation and new technologies became the dominant forces affecting economic development.

What will be the driving forces of economic growth in the twenty-first century? Perhaps advances

in computation, software, and artificial intelligence will spark yet another industrial revolution. Perhaps, as some ecological pessimists warn, a present-day Malthusian specter haunts rich countries as climate change, sea-level rise, and drought-induced migrations lead to social unrest and economic decline.

To understand how capital accumulation and technological change affect the economy, we must introduce the **neoclassical model of economic growth.** This approach was pioneered by Robert Solow of MIT, who was awarded the 1987 Nobel Prize for this and other contributions to economic-growth theory. The neoclassical growth model serves as the basic tool for understanding the growth process in advanced countries and has been applied in empirical studies of the sources of economic growth.

### Apostle of Economic Growth

Robert M. Solow was born in Brooklyn and educated at Harvard and then moved to the MIT Economics Department in 1950. Over the next few years he developed the neoclassical growth model and applied it in the growth-accounting framework discussed later in this chapter.

One of Solow's major studies was "A Contribution to the Theory of Economic Growth" in 1956. This was a mathematical version of the neoclassical growth model surveyed in this chapter. The importance of this study was highlighted as follows in Solow's Nobel Prize citation:

> Solow's theoretical model had an enormous impact on economic analysis. From simply being a tool for the analysis of the growth process, the model has been generalized in several different directions. It has been extended by the introduction of other types of production factors and it has been reformulated to include stochastic features. The design of dynamic links in certain "numerical" models employed in general equilibrium analysis has also been based on Solow's model. But, above all, Solow's growth model constitutes a framework within which modern macroeconomic theory can be structured.
>
> The increased interest of government to expand education and research and development was inspired by these studies. Every long-term report . . . for any country has used a Solow-type analysis.[3]

Solow has also contributed to empirical studies of economic growth, to natural-resource economics, and to the development of capital theory. In addition, Solow served as a macroeconomic adviser for the Kennedy administration.

Solow is known for his enthusiasm for economics as well as for his humor. He believed that the hunger for publicity has led some economists to exaggerate their knowledge. He criticized economists for "an apparently irresistible urge to push their science further than it will go, to answer questions more delicate than our limited understanding of a complicated question will allow. Nobody likes to say 'I don't know.'"

A lively writer, Solow worries that economics is terrifically difficult to explain to the public. At his news conference after winning the Nobel Prize, Solow quipped, "The attention span of the people you write for is shorter than the length of one true sentence." Nonetheless, Solow continues to labor for his brand of economics, and the world listens carefully to the apostle of economic growth from MIT.

[3] The citations of the committees for the Nobel Prizes in economics can be found on the Internet at *www.nobel.se/laureates.*

***Basic Assumptions.*** The neoclassical growth model describes an economy in which a single homogeneous output is produced by two types of inputs—capital and labor. In contrast to the Malthusian analysis, labor growth is assumed to be a given. In addition, we assume that the economy is competitive and always operates at full employment, so we can analyze the growth of potential output.

The major new ingredients in the neoclassical growth model are capital and technological change. For the moment, assume that technology remains constant. Capital consists of durable produced goods that are used to make other goods. Capital goods include structures like factories and houses, equipment like computers and machine tools, and inventories of finished goods and goods in process.

For convenience, we will assume that there is a single kind of capital good (call it $K$). We then measure the aggregate stock of capital as the total quantity of capital goods. In our real-world calculations, we approximate the universal capital good as the total dollar value of capital goods (i.e., the constant-dollar value of equipment, structures, and inventories). If $L$ is the number of workers, then $(K/L)$ is equal to the quantity of capital per worker, or the *capital-labor ratio.* We can write our aggregate production function for the neoclassical growth model without technological change as $Q = F(K, L)$.

Turning now to the economic-growth process, economists stress the need for **capital deepening,** which is the process by which the quantity of capital

per worker increases over time. Here are some examples of capital deepening: A farmer uses a mechanical orange picker instead of unskilled manual labor; a road builder uses a backhoe instead of a worker with a pick and shovel; a bank substitutes hundreds of ATM machines for human tellers. These are all examples of how the economy increases the amount of capital per worker. As a result, the output per worker has grown enormously in agriculture, road building, and banking.

What happens to the return on capital in the process of capital deepening? For a given state of technology, a rapid rate of investment in plant and equipment tends to depress the rate of return on capital.[4] This occurs because the most worthwhile investment projects get undertaken first, after which later investments become less and less valuable. Once a full railroad network or telephone system has been constructed, new investments will branch into more sparsely populated regions or duplicate existing lines. The rates of return on these later investments will be lower than the high returns on the first lines between densely populated regions.

In addition, the wage rate paid to workers will tend to rise as capital deepening takes place. Why? Each worker has more capital to work with and his or her marginal product therefore rises. As a result, the competitive wage rate rises along with the marginal product of labor.

We can summarize the impact of capital deepening in the neoclassical growth model as follows:

Capital deepening occurs when the stock of capital grows more rapidly than the labor force. In the absence of technological change, capital deepening will produce a growth of output per worker, of the marginal product of labor, and of real wages; it also will lead to diminishing returns on capital and therefore to a decline in the rate of return on capital.

## Geometrical Analysis of the Neoclassical Model

We can analyze the effects of capital accumulation by using Figure 25-3. This figure shows the aggregate production function graphically by depicting output per worker on the vertical axis and capital per worker on the horizontal axis. In the background, *and held constant for the moment*, are all the other variables that were discussed at the start of this section—the amount of land, the endowment of natural resources, and, most important of all, the technology used by the economy.

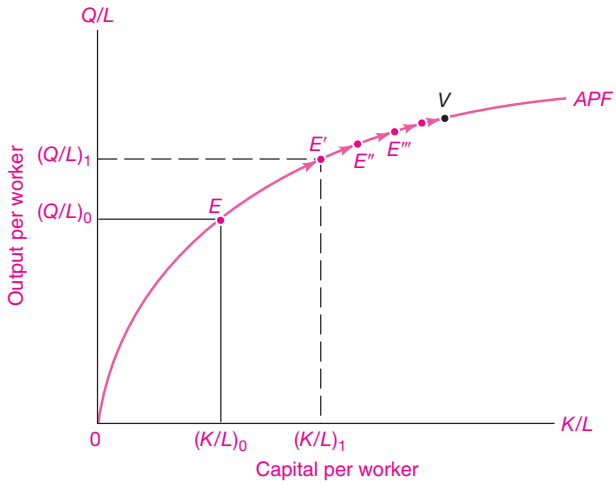


**FIGURE 25-3. Economic Growth through Capital Deepening**

As the amount of capital per worker increases, output per worker also increases. This graph shows the importance of "capital deepening," or increasing the amount of capital each worker has on hand. Remember, however, that other factors are held constant, such as technology, quality of the labor force, and natural resources.

What happens as the society accumulates capital? As each worker has more and more capital to work with, the economy moves up and to the right on the aggregate production function. Say that the capital-labor ratio increases, from $(K/L)_0$ to $(K/L)_1$. Then the amount of output per worker increases, from $(Q/L)_0$ to $(Q/L)_1$.

What happens to the factor prices of labor and capital? As capital deepens, diminishing returns to capital set in, so the rate of return on capital and the real interest rate fall. (The slope of the curve in Figure 25-3 is the marginal product of capital, which is seen to fall as capital deepening occurs.) Also, because each worker can work with more capital, workers' marginal productivities rise and the real wage rate consequently also rises.

[4] Under perfect competition and without risk, taxes, or inflation, the rate of return on capital is equal to the real interest rate on bonds and other financial assets.

The reverse would happen if the amount of capital per worker were to fall for some reason. For example, wars tend to reduce much of a nation's capital to rubble and lower the capital-labor ratio; after wars, therefore, we see a scarcity of capital and high returns on capital. Hence, our earlier verbal summary of the impact of capital deepening is verified by the analysis in Figure 25-3.

***Long-Run Steady State.*** What is the long-run equilibrium in the neoclassical growth model without technological change? Eventually, the capital-labor ratio will stop rising. *In the long run, the economy will enter a steady state in which capital deepening ceases, real wages stop growing, and capital returns and real interest rates are constant.*

We can show how the economy moves toward the steady state in Figure 25-3. As capital continues to accumulate, the capital-labor ratio increases as shown by the arrows from $E'$ to $E''$ to $E'''$ until finally the capital-labor ratio stops growing at $V$. At that point, output per worker $(Q/L)$ is constant, and real wages stop growing.

Without technological change, output per worker and the wage rate stagnate. This is certainly a far better outcome than the world of subsistence wages predicted by Malthus. But the long-run equilibrium of the neoclassical growth model makes it clear that if economic growth consists only of accumulating capital through replicating factories with existing methods of production, then the standard of living will eventually stop rising.

## The Central Role of Technological Change

While the capital-accumulation model is a first step on the road to understanding economic growth, it leaves some major questions unanswered. To begin with, the model predicts that real wages will eventually stagnate if there is no improvement in technology. However, real wages have definitely not stagnated over the last century. Peek ahead at Figure 25-5($c$) on page 513. This figure shows that real wages have grown by a factor of more than 8 over the last century. The simple capital-accumulation model cannot explain the tremendous growth in productivity over time, nor does it account for the tremendous differences in per capita income among countries.

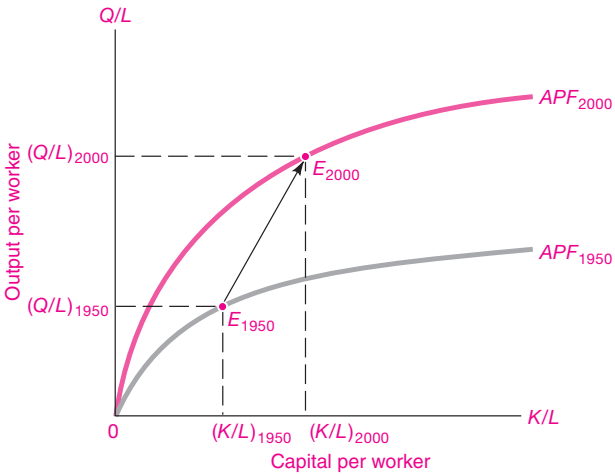


**FIGURE 25-4. Technological Advance Shifts Up the Production Function**

As a result of improvements in technology, the aggregate production function shifts *upward over time*. Hence improvements in technology combine with capital deepening to raise output per worker and real wages.

What is missing is technological change. We can depict technological change in our growth diagram as an upward shift in the aggregate production function, as illustrated in Figure 25-4. In this diagram, we show the aggregate production function for both 1950 and 2000. Because of technological change, the aggregate production function has shifted upward from $APF_{1950}$ to $APF_{2000}$. This upward shift shows the advances in productivity that are generated by the vast array of new processes and products like electronics, Internet commerce, advances in metallurgy, improved medical technologies, and so forth.

Therefore, in addition to considering the capital deepening described above, we must also take into account advances in technology. The sum of capital deepening and technological change is the arrow in Figure 25-4, which indicates an increase in output per worker from $(Q/L)_{1950}$ to $(Q/L)_{2000}$. Instead of settling into a steady state, the economy enjoys rising output per worker, rising wages, and increasing living standards.

Of particular interest is the impact of changing technologies on rates of profit and real interest

rates. As a result of technological progress, the real interest rate need not fall. Invention increases the productivity of capital and offsets the tendency for a falling rate of profit.

### Technological Change as an Economic Output

Up to now we have treated technological change as something that floats mysteriously down from scientists and inventors like manna from heaven. Recent research on economic growth has begun to focus on the *sources of technological change*. This research, sometimes called *new growth theory* or the "theory of endogenous technological change," seeks to uncover the processes by which private market forces, public-policy decisions, and alternative institutions lead to different patterns of technological change.

One important point is that technological change is an output of the economic system. Edison's lightbulb was the result of years of research into different lightbulb designs; the transistor resulted from the efforts of scientists in Bell Labs to find a process that would improve telephone switching devices; pharmaceutical companies spend hundreds of millions of dollars developing and testing new drugs. Those who are talented and lucky may earn supernormal profits, or even become billionaires like Bill Gates of Microsoft, but many are the disappointed inventors or companies that end up with empty pockets.

The other unusual feature of technologies is that they are public goods, or "nonrival" goods in technical language. This means that they can be used by many people at the same time without being used up. A new computer language, a new miracle drug, a design for a new steelmaking process—I can use each of these without reducing its productivity for you and the British and the Japanese and everyone else. In addition, inventions are expensive to produce but inexpensive to reproduce. These features of technological change can produce severe market failures, which means that inventors sometimes have great difficulty profiting from their inventions because other people can copy them.

The market failures are largest for the most basic and fundamental forms of research. Public policy has an important role to play here. First, governments generally support basic science through government grants and research facilities. Without government and not-for-profit support, basic research in mathematics, the natural sciences, and the social sciences would wither away. Additionally, governments must be careful to ensure that profit-oriented inventors have adequate incentives to engage in research and development. Governments increasingly pay attention to *intellectual property rights,* such as patents and copyrights, to provide adequate market rewards for creative activities.

What is the major contribution of new growth theory? It has changed the way we think about the growth process and public policies. If technological differences are the major reason for differences in living standards among nations, and if technology is a produced factor, then economic-growth policy should focus much more sharply on how nations can improve their technological performance. This is just the lesson drawn by Stanford's Paul Romer, one of the leaders of new growth theory:

> Economists can once again make progress toward a complete understanding of the determinants of long-run economic success. Ultimately, this will put us in position to offer policymakers something more insightful than the standard neoclassical prescription—more saving and more schooling. We will be able to rejoin the ongoing policy debates about tax subsidies for private research, antitrust exemptions for research joint ventures, the activities of multinational firms, the effects of government procurement, the feedback between trade policy and innovation, the scope of protection for intellectual property rights, the links between private firms and universities, the mechanisms for selecting the research areas that receive public support, and the costs and benefits of an explicit government-led technology policy.[5]

To summarize:

Technological change—which increases output produced for a given bundle of inputs—is a crucial ingredient in the growth of nations. The new growth theory seeks to uncover the processes which generate technological change. This approach emphasizes that technological change is an output that is subject to severe market failures because technology is a public good that is expensive to produce but cheap to reproduce. Governments increasingly seek to provide strong intellectual property rights for those who develop new technologies.

[5] See Paul Romer in this chapter's Further Reading section.

## B. THE PATTERNS OF GROWTH IN THE UNITED STATES

### The Facts of Economic Growth

The first part of this chapter described the basic theories of economic growth. But economists have not been content to rest with theory. A major research area all around the world has been measuring the different components of the economic-growth process and applying them to the important theories. An understanding of the patterns of economic growth will help sort out the reasons that some nations prosper while others decline.

Figure 25-5 depicts the key trends of economic development for the United States since the start of the twentieth century. Similar patterns have been found in most of the major industrial countries.

Figure 25-5(*a*) shows the trends in real GDP, the capital stock, and population. Population and employment have more than tripled since 1900. At the same time, the stock of physical capital has risen by a factor of 14. Thus, the amount of capital per worker (the $K/L$ ratio) has increased by a factor of more than 4. Clearly, capital deepening has been an important feature of twentieth- and early-twenty-first-century American capitalism.

What about the growth in output? In a world without technological change, output growth would be somewhere between labor growth and capital growth. In fact, the output curve in Figure 25-5(*a*) is not in between the two factor curves, but actually lies above both curves. This indicates that technological progress must have increased the productivity of capital and labor.

For most people, an economy's performance is measured by their wages, salaries, and fringe benefits. This is shown in Figure 25-5(*c*) in terms of real hourly compensation (or wages and fringe benefits corrected for inflation). Hourly earnings have grown impressively for most of the post-1900 period, as we would expect from the growth in the capital-labor ratio and from steady technological advance.

The real interest rate (which is calculated as the interest rate on long-term Treasury securities corrected for inflation) is shown in Figure 25-5(*d*). The rate of profit on capital is larger than this risk-free interest rate to reflect risk and taxes, but it shows a similar pattern. Real interest rates and profit rates fluctuated greatly in business cycles and wars but have displayed no strong upward or downward trend over the whole period. Either by coincidence or because of an economic mechanism inducing this pattern, technological change has largely offset diminishing returns to capital.

Output per worker-hour is the solid blue curve in Figure 25-5(*c*). As could be expected from the deepening of capital and from technological advance, output per worker has risen steadily.

The fact that wages rise at the same rate as output per worker does not mean that labor has captured all the fruits of productivity advance. Rather, it means that labor has kept about the same *share* of total product, with capital also earning about the same relative share throughout the period. A close look at Figure 25-5(*c*) shows that real wages have grown at about the same rate as output per worker since 1900. More precisely, the average growth rate of real wages was 1.8 percent per year, while that of output per worker was 2.2 percent per year. These figures imply that labor's share of national income (and therefore also property's share) was near-constant over the last century.

Seven Basic Trends of Economic Growth

Economists studying the economic history of advanced nations have found that the following trends apply in most countries:

1. The capital stock has grown more rapidly than population and employment, resulting from capital deepening.
2. For most of the period since 1900, there has been a strong upward trend in real average hourly earnings.
3. The share of labor compensation in national income has been remarkably stable over the last century.
4. There were major oscillations in real interest rates and the rate of profit, particularly during business cycles, but there has been no strong upward or downward trend over the post-1900 period.
5. Instead of steadily rising, which would be predicted by the law of diminishing returns with unchanging technology, the capital-output ratio has actually declined since the start of the twentieth century.
6. For most of the period since 1900, the ratios of national saving and of investment to GDP were stable. Since

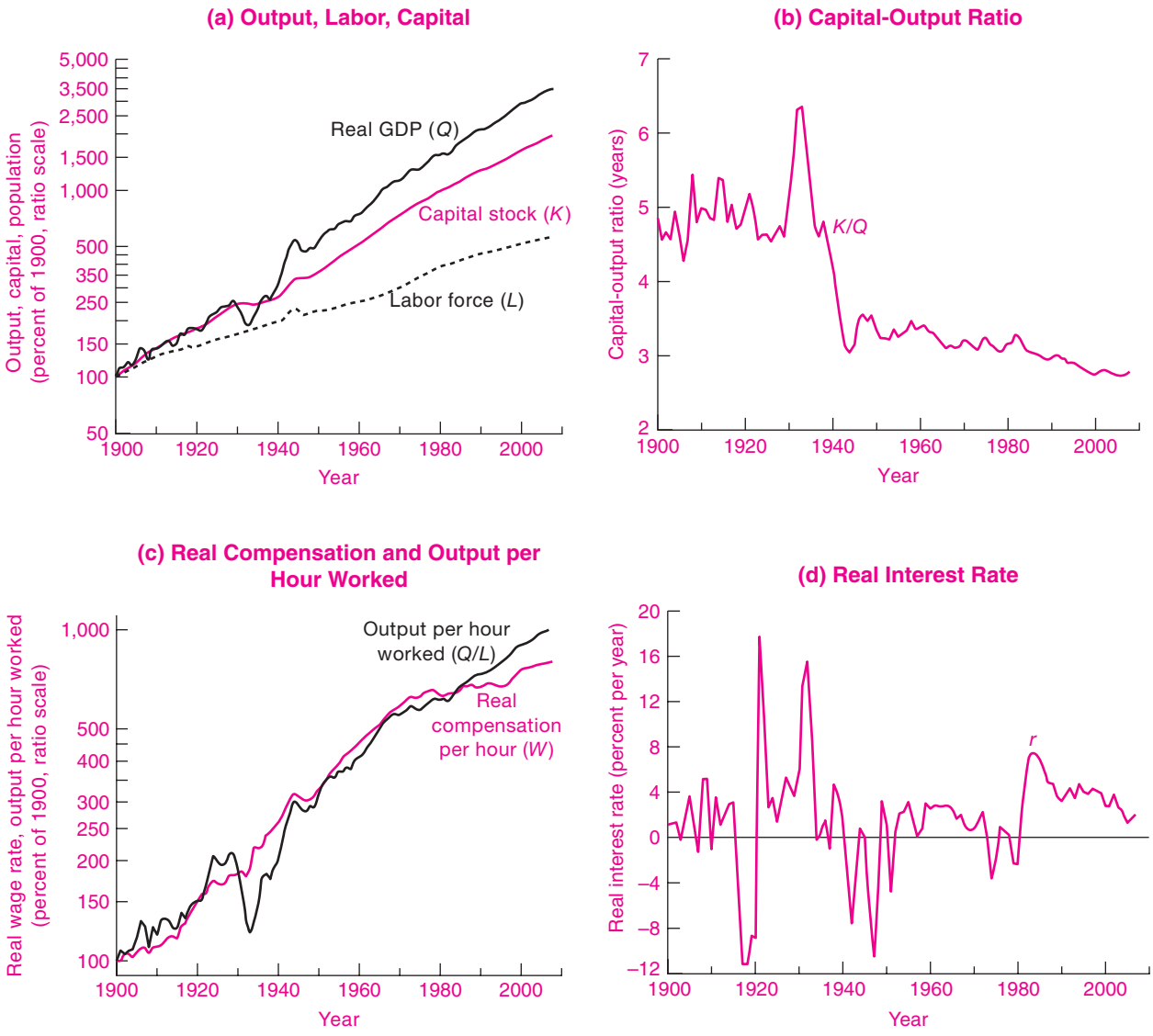


**FIGURE 25-5. Economic Growth Displays Striking Regularities**

**(a)** The capital stock has grown faster than population and labor supply. Nonetheless, total output has grown even more rapidly than capital because of improving technology. **(b)** The capital-output ratio dropped sharply during the first half of the twentieth century and has declined slowly since then. **(c)** Real earnings have grown steadily and at almost the same rate as average product per worker-hour over the entire period. **(d)** The real interest rate has been trendless since 1900, suggesting that technological change has offset diminishing returns to capital accumulation.

Source: U.S. Departments of Commerce and Labor, Federal Reserve Board, U.S. Bureau of the Census, and Susan Carter et al., *Historical Statistics of the United States: Millennial Edition* (Cambridge University Press, Cambridge, U.K., 2006), available online.

1980, the national saving rate has declined sharply in the United States.

7. After effects of the business cycle are removed, national product has grown at an average rate of 3.3 percent per year. Output growth has been much higher than a weighted average of the growth of capital, labor, and resource inputs, suggesting that technological innovation must be playing a key role in economic growth.

## Relationship of the Seven Trends to Economic-Growth Theories

While the seven trends of economic history are not like the immutable laws of physics, they do portray fundamental facts about growth in the modern era. How do they fit into our economic-growth theories?

Trends 2 and 1—higher wage rates when capital deepens—fit nicely into our neoclassical growth model shown in Figure 25-3. Trend 3—that the wage share has been remarkably stable—is an interesting coincidence that is consistent with a wide variety of production functions relating $Q$ to $L$ and $K$.

Trends 4 and 5, however, show us that technological change must be playing a role here, so Figure 25-4, with its picture of advancing technology, is more realistic than the steady state depicted in Figure 25-3. A steady profit rate and a declining, or steady, capital-output ratio cannot hold if the $K/L$ ratio rises in a world with unchanging technology; taken together, they contradict the basic law of diminishing returns under deepening of capital. We must therefore recognize the key role of technological progress in explaining the seven trends of modern economic growth. Our models confirm what our intuition suggests.

## The Sources of Economic Growth

We have seen that advanced market economies grow through increases in labor and capital and by technological change as well. But what are the relative contributions of labor, capital, and technology? To answer this question, we turn to an analysis of the quantitative aspects of growth and of the useful approach known as growth accounting. This approach is the first step in the quantitative analysis of economic growth for any country.

***The Growth-Accounting Approach.*** Detailed studies of economic growth rely on what is called **growth accounting.** This technique is not a balance sheet or national product account of the kind we met in earlier chapters. Rather, it is a way of separating out the contributions of the different ingredients driving observed growth trends.

Growth accounting usually begins with the aggregate production function we met earlier in this chapter, $Q = AF(K, L, R)$. Often resources are omitted because land is constant. Using elementary calculus and some simplifying assumptions, we can express the growth of output in terms of the growth of the inputs plus the contribution of technological change. Growth in output ($Q$) can be decomposed into three separate terms: growth in labor ($L$) times its weight, growth in capital ($K$) times its weight, and technological change itself (T.C.).

Momentarily ignoring technological change, an assumption of constant returns to scale means that a 1 percent growth in $L$ together with a 1 percent growth in $K$ will lead to a 1 percent growth in output. But suppose $L$ grows at 1 percent and $K$ at 5 percent. It is tempting, but wrong, to guess that $Q$ will then grow at 3 percent, the simple average of 1 and 5. Why is this wrong? Because the two factors do not necessarily contribute equally to output. Rather, the fact that three-fourths of national income goes to labor while only one-fourth goes to capital suggests that labor growth will contribute more to output than will capital growth.

If labor's growth rate gets 3 times the weight of capital's growth, we can calculate the answer as follows: $Q$ will grow at 2 percent per year (= ¾ of 1 percent + ¼ of 5 percent). To growth of inputs, we add technological change and thereby obtain all the sources of growth.

Hence, output growth per year follows the *fundamental equation of growth accounting:*

$$\%\ Q\text{ growth} = \tfrac{3}{4}(\%\ L\text{ growth}) + \tfrac{1}{4}(\%\ K\text{ growth}) + \text{T.C.} \quad (1)$$

where "T.C." represents technological change (or total factor productivity) that raises productivity and where ¾ and ¼ are the relative contributions of each input to economic growth. Under conditions of perfect competition, these fractions are equal to the shares of national income of the two factors; naturally, these fractions would be replaced by new fractions if the relative shares of the factors were to change or if other factors were added.

To explain per capita growth, we can eliminate $L$ as a separate growth source. Now, using the fact that capital gets one-fourth of output, we have from equation (1)

$$\begin{aligned}\%\frac{Q}{L}\text{ growth} &= \%\ Q\text{ growth} - \%\ L\text{ growth}\\ &= \tfrac{1}{4}\left(\%\frac{K}{L}\text{growth}\right) + \text{T.C.}\end{aligned} \tag{2}$$

This relation shows clearly how capital deepening would affect per capita output if technological advance were zero. Output per worker would grow only one-fourth as fast as capital per worker, reflecting diminishing returns.

One final point remains: We can measure $Q$ growth, $K$ growth, and $L$ growth, as well as the shares of $K$ and $L$. But how can we measure T.C. (technological change)? We cannot. Rather, we must *infer* T.C. as the residual or leftover after the other components of output and inputs are calculated. We can therefore calculate technological change (or total factor productivity) by rearranging the terms in equation (1) as follows:

$$\begin{aligned}\text{T.C.} = \%\ Q\text{ growth} &- \tfrac{3}{4}\ (\%\ L\text{ growth})\\ &- \tfrac{1}{4}\ (\%\ K\text{ growth})\end{aligned} \tag{3}$$

This equation allows us to answer critically important questions about economic growth. What part of per capita output growth is due to capital deepening, and what part is due to technological advance? Does society progress chiefly by dint of thrift and the forgoing of current consumption? Or is our rising living standard the reward for the ingenuity of inventors and the daring of innovator-entrepreneurs?

***Numerical Example.*** To determine the contributions of labor, capital, and other factors to output growth, we substitute representative numbers for the period 1900–2008 into equation (2) for the growth of $Q/L$. Since 1900, hours worked have grown 1.4 percent per year, and $K$ has grown 2.6 percent per year, while $Q$ has grown 3.3 percent per year. Thus, by arithmetic, we find that

$$\%\frac{Q}{L}\text{growth} = \tfrac{1}{4}\left(\%\frac{K}{L}\text{growth}\right) + \text{T.C.}$$

becomes

$$1.9 = \tfrac{1}{4}\,(1.2) + \text{T.C.} = 0.3 + 1.6$$

Thus of the 1.9 percent-per-year increase in output per hour worked, about 0.3 percentage point is due to capital deepening, while the largest portion, 1.6 percent per year, stems from T.C. (technological change).

***Detailed Studies.*** More thorough studies refine the simple calculation but show quite similar conclusions. Table 25-3 presents the results of studies by

**Contribution of Different Elements to Growth in Real GDP, United States, 1948–2007**

| | In percent per year | As percent of total |
|---|---|---|
| **Real GDP growth (private business sector)** | **3.52** | **100** |
| **Sources of growth:** | | |
| **Contribution of inputs** | **2.14** | **61** |
| Capital | 1.21 | 34 |
| Labor | 0.94 | 27 |
| **Total factor productivity growth** (research and development, education, advances in knowledge, and other sources) | **1.39** | **39** |

**TABLE 25-3. Advances in Knowledge Outweigh Capital in Contributing to Economic Growth**

Using the techniques of growth accounting, studies break down the growth of GDP in the private business sector into contributing factors. Recent comprehensive studies find that capital growth accounted for 34 percent of output growth. Education, research and development, and other advances in knowledge made up 39 percent of total output growth and more than half of the growth of output per unit of labor.

Source: U.S. Department of Labor, "Historical Multifactor Productivity Measures (SIC 1948–87 Linked to NAICS 1987–2007)," at *www.bls.gov/mfp/home.htm*.

the Department of Labor for the 1948–2007 period. During this time, output (measured as gross output of the private business sector) grew at an average rate of 3.5 percent per year, while input growth (of capital, labor, and land) contributed 2.1 percentage points per year. Hence **total factor productivity**—the growth of output less the growth of the weighted sum of all inputs, or what we have called T.C.—averaged 1.4 percent annually.

About 60 percent of the growth in output in the United States can be accounted for by the growth in labor and capital. The remaining 40 percent is a residual factor that can be attributed to education, research and development, innovation, economies of scale, advances in knowledge, and other factors.

Other countries show different patterns of growth. For example, scholars have used growth accounting to study the Soviet Union, which grew rapidly during the period from 1930 until the mid-1960s. It appears, however, that the high growth rate came primarily from forced-draft increases in capital and labor inputs. For the last few years of the U.S.S.R.'s existence, productivity actually *declined* as the central-planning apparatus became more dysfunctional, as corruption deepened, and as incentives worsened. The estimated growth of total factor productivity for the Soviet Union over the half-century before its collapse was slower than that for the United States and other major market economies. Only the ability of the central government to divert output into investment (and away from consumption) offset the system's inefficiency.

## RECENT TRENDS IN PRODUCTIVITY

A careful look at productivity trends indicates that there are sharp movements from year to year as well as long swings. The growth of labor productivity is shown in Figure 25-6. Productivity grew briskly from World War II until the late 1960s.

Then, beginning around 1973, there were several years of poor performance, and even decline. Surveys of this period indicate that the poor productivity record stemmed from the sharp increases in

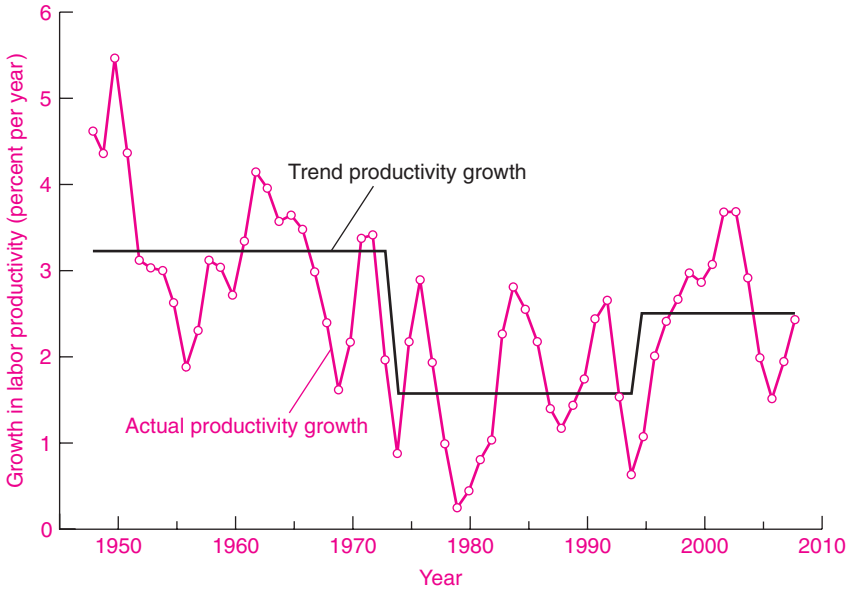


**FIGURE 25-6. Labor Productivity Growth in U.S. Business, 1948–2008**

Labor productivity grew rapidly until the troubled 1970s and then declined. Bolstered by impressive gains in information technology, especially computers, productivity growth has rebounded over the last decade.

Source: Bureau of Labor Statistics. Data were downloaded from the St. Louis Fed database at *research.stlouisfed.org/fred2.*

**Productivity and Real Wages**

| Period | Average Annual Percentage Growth in: Labor productivity | Real wages |
|---|---|---|
| 1948–1973 | 3.1 | 3.3 |
| 1973–1995 | 1.3 | 1.5 |
| 1995–2008 | 2.6 | 2.6 |

**TABLE 25-4. Real Wages Mirror Productivity Growth**

Over the long run, real wages tend to move with trends in labor productivity. After the productivity slowdown in 1973, real wage growth slowed sharply.

Source: U.S. Department of Labor. Productivity is for the U.S. business sector; nominal compensation is deflated using the price index for private business.

oil prices, increasing stringency of regulations, and impacts of price and wage controls and pervasive regulation of the energy industries, as well as a slowdown in research and development spending.

Economists worry about productivity because of its close association with growth in real wages and living standards. Figure 25-5(*c*) showed how growth in real wages has tracked productivity per hour worked since 1900. This point is presented quantitatively in Table 25-4. Some elementary arithmetic shows that if labor's share of national income is constant, this implies that real wages will grow at the rate of growth of labor productivity.[6]

## The Productivity Rebound

Economists have been waiting for an upturn in productivity growth, hoping that the revolution in information technology would spur rapid growth throughout the economy. Indeed, innovations in information technology (computer hardware, software, and communications) have produced astonishing improvements in every corner of the economy. The prices of computers have fallen more than a thousandfold in the last three decades. Electronic mail and the Internet are changing the face of retailing. Computers are the nerve system of business—running airline pricing and reservation systems, scanning price and quantity data in stores, dispatching electricity, clearing checks, dunning taxpayers, and sending students their tuition bills. Some economists think that computers are like a new fourth factor of production.

The impact of the computer revolution became apparent in the productivity statistics beginning around 1995. Having grown slowly during the 1973–1995 period, labor productivity then surged ahead at 2.6 percent per year from 1995 to 2008.

As is predicted by the model with constant income shares, real compensation moved in parallel with labor productivity (see Table 25-4). Real wages grew at an average rate of 3.3 percent from 1948 to 1973, slowed to 1.5 percent per year from 1973 to 1995, and then increased sharply to 2.6 percent from 1995 to 2008.

Enthusiasts spoke of a "new era" and a "brave new world of American capitalism." Fed chair Alan Greenspan, known for his Delphic pronouncements, joined the technological enthusiasts, arguing, "A perceptible quickening in the pace at which technological innovations are applied argues for the hypothesis that the recent acceleration in labor productivity is not just a cyclical phenomenon or a statistical aberration, but reflects, at least in part, a more deep-seated, still developing, shift in our economic landscape."

Economists who have looked at the numbers under a statistical microscope have uncovered some interesting facts about the productivity rebound. Among the important factors are the following:

- *Productivity explosion in computers.* The productivity explosion (and consequent price decline) in computers has been extraordinary. Economists who have studied computer technology estimate that the growth of productivity in this sector has been between 20 and 30 percent per year. This became economically important as computers penetrated ever deeper into the U.S. economy. By the late 1990s, production of information technology was contributing almost half of all productivity growth, although that slowed sharply after the bursting of the technology bubble in 2000.

[6] To see this relationship, write labor's share as $W \times L = s \times P \times Q$, where $s$ = labor's share, $W$ = money wage rate, $L$ = hours of work, $P$ = price index, and $Q$ = output. Dividing both sides by $L$ and $P$ yields $(W/P) = s \times (Q/L)$, which signifies that the real wage equals labor's share times labor productivity. Hence, if the share of labor of national income is constant, real wages will grow at the same rate as labor productivity.

- *Capital deepening.* There has been a very sharp increase in investment since 1995. Companies invested heavily in computers and software to take advantage of their falling prices and the increasing power of new software.
- *Unmeasured outputs.* Many of the advances of the new economy have not been captured by the productivity statistics. The phenomenal advances of the Internet, e-mail, and cellular phones are largely missed in the productivity statistics. Some economists have found that productivity is significantly underestimated for software and communications equipment (see the discussion of price measurement in Chapter 20). Or consider, the time that consumers save by shopping on the Internet, the saving of time and postage involved in the switch from snail-mail to e-mail, and the convenience of cellular telephones—none of these shows up in measured productivity. Others think the true gains from computers lie in the future. Stanford economic historian Paul David, who has studied past inventions, believes that it takes decades for the economy to reap the full benefits of fundamental inventions.

Whether or not the more rapid productivity growth is a permanent feature of our economy, it is clear that computers continue to shape our economy and our lives in surprising ways.

This concludes our introduction to the principles of economic growth. The next chapter applies these principles to the struggle of poor countries to improve their living standards. In the remaining chapters in this part, we open our inquiry to international trade and finance.

## SUMMARY

### A. Theories of Economic Growth

1. The analysis of economic growth examines the factors that lead to the growth of potential output over the long run. The growth in output per capita is an important objective of government because it is associated with rising average real incomes and living standards.
2. Reviewing the experience of nations over space and time, we see that the economy rides on the four wheels of economic growth: (*a*) the quantity and quality of its labor force; (*b*) the abundance of its land and other natural resources; (*c*) the stock of accumulated capital; and, perhaps most important, (*d*) the technological change and innovation that allow greater output to be produced with the same inputs. There is no unique combination of these four ingredients, however; the United States, Europe, and Asian countries have followed different paths to economic success.
3. The classical models of Smith and Malthus describe economic development in terms of land and population. In the absence of technological change, increasing population ultimately exhausts the supply of free land. The resulting increase in population density triggers the law of diminishing returns, so growth produces higher land rents with lower competitive wages. The Malthusian equilibrium is attained when the wage rate has fallen to the subsistence level, below which population cannot sustain itself. In reality, however, technological change has allowed long-term growth in real wages and productivity per worker in most countries by continually shifting the productivity curve of labor upward.
4. Capital accumulation with complementary labor forms the core of modern growth theory in the neoclassical growth model. This approach uses a tool known as the aggregate production function, which relates inputs and technology to total potential GDP. In the absence of technological change and innovation, an increase in capital per worker (capital deepening) would not be matched by a proportional increase in output per worker because of diminishing returns to capital. Hence, capital deepening would lower the rate of return on capital (equal to the real interest rate under risk-free competition) while raising real wages.
5. Technological change increases the output producible with a given bundle of inputs. This pushes upward the aggregate production function, making more output available with the same inputs of labor and capital. Recent analysis in the "new growth theory" seeks to uncover the processes which generate technological change. This approach emphasizes (*a*) that technological change is an output of the economic system, (*b*) that technology is a public or nonrival good that can be used simultaneously by many people, and (*c*) that new inventions are expensive to produce but

inexpensive to reproduce. These features mean that governments must pay careful attention to ensuring that inventors have adequate incentives, through strong intellectual property rights, to engage in research and development.

### B. The Patterns of Growth in the United States

6. Numerous trends of economic growth are seen in data for the twentieth and early twenty-first centuries. Among the key findings are that real wages and output per hour worked have risen steadily; that the real interest rate has shown no major trend; and that the capital-output ratio has declined. The major trends are consistent with the neoclassical growth model augmented by technological advance. Thus economic theory confirms what economic history tells us—that technological advance increases the productivity of inputs and improves wages and living standards.
7. The last trend, continual growth in potential output since 1900, raises the important question of the sources of economic growth. Applying quantitative techniques, economists have used growth accounting to determine that "residual" sources—such as technological change and education—outweigh capital deepening in their impact on GDP growth and labor productivity.
8. After 1970, productivity growth slowed under the weight of energy-price increases, increasing environmental regulation, and other structural changes. In the late 1990s, however, the explosion of productivity and the investment in computers and other information technologies have led to a sharp upturn in measured productivity growth.

## CONCEPTS FOR REVIEW

four wheels of growth:
- labor
- resources
- capital
- technology

aggregate production function
Smith's golden age
capital-labor ratio
Malthus's subsistence wage
neoclassical growth model
$K/L$ rise as capital deepens
new growth theory
technology as a produced good
seven trends of economic growth
growth accounting:
- % $Q$ growth = ¾ (% $L$ growth) + 1/4 (% $K$ growth) + T.C.
- % $Q/L$ growth = ¼ (% $K/L$ growth) + T.C.

## FURTHER READING AND INTERNET WEBSITES

### Further Reading

One of the best surveys of economic growth is Robert Solow, *Economic Growth* (Oxford University Press, Oxford, U.K., 1970). See his pathbreaking article, "A Contribution to the Theory of Economic Growth," *Quarterly Journal of Economics,* 1956. The text reference is William Baumol, "Entrepreneurship: Productive, Unproductive, and Destructive," *Journal of Political Economy,* October 1990, pp. 893–921.

You may want to read some excellent books on economic growth. David N. Weil, *Economic Growth* (Pearson, Addison-Wesley, New York, 2006) is an advanced survey of the subject. David Warsh is an excellent economic journalist; his *Knowledge and the Wealth of Nations* (Norton, New York, 2006) explores the origins of the new growth theory. Benjamin Friedman, *The Moral Consequences of Economic Growth* (Knopf, New York, 2006) explores the moral and historical dimensions of economic growth, with some surprising conclusions.

### Websites

A website devoted to economic growth is maintained by Jonathan Temple of Oxford, *www.bristol.ac.uk/Depts/Economics/Growth/*, and contains many references and links, as well as access to growth data. The articles by Solow and Baumol are available at *www.jstor.org*.

Technological change is often associated with particular inventions. The lives and patents of great inventors can be found at *www.invent.org/hall_of_fame/1_0_0_hall_of_fame.asp*.

## QUESTIONS FOR DISCUSSION

1. **Reminder on compound growth:** Like financial economics, economic growth theory and measurement rely on calculations of growth rates. The one-period growth rate in percent per year is

$$g_t = 100 \times \left( \frac{x_t}{x_{t-1}} - 1 \right)$$

Similarly, the $n$-period growth rate in percent per year is calculated as

$$g_t^{(n)} = 100 \times \left[ \left( \frac{x_t}{x_{t-n}} \right)^{1/n} - 1 \right]$$

   a. Now look back to the table of macroeconomic data in the Appendix to Chapter 19. Calculate the annual growth rate of real GDP for 1980–1981 and 1980–1982.
   b. Next, calculate the growth of labor productivity from 1995 to 2000, assuming the following shows indexes of real output and labor inputs.

| Year | Labor inputs | Output |
|---|---|---|
| 1995 | 100.00 | 100.00 |
| 2000 | 110.29 | 126.16 |

2. "If the government strengthens intellectual property rights, subsidizes basic science, and controls business cycles, we will see economic growth that would astound the classical economists." Explain what the writer meant by this statement.
3. "With zero population growth and no technological change, persistent capital accumulation would ultimately destroy the capitalist class." Explain why such a scenario might lead to a zero real interest rate and to a disappearance of profits.
4. Recall the growth-accounting equation [equation (1) on page 514]. Calculate the growth of output if labor grows at 1 percent per year, capital grows at 4 percent per year, and technological change is 1½ percent per year. How would your answer change if:
   a. Labor growth slowed to 0 percent per year?
   b. Capital growth increased to 5 percent per year?
   c. Labor and capital had equal shares in GDP?

   Also, calculate for each of these conditions the rate of growth of output per hour worked.
5. Use the *PPF* to illustrate the Malthusian prediction and why it is flawed. Put per capita food production on one axis and per capita manufactures on the other. Assume that there are diminishing returns to labor in food production but that manufactures have constant returns to labor.
6. **Advanced problem for those who know calculus:** Those who understand calculus can easily grasp the essentials of the growth-accounting framework of this chapter. We rely for this problem on the important Cobb-Douglas production function. This is a specific algebraic formula that is written as $Q_t = A_t K_t^{\alpha} L_t^{(1-\alpha)}$. It is widely used in empirical studies.
   a. Show that the growth rate of output is given by

$$g(Q_t) = g(A_t) + \alpha g(K_t) + (1 - \alpha)\, g(L_t)$$

   where $g(x_t)$ is the growth rate of that variable.
   b. Advanced courses will show that under perfect competition, $\alpha$ = the share of capital in national income and $(1 - \alpha)$ = labor's share. If the share of labor in national income is 75 percent, derive the growth-accounting equation in the text.
7. **Advanced problem:** Many fear that computers will do to humans what tractors and cars did to horses—the horse population declined precipitously early in this century after technological change made horses obsolete. If we treat computers as a particularly productive kind of $K$, what would their introduction do to the capital-labor ratio in Figure 25-3? Can total output go down with a fixed labor force? Under what conditions would the real wage decline? Can you see why the horse analogy might not apply?

CHAPTER

# 26

# The Challenge of Economic Development

*I believe in materialism. I believe in all the proceeds of a healthy materialism—good cooking, dry houses, dry feet, sewers, drain pipes, hot water, baths, electric lights, automobiles, good roads, bright streets, long vacations away from the village pump, new ideas, fast horses, swift conversation, theaters, operas, orchestras, bands—I believe in them all for everybody. The man who dies without knowing these things may be as exquisite as a saint, and as rich as a poet; but it is in spite of, not because of, his deprivation.*

Francis Hackett

Planet Earth today contains people at vastly different living standards. At one end are the affluent of North America and Western Europe, where the richest 1 percent of the people enjoy about 20 percent of world income and consumption. At the other extreme are the destitute of Africa and Asia—1 billion people living in absolute poverty, with few comforts, seldom knowing where the next meal will come from.

What causes the great differences in the wealth of nations? Can the world peacefully survive with such poverty in the midst of plenty? What steps can poorer nations take to improve their living standards? What are the responsibilities of affluent countries?

These questions concerning the obstacles facing developing countries are among the greatest challenges facing modern economics. It is here that the tools of economics can make the greatest difference in people's daily lives. It is here that economics can literally make the difference between life and death. We begin with an analysis of population and then describe the characteristics of developing countries. The second part of this chapter examines alternative approaches to economic growth in developing countries, particularly the more successful models in Asia along with the failed communist experiment in Russia.

## A. POPULATION GROWTH AND DEVELOPMENT

### MALTHUS AND THE DISMAL SCIENCE

Can technology keep pace with population growth in poor countries? Is Africa doomed to live on the ragged edge of subsistence because of its high birth rate and the burden of diseases like AIDS? These

questions have been a prominent part of economics for almost two centuries.

Economic analysis of population dates back to the Reverend T. R. Malthus, whom we met in the context of the analysis of economic growth in the last chapter. Malthus developed his views while arguing against his father's perfectionist opinion that the human race was always improving. Finally, the son became so agitated that he wrote *An Essay on the Principle of Population* (1798), which was a best-seller and has since influenced the thinking of people all over the world about population and economic growth.

Malthus began with the observation of Benjamin Franklin that in the American colonies, where resources were abundant, population tended to double every 25 years or so. He then postulated a universal tendency for population—unless checked by limited food supply—to grow exponentially, or by a geometric progression. Eventually, a population which doubles every generation—1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, . . . —becomes so large that there is not enough space in the world for all the people to stand.

After invoking exponential growth, Malthus had one further argument. At this point he unleashed the devil of diminishing returns. He argued that, because land is fixed, the supply of food would tend to grow only at an arithmetic progression. It could not keep pace with the exponential growth (or geometric progression) of labor. (Compare 1, 2, 3, 4, . . . , with 1, 2, 4, 8, . . .). We paraphrase Malthus's gloomy conclusions as follows:

> As population doubles and redoubles, it is as if the globe were halving and halving again in size—until finally it has shrunk so much that food production is below the level necessary to support the population.

When the law of diminishing returns is applied to a fixed supply of land, food production tends not to keep up with a population's geometric-progression rate of growth.

Actually, Malthus did not say that population would *necessarily* increase at a geometric rate. This was only its tendency if unchecked. He described the checks that operate, in all times and places, to hold population down. In his first edition, he stressed the "positive" checks that increase the death rate: pestilence, famine, and war. Later, he held out hope that population growth could be slowed by "moral restraint" such as abstinence and postponed marriages.

This important application of diminishing returns illustrates the profound effects that a simple theory can have. Malthus's ideas had wide repercussions. His book was used to support a stern revision of the English poor laws. Under the influence of Malthus's writings, people argued that poverty should be made as uncomfortable as possible. In this view, the government cannot improve the welfare of the poor population because any increase in the incomes of the poor would only cause workers to reproduce until all were reduced to a bare subsistence.

### Compound Interest and Exponential Growth

Let us pause for a reminder on exponential growth and compound interest, which are important tools in economics. Exponential (or geometric) growth occurs when a variable increases at a constant proportional rate from period to period. Thus, if a population of 200 is growing at 3 percent per year, it would equal 200 in year 0, $200 \times 1.03$ in year 1, $200 \times 1.03 \times 1.03$ in year 2, . . . , $200 \times (1.03)^{10}$ in year 10, and so on.

When money is invested continuously, it earns compound interest, meaning that interest is earned on past interest. Money earning compound interest grows geometrically. An intriguing calculation is to determine how much the $26 received by the Indians for Manhattan Island would, if deposited at compound interest, be worth today. Say that this fund was placed in an endowment that earned 6 percent each year from 1626. It would be worth $136 billion in 2010.

A useful rule about compound interest is the **rule of 70,** which states that a magnitude growing at a rate of $g$ per year will double in (70/$g$) years. For example, a human population growing at 2 percent per year will double in 35 years, whereas if you invest your funds at 7 percent per year, the funds will double in value every 10 years.

***Flawed Prophecies of Malthus.*** Despite Malthus's careful statistical studies, demographers today think that his views were oversimplified. In his discussion of diminishing returns, Malthus did not anticipate the technological miracle of the Industrial Revolution; nor did he understand that the birth-control movement and new technologies would provide families with the capability to reduce the birth rate. In fact, population growth in most Western nations began to

decline after 1870 just as living standards and real wages grew most rapidly.

In the century following Malthus, technological advance shifted out the production-possibility frontiers of countries in Europe and North America. Technological change outpaced population, resulting in a rapid rise in real wages. Nevertheless, the germs of truth in Malthus's doctrines are still important for understanding population trends in some poor countries where the race between population and food supply continues today.

***Population Implosion?*** Before we turn to issues facing poor countries, it is important to recognize that the problem facing many rich countries is *declining population growth,* not population explosion. Virtually every rich country in the world today has zero or negative native population growth, meaning that the average number of adult children per woman is 2 or less. Population in most advanced countries is today growing only because of immigration. Stable or declining population with increasing life expectancy puts great stress on countries' fiscal conditions because of the need to fund health care and public pensions.

## Limits to Growth and Neo-Malthusianism

Often, earlier ideas reemerge in light of new social trends or scientific findings. Again and again, neo-Malthusian ideas have surfaced as many antigrowth advocates and environmentalists argue that economic growth is limited due to the finiteness of our natural resources and because of environmental constraints.

Worries about the viability of growth emerged prominently in the early 1970s with a series of studies by an ominous-sounding group called the "Club of Rome." The analysis of this school appeared in a famous computer study called *The Limits to Growth* and its 1992 sequel *Beyond the Limits.* The predictions of the neo-Malthusians were even more dismal than those of Malthus himself:

> If present growth trends in world population, industrialization, pollution, food problems, and resource depletion continue unchanged, the limits to growth on this planet will be reached within the next one hundred years. The most probable results will be a rather sudden and uncontrollable decline in both population and industrial capacity.

These growth critics found a receptive audience because of mounting alarm about rapid population growth in developing countries and, in the 1970s, an upward spiral in oil prices and the sharp decline in the growth of productivity. A second wave of growth pessimism emerged over the last decade because of concerns about environmental constraints on long-term economic growth. Among today's concerns are global warming, in which the use of fossil fuels is warming the climate; widespread evidence of acid rain; the appearance of the Antarctic "ozone hole," along with ozone depletion in temperate regions; deforestation, especially of the tropical rain forests, which may upset the global ecological balance; soil erosion, which threatens the long-term viability of agriculture; ocean acidification from increased atmospheric carbon dioxide; and species extinction, which threatens many ecosystems and precious biological resources.

The economic analysis underlying the neo-Malthusian analysis is closely related to the Malthusian theory. Whereas Malthus held that production would be limited by diminishing returns in food production, today's growth pessimists argue that growth will be limited by the absorptive capacity of our environment. We can, some say, burn only a finite amount of fossil fuel before we face the threat of dangerous climate change. The need to reduce the use of fossil fuels might well slow our long-term economic growth.

There is a key difference, however. The earlier analysis related to *market commodities* such as land, food, and oil. Many of today's concerns relate to *externalities* and *public goods,* where unregulated market prices provide distorted signals.

What is the empirical evidence on the effects of resource exhaustion and environmental limits on economic growth? The facts are that the prices of most basic commodities such as grains, energy, and timber have risen *more slowly* than the general price level. However, many economists are concerned about externalities, particularly global public goods such as global warming. Nations have not found it easy to negotiate cooperative agreements to slow global warming. We can look to the troubled history of nuclear proliferation as another example where global cooperation has been difficult to achieve. The future of the global economy may depend upon finding solutions to these new Malthusian dilemmas.

## B. ECONOMIC GROWTH IN POOR COUNTRIES

### ASPECTS OF A DEVELOPING COUNTRY

Exactly what is a **developing country?** The most important characteristic of a developing country is that it has low per capita income. In addition, people in developing countries usually have poor health, low levels of literacy, extensive malnutrition, and little capital to work with. Many poor countries have weak market and government institutions, corruption, and civil strife. These countries often have high native population growth, but they also suffer from out-migration, particularly among skilled workers.

Table 26-1 is a key source of data for understanding the major players in the world economy, as well as important indicators of underdevelopment. Low- and middle-income countries are grouped into six major regions.

A number of interesting features emerge from the table. Clearly, low-income countries are much poorer than advanced countries like the United States. People in the poorest countries earn only about one-twentieth as much as people in high-income countries. For the table's data, *purchasing-power-parity* (PPP) calculations were used to measure incomes. Market exchange rates tend to understate the incomes of low-wage countries. (The use of purchasing-power-parity exchange rates to evaluate living standards is discussed in Chapter 27.) Note also that the early 2000s were a period of strong

| | Population | | | Per capita GDP | | Education | Net Migration |
|---|---|---|---|---|---|---|---|
| Region | Total number, 2006 (millions) | Growth rate, 2000–2006 (% per year) | Life expectancy at birth (years) | 2006 ($) | Growth, 2000–2006 (% per year) | Adult illiteracy (%, ages 15 and older) | Migration Rate (per 1,000 persons) |
| **East Asia and Pacific** (China, Indonesia, . . .) | 1,900 | 0.9 | 71 | 6,820 | 7.6 | 9 | −2.0 |
| **Eastern Europe and Central Asia** (Russia, Poland, . . .) | 460 | 0.0 | 69 | 9,660 | 5.7 | 2 | −0.4 |
| **Latin America and Caribbean** (Brazil, Mexico, . . .) | 556 | 1.3 | 73 | 8,800 | 1.8 | 10 | −1.2 |
| **Middle East and North Africa** (Egypt, Iran, . . .) | 311 | 1.8 | 70 | 6,450 | 2.3 | 27 | −0.9 |
| **South Asia** (India, Pakistan, . . .) | 1,493 | 1.7 | 63 | 3,440 | 5.1 | 42 | −0.2 |
| **Sub-Saharan Africa** (Nigeria, Ethiopia, . . .) | 770 | 2.3 | 47 | 2,030 | 2.3 | 41 | −0.1 |

**TABLE 26-1. Important Indicators for Different Country Groups**

The World Bank groups developing countries into six regions. For each, a number of important indicators of economic development are shown. Note that low-income countries tend to have high illiteracy and out-migration. Some low-income countries have life expectancies close to those of rich countries.

Source: World Bank, *World Development Report,* and data at *www.worldbank.org.*

growth in the world economy, and that spilled over to most poor regions as well.

In addition, many social and health indicators show the effects of poverty on low-income nations. Life expectancy is lower than in high-income countries, and educational attainment and literacy are often minimal.

There is a great diversity among developing countries. Some remain at the ragged edge of starvation—these are the poorest countries like Congo, Ethiopia, and Liberia. Other countries that were in that category two or three decades ago have moved to the rank of middle-income countries. The more successful ones—Slovenia, Singapore, and South Korea—have graduated from the developing group, and the most successful of these have per capita incomes that have reached the ranks of high-income countries. Yesterday's successful developing countries will be tomorrow's high-income countries.

### Life in Low-Income Countries

To bring out the contrasts between advanced and developing economies, imagine that you are a typical 21-year-old in a low-income country such as Mali, India, or Bangladesh. You are poor. Even after making allowance for the goods that you produce and consume, your annual income barely averages $2000. Your counterpart in North America might have more than $30,000 in average earnings. Perhaps you can find cold comfort in the thought that only 1 person in 4 in the world averages more than $5000 in annual income.

For each of your fellow citizens who can read, there is one like you who is illiterate. Your life expectancy is four-fifths that of the average person in an advanced country; already, two of your brothers and sisters have died before reaching adulthood. Birth rates are high, particularly for families where women receive no education, but mortality rates are also much higher here than in countries with good health-care systems.

Most people in your country work on farms. Few can be spared from food production to work in factories. You work with but one-sixtieth the horsepower of a prosperous North American worker. You know little about science, but much about your village traditions.

You are often hungry, and the food you eat is mainly roughage or rice. While you were among those who got some primary schooling, like most of your friends, you did not go on to high school, and only the wealthiest go to a university. You work long hours in the fields without the benefit of machinery. At night, you sleep on a mat. You have little household furniture, perhaps a table and a radio. Your only mode of transportation is an old pair of boots.

### *Human Development*

This review of life in the poorest countries of the world reminds us of the importance of adequate incomes in meeting basic needs as well as the fact that life involves more than market incomes. Thoughtful economists such as Nobel Prize recipient Amartya Sen and Yale's Gustav Ranis emphasize that other factors should be considered in appraising a country's progress: Factors such as health and life expectancy, school enrollment, adult literacy, and independence of women are important goals for developing countries along with increasing per capita market consumption.

Figure 26-1 shows a plot of life expectancy and per capita GDP. The correlation is strong, but there are exceptions to the general positive relationship. Some countries, such as Botswana, Equatorial Guinea, and South Africa, have low life expectancies relative to income because of the scourge of AIDS. No poor countries have high life expectancies, but countries like Greece and Costa Rica have life expectancies as high as or higher than those in the United States because of the poorly designed health-care system in the United States.

## THE FOUR ELEMENTS IN DEVELOPMENT

Having seen what it means to be a developing country, we now turn to an analysis of the process by which low-income countries improve their living standards. We saw in Chapter 25 that economic growth in the United States—growth in its potential output—rides on four wheels. These are (1) human resources, (2) natural resources, (3) capital, and (4) technology. These four wheels operate in rich and poor countries, although the mix and strategy for combining them will differ depending on the state of development. Let's see how each of the four wheels operates in developing countries and consider how public policy can steer the growth process in favorable directions.

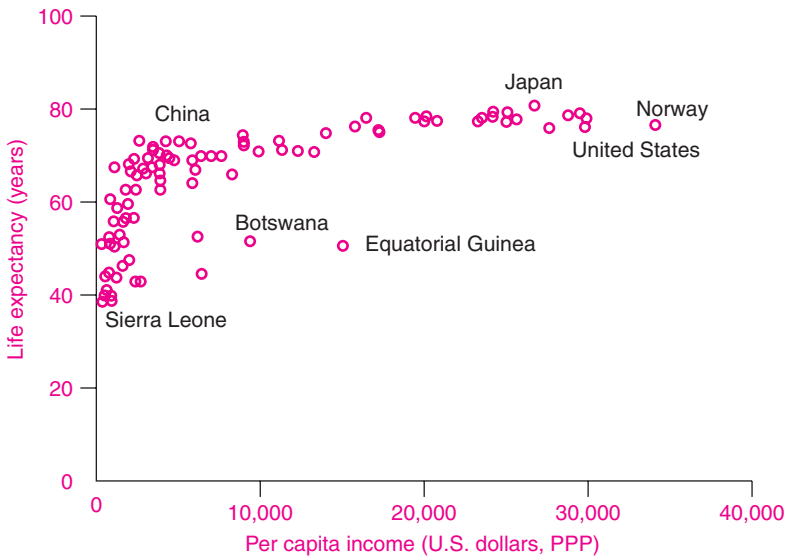


**FIGURE 26-1. Life Expectancy and Incomes, 2000**

Life expectancies are highly correlated with per capita incomes. Higher incomes allow greater investments in health care, but a healthier population is also more productive. Note that some middle-income African countries have been hard hit by the AIDS epidemic, threatening both health and economic development.

Source: United Nations Development Programme, *Human Development Report,* 2002.

## Human Resources

***Population Explosion: The Legacy of Malthus.*** Many poor countries are forever running hard just to stay in place. Even as a poor nation's GDP rises, so does its population. Recall our discussion of the Malthusian population trap, where population grows so rapidly that incomes remain at subsistence levels. While the high-income countries left Malthus behind long ago, Africa is still caught in the Malthusian bind of high birth rates and stagnant incomes. And the population expansion has not stopped—demographers project that the poor countries will add about 1 billion people over the next 25 years.

It's hard for poor countries to overcome poverty with birth rates so high. But there are escape routes from overpopulation. One strategy is to take an active role in curbing population growth, even when such actions run against prevailing religious norms. Many countries have introduced educational campaigns and subsidized birth control.

And for countries which manage to boost their per capita incomes, there is the prospect of making the *demographic transition,* which occurs when a population stabilizes with low birth rates and low death rates. Once countries get rich enough, and infant mortality drops, people voluntarily reduce their birth rates. When women are educated and emerge from subservience, they usually decide to spend less of their lives in childbearing. Families substitute quality for quantity—devoting time and incomes to a better education for fewer children. Mexico, Korea, and Taiwan have all seen their birth rates drop sharply as their incomes have risen and their populations have received more education.

Slowly, the results of economic development and birth control are being felt. The birth rate in poor countries has declined from 44 per 1000 per year in 1960 to 27 per 1000 in 2005, but that is still far higher than the birth rate of 11 per 1000 in the high-income countries. The struggle against poverty induced by excessive population growth continues.

However, the demographic transition has not been reached in every corner of the world. Fertility continues at a high rate in much of tropical Africa even as the AIDS epidemic rages through the population and lowers life expectancies in a way not experienced

since the great plagues of earlier centuries. The specter of Malthus hangs over much of central Africa.

***Human Capital.*** In addition to dealing with excessive population growth, developing countries must also be concerned with the quality of their human resources. Economic planners in developing countries emphasize the following strategies:

1. *Control disease and improve health and nutrition.* Raising the population's health standards not only makes people happier but also makes them more productive workers. Health-care clinics and provision of safe drinking water are vitally useful social capital.
2. *Improve education, reduce illiteracy, and train workers.* Educated people are more productive workers because they can use capital more effectively, adopt new technologies, and learn from their mistakes. For advanced learning in science, engineering, medicine, and management, countries will benefit by sending their best minds abroad to bring back the newest advances. But countries must beware of the brain drain, in which the most able people get drawn off to high-wage countries.
3. *Above all, do not underestimate the importance of human resources.* Most other factors can be bought in the international marketplace. Most labor is home-grown, although labor can sometimes be augmented through immigration. The crucial role of skilled labor has been shown again and again when sophisticated mining, defense, or manufacturing machinery fell into disrepair and disuse because the labor force of developing countries had not acquired the necessary skills for its operation and maintenance.

## Natural Resources

Some poor countries of Africa and Asia have meager endowments of natural resources, and such land and minerals that they do possess must be divided among large populations. Perhaps the most valuable natural resource of developing countries is arable land. Much of the labor force in developing countries is employed in farming. Hence, the productive use of land—with appropriate conservation, fertilizers, and tillage—will go far in increasing a poor nation's output.

Moreover, land ownership patterns are a key to providing farmers with strong incentives to invest in capital and technologies that will increase their land's yield. When farmers own their own land, they have better incentives to make improvements, such as in irrigation systems, and undertake appropriate conservation practices.

Some economists believe that natural wealth from oil or minerals is not an unalloyed blessing. Countries like the United States, Canada, and Norway have used their natural wealth to form the solid base of industrial expansion. In other countries, the wealth has been subject to plunder and *rent seeking* by corrupt leaders and military cliques. Countries like Nigeria and Congo (formerly Zaire), which are fabulously wealthy in terms of mineral resources, failed to convert their underground assets into productive human or tangible capital because of venal rulers who drained that wealth into their own bank accounts and conspicuous consumption.

## Capital

A modern economy requires a vast array of capital. Countries must abstain from current consumption to engage in fruitful roundabout production. But there's the rub, for the poorest countries are near a subsistence standard of living. When you are poor to begin with, reducing current consumption to provide for future consumption seems impossible.

The leaders in the growth race invest at least 20 percent of output in capital formation. By contrast, the poorest agrarian countries are often able to save only 5 percent of national income. Moreover, much of the low level of saving goes to provide the growing population with housing and simple tools. Little is left over for development.

But let's say a country has succeeded in hiking up its rate of saving. Even so, it takes many decades to accumulate the highways, telecommunications systems, hospitals, electricity-generating plants, and other capital goods that underpin a productive economic structure.

Even before acquiring the most sophisticated capital, however, developing countries must first build up their *infrastructure,* or social overhead capital, which consists of the large-scale projects upon which a market economy depends. For example, a regional agricultural adviser helps farmers in an area learn of new seeds or crops; a road system links up the different markets; a public-health program inoculates people against typhoid or diphtheria and protects the population beyond those inoculated. In each of these cases it would be impossible for an enterprising firm to capture the social benefits involved, because the firm cannot collect fees from the thousands or even millions of

beneficiaries. Because of the large indivisibilities and external effects of infrastructure, the government must step in to make or ensure the necessary investments.

In many developing countries, the single most pressing problem is too little saving. Particularly in the poorest regions, urgent current consumption competes with investment for scarce resources. The result is too little investment in the productive capital so indispensable for rapid economic progress.

### Foreign Borrowing and Debt Crises

If there are so many obstacles to finding domestic saving for capital formation, why not borrow abroad? Economic theory tells us that a rich country, which has tapped its own high-yield investment projects, can benefit both itself and the recipient by investing in high-yield projects abroad.

However, risks are the necessary companion of reward in foreign lending. The history of lending from rich to poor regions shows a cycle of opportunity, lending, profits, overexpansion, speculation, crisis, and drying-up of funds, followed by a new round of lending by yet another group of starry-eyed investors. No sooner has one crisis been forgotten than another one erupts.

It is instructive to review the saga of *emerging markets,* which is the name often given to rapidly growing low- and middle-income countries that are promising areas for foreign investment. In the 1990s, investors in wealthy countries sent their funds abroad in search of higher returns; poor countries, hungry for capital, welcomed this flow of foreign funds. From Thailand to South Africa, both loans and equity investments grew rapidly during the 1990s.

Figure 26-2 shows the interest-rate spread on emerging market securities. This represents the risk premium that borrowers from emerging-market countries would need to pay to attract funds. When the perceived risk is

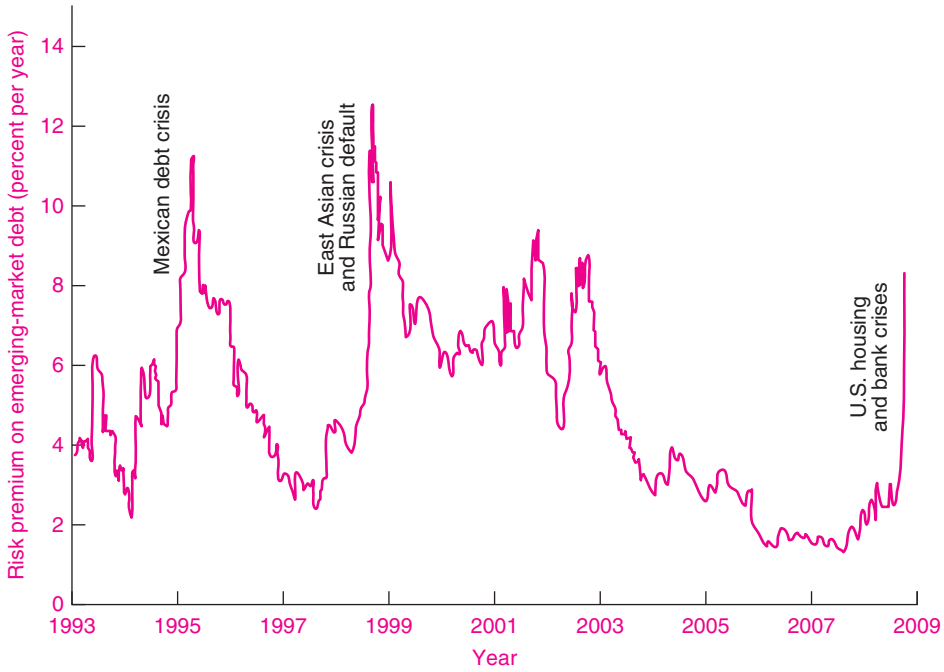


**FIGURE 26-2. Spread on Emerging-Market Bonds, 1993–2008**

The spread shows the risk premium that borrowers from emerging-market countries paid. It is the premium over safe U.S. dollar securities. Note how the premium shot up during the Mexican crisis in 1995 and the emerging-market crisis and Russian default in 1998. Then market participants became optimistic during the long market boom of the 2000s. All this came to an end with the credit crisis of 2007–2009 as the spread increased.

Source: International Monetary Fund.

low, the spread is low. When investors become concerned that countries will not pay back their loans, or during periods when the price of risk rises, the spreads skyrocket.

As long as the growth in emerging markets continued, all was quiet and returns were solid. But a slowdown in growth, combined with a series of banking crises, led to massive outflows of short-term funds from Thailand, Indonesia, and South Korea. Bankers who had invested heavily called in their loans. This led to a sharp increase in the supply of the currencies of these countries. Most countries were on fixed-exchange-rate systems, and the selling overwhelmed the countries' foreign exchange reserves. One after another, the currencies of the East Asian countries depreciated sharply. Many called upon the International Monetary Fund (IMF) to provide short-term funds, but the IMF required contractionary monetary and fiscal policies. All these factors together produced sharp business recessions throughout East Asia. When Russia defaulted on its debt in 1998, the emerging-country market panicked and credit spreads shot up.

Within 3 years, most of these countries had recovered from the crisis after a period of *adjustment*—slow output growth, declining real wages, debt reschedulings, and trade surpluses. Economic growth had resumed. The world had survived another financial crisis. As Figure 26-2 shows, the spread or risk premium declined gradually over the next decade—until the next crisis erupted in the U.S. financial system in 2007.

## Technological Change and Innovations

The final and most important wheel is technological advance. Here, developing countries have one major advantage: They can hope to benefit by relying on the technological progress of more advanced nations.

***Imitating Technology.*** Poor countries need not find modern Newtons to discover the law of gravity; they can read about it in any physics book. They don't have to repeat the slow, meandering route to the Industrial Revolution; they can buy tractors, computers, and power looms undreamed of by the great merchants of the past.

Japan and the United States clearly illustrate this in their historical developments. The United States provides a hopeful example to the rest of the world. The key inventions involved in the automobile originated almost exclusively abroad. Nevertheless, Ford and General Motors applied foreign inventions and rapidly became the world leaders in the automotive industry.

Japan joined the industrial race late, and only at the end of the nineteenth century did it send students abroad to study Western technology. The Japanese government took an active role in stimulating the pace of development and in building railroads and utilities. By adopting productive foreign technologies, Japan moved into its position today as the world's second-largest industrial economy. The examples of the United States and Japan show how countries can thrive by adapting foreign science and technology to local market conditions.

***Entrepreneurship and Innovation.*** From the histories of the United States and Japan, it might appear that adaptation of foreign technology is an easy recipe for development. You might say: "Just go abroad; copy more-efficient methods; put them into effect at home; then sit back and wait for the extra output to roll in."

Alas, implementing technological change is not that simple. You can send a textbook on chemical engineering to Poorovia, but without skilled scientists, engineers, entrepreneurs, and adequate capital, Poorovia couldn't even think about building a working petrochemical plant. The advanced technology was itself developed to meet the special conditions of the advanced countries—including ample skilled engineers and workers, reliable electrical service, and quickly available spare parts and repair services. These conditions do not prevail in poor countries.

One of the key tasks of economic development is promoting an entrepreneurial spirit. A country cannot thrive without a group of owners or managers willing to undertake risks, open new businesses, adopt new technologies, and import new ways of doing business. At the most fundamental level, innovation and entrepreneurship thrive when property rights are clear and complete and taxes and other drains on profits (such as corruption) are low and predictable. Government can also foster entrepreneurship through specific investments: by setting up extension services for farmers, by educating and training the workforce, and by establishing management schools.

Poor countries often suffer from pervasive corruption. The following discussion by economic

development specialist Robert Klitgaard explains how corruption undermines economic development:

> At the broadest level, corruption is the misuse of office for unofficial ends. The catalogue of corrupt acts includes bribery, extortion, influence-peddling, nepotism, fraud, speed money, embezzlement, and more.
>
> Corruption that undercuts the rules of the game—for example, the justice system or property rights or banking and credit—devastates economic and political development. Corruption that allows polluters to foul rivers or hospitals to extort patients can be environmentally and socially corrosive. When corruption becomes the norm, its effects are crippling. So, although every country has corruption, the varieties and extent differ. The killer is systematic corruption that destroys the rules of the game. It is one of the principal reasons why the most underdeveloped parts of our planet stay that way.

Battling corruption is particularly difficult because the state, which is the instrument of justice, is often itself corrupt.

## Vicious Cycles to Virtuous Circles

We have emphasized that poor countries face great obstacles in combining the four elements of progress—labor, capital, resources, and innovation. In addition, countries find that the difficulties reinforce each other in a *vicious cycle of poverty*.

Figure 26-3 illustrates how one hurdle raises yet other hurdles. Low incomes lead to low saving; low saving retards the growth of capital; inadequate capital prevents introduction of new machinery and rapid growth in productivity; low productivity leads to low incomes. Other elements in poverty are also self-reinforcing. Poverty is accompanied by low levels of education, literacy, and skill; these in turn prevent the adoption of new and improved technologies and lead to rapid population growth, which eats away at improvements in output and food production.

Countries that suffer from a vicious cycle can get caught in a *poverty trap*. This syndrome arises when there are multiple equilibria, and one of the equilibria may be particularly pernicious. Low-level traps are found in many areas of the social and natural sciences and are illustrated in Figure 26-4. This graph shows average income in period $t$ on the horizontal axis and average income in period $(t + 1)$ on the

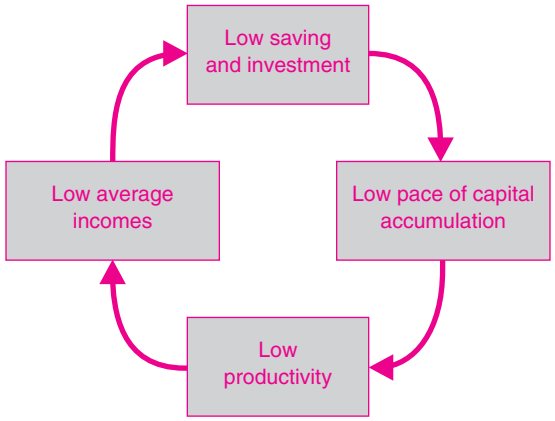


**FIGURE 26-3. The Vicious Cycle of Poverty**

Many obstacles to development are self-reinforcing. Low levels of income prevent saving, retard capital growth, hinder productivity growth, and keep income low. Successful development may require taking steps to break the chain at many points.

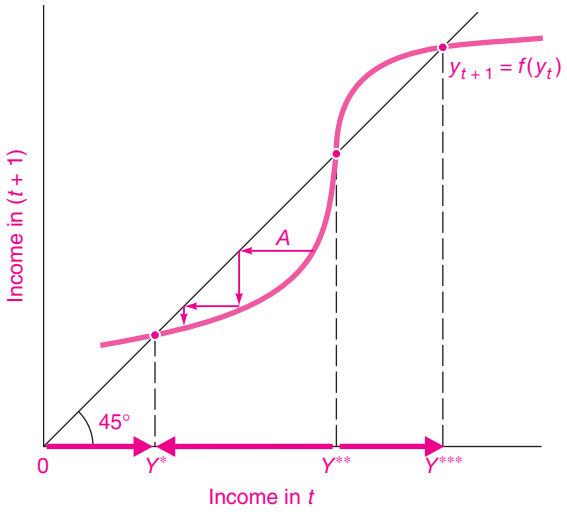


**FIGURE 26-4. Countries Can Get Caught in Poverty Traps**

When vicious cycles lead to downward spirals, countries can get caught in low-level traps such as $Y^*$. Note how a country that starts out between 0 and $Y^{**}$ will gravitate back to the low-level trap. Follow the arrows starting at $A$ and see how they lead to $Y^*$. However, if a country can make a big push to get out of the trap by pushing beyond $Y^{**}$, then the country enjoys a virtuous cycle of growth to the high-level of income at $Y^{***}$. Low-level traps can arise because of the interaction of low income, poor health, low saving, low investment, and low productivity.

vertical axis. The nonlinear growth curve $y_{t+1} = f(y_t)$ shows how income moves over time. The 45° line shows the dividing line between positive growth and decline. When a point on the growth curve is above the 45° line, income in $(t + 1)$ is greater than income in $t$, so income is growing. When the growth curve intersects the 45° line, income is constant and we have an economic equilibrium.

The unusual feature of the *S*-shaped growth curve is that it leads to multiple equilibria. The lower crossing represents a nasty low-level equilibrium trap at $Y^*$, while the upper one is a benign high-level equilibrium at $Y^{***}$. Modern economic-development theory points to low-level traps coming from rapid population growth, low productivity, or low "connectivity."

Overcoming the poverty trap may require a concerted effort on many fronts, and some development economists recommend a "big push" forward to break the vicious cycle. If a country is fortunate, simultaneous steps to invest more, improve health and education, develop skills, and curb population growth can break the vicious cycle of poverty and stimulate a virtuous circle of rapid economic development. If the country can push itself to the right of $Y^{**}$ in Figure 26-4, then it will take off into sustained economic growth.

## STRATEGIES OF ECONOMIC DEVELOPMENT

We see how countries must combine labor, resources, capital, and technology in order to grow rapidly. But this is no real formula; it is the equivalent of saying that an Olympic sprinter must run like the wind. Why do some countries succeed in running faster than others? How do poor countries ever get started down the road of economic development?

Historians and social scientists have long been fascinated by the differences in the pace of economic growth among nations. Some early theories stressed climate, noting that all advanced countries lie in the earth's temperate zone. Others have pointed to custom, culture, or religion as a key factor. Max Weber emphasized the "Protestant ethic" as a driving force behind capitalism. More recently, Mancur Olson has argued that nations begin to decline when their decision structures become brittle and interest groups or oligarchies prevent social and economic change.

No doubt each of these theories has some validity for a particular time and place. But they do not hold up as universal explanations of economic development. Weber's theory leaves unexplained why the cradle of civilization appeared in the Near East and Greece while the later-dominant Europeans lived in caves, worshiped trolls, and wore bearskins. Where do we find the Protestant ethic in bustling China? How can we explain that a country like Japan, with a rigid social structure and powerful lobbies, has become one of the world's most productive economies?

Even in the modern era, people become attached to simple, holistic explanations of economic development. People once considered import substitution (the replacement of imports with domestically produced goods) to be the most secure development strategy. Then, in the 1970s, reliance on labor-intensive techniques was thought advantageous. Today, as we will see, economists tend to emphasize reliance on market forces with an outward orientation. This history should serve as a warning to be wary of oversimplified approaches to complex processes.

Nonetheless, historians and development economists have learned much from the study of the varieties of economic growth. What are some of the lessons? The following account represents a montage of important ideas developed in recent years. Each approach describes how countries might break out of the vicious cycle of poverty and begin to mobilize the four wheels of economic development.

### *The Backwardness Hypothesis*

One view emphasizes the international context of development. We saw above that poorer countries have important advantages that the first pioneers along the path of industrialization did not. Developing nations can now draw upon the capital, skills, and technology of more-advanced countries. A hypothesis advanced by Alexander Gerschenkron of Harvard suggests that *relative backwardness* itself may aid development. Countries can buy modern textile machinery, efficient pumps, miracle seeds, chemical fertilizers, and medical supplies. Because they can lean on the technologies of advanced countries, today's developing countries can grow more rapidly than did Britain or Western Europe in the period 1780–1850. As low-income countries draw upon the

more productive technologies of the leaders, we would expect to see *convergence* of countries toward the technological frontier. Convergence occurs when those countries or regions that have initially low incomes tend to grow more rapidly than ones with high incomes.

### Industrialization vs. Agriculture

In most countries, incomes in urban areas are almost double those in rural areas. And in affluent nations, much of the economy is in industry and services. Hence, many nations jump to the conclusion that industrialization is the cause rather than the effect of affluence.

We must be wary of such inferences, which confuse the association of two characteristics with causality. Some people say, "Rich people drive BMWs, but driving a BMW will not make you a rich person." Similarly, there is no economic justification for a poor country to insist upon having its own national airline and large steel mill. These are not the fundamental necessities of economic growth.

The lesson of decades of attempts to accelerate industrialization at the expense of agriculture has led many analysts to rethink the role of farming. Industrialization is capital-intensive, attracts workers into crowded cities, and often produces high levels of unemployment. Raising productivity on farms may require less capital, while providing productive employment for surplus labor. Indeed, if Bangladesh could increase the productivity of its farming by 20 percent, that advance would do more to release resources for the production of comforts than would trying to construct a domestic steel industry to displace imports.

### State vs. Market

The cultures of many developing countries are hostile to the operation of markets. Often, competition among firms or profit-seeking behavior is contrary to traditional practices, religious beliefs, or vested interests. Yet decades of experience suggest that extensive reliance on markets provides the most effective way of managing an economy and promoting rapid economic growth.

What are the important elements of a market-oriented policy? The important elements include the predominance of private property and ownership, an outward orientation in trade policy, low tariffs and few quantitative trade restrictions, the promotion of small business, and the fostering of competition. Moreover, markets work best in a stable macroeconomic environment—one in which taxes are predictable and inflation is low.

### Growth and Outward Orientation

A fundamental issue of economic development concerns a country's stance toward international trade. Should developing countries attempt to be self-sufficient, to replace most imports with domestic production? (This is known as a strategy of *import substitution*.) Or should a country strive to pay for the imports it needs by improving efficiency and competitiveness, developing foreign markets, and keeping trade barriers low? (This is called a strategy of *outward orientation* or *openness*.)

Policies of import substitution were often popular in Latin America until the 1980s. The policy most frequently used toward this end was to build high tariff walls around domestic manufacturing industries so that local firms could produce and sell goods that would otherwise be imported.

A policy of openness keeps trade barriers as low as practical, relying primarily on tariffs rather than quotas and other nontariff barriers. It minimizes the interference with financial flows and allows supply and demand to operate in financial markets. It avoids a state monopoly on exports and imports. It keeps government regulation to the minimum necessary for an orderly market economy. Above all, it relies primarily on a private market system of profits and losses to guide production, rather than depending on public ownership and control or the commands of a government planning system.

The success of outward-oriented policies is best illustrated by the successful East Asian countries. A generation ago, countries like Taiwan, South Korea, and Singapore had per capita incomes one-quarter to one-third of those in the wealthiest Latin American countries. Yet, by saving large fractions of their national incomes and channeling these to high-return export industries, the East Asian countries overtook every Latin American country by the late 1980s. The secret to success was not a doctrinaire laissez-faire policy, for the governments in

fact engaged in selective planning and intervention. Rather, the openness and outward orientation allowed the countries to reap economies of scale and the benefits of international specialization and thus to increase employment, use domestic resources effectively, enjoy rapid productivity growth, and provide enormous gains in living standards.

While openness provides many benefits, excessive openness, particularly to short-term financial flows, is an invitation to speculative attack. What investors lendeth, investors can taketh back. This syndrome can cause financial and banking crises, as we noted for the East Asian economies in our discussion earlier in this chapter.

### *Summary Judgment*

Decades of experience in dozens of countries have led many development economists to the following summary view of the way government can best promote rapid economic development:

The government has a vital role in establishing and maintaining a healthy economic environment. It must ensure respect for the rule of law, enforce contracts, fight corruption, and orient its policies toward competition and innovation. Government must play a leading role in investments in social overhead capital—in education, health, communications, energy, and transportation—but it should look to the private sector where it has no comparative advantage. Government should resist the temptation to produce everything at home. A firm commitment to openness to trade and foreign investment will help ensure that a country moves quickly toward the best world practices in different sectors.

## C. ALTERNATIVE MODELS FOR DEVELOPMENT

People continually look for ways to improve their living standards. Economic betterment is particularly compelling for poor countries seeking a path to the riches they see around them. This textbook has surveyed in depth the mixed market economy of the United States, which combines fundamentally free markets with a sizable government sector. What other alternatives are available?

## A BOUQUET OF "ISMS"

At one extreme is *free-market absolutism,* which holds that the best government is the least government. At the other extreme is complete communism, with the government operating a collectivized economic order in which the first-person singular hardly exists. Between the extremes of laissez-faire and communism lie mixed capitalism, managed markets, socialism, and many combinations of these models. In this section, we describe briefly some of the influential alternative strategies for growth and development:

1. *The Asian managed-market approach.* South Korea, Taiwan, Singapore, and other countries of East Asia have devised their own brands of economics that combine strong government oversight with powerful market forces.
2. *Socialism.* Socialist thinking encompasses a wide variety of different approaches. In Western Europe after World War II, socialist governments operating in a democratic framework expanded the welfare state, nationalized industries, and planned their economies. In recent years, however, these countries moved back toward a free-market framework with extensive deregulation and privatization.
3. *Soviet-style communism.* For many years, the clearest alternative to the market economy existed in the Soviet Union. Under the Soviet model, the state owned all the land and most of the capital, set wages and most prices, and directed the microeconomic operation of the economy.

### *The Central Dilemma: Market vs. Command*

A survey of alternative economic systems may seem like a bewildering array of economic "isms." And indeed, there is a great variety in the way countries organize their economies.

One central issue runs through all the great debates about alternative economic systems: Should economic decisions be taken primarily by the *private market* or by *government command?*

At one end of the spectrum is the *market economy*. In a market system, people act voluntarily and primarily for financial gain or personal satisfaction. Firms buy factors and produce outputs, selecting inputs and outputs in a way that will maximize their profits. Consumers supply factors and buy consumer goods to maximize their satisfactions. Agreements on production and consumption are made voluntarily and with the use of money, at prices determined in free markets, and on the basis of arrangements between buyers and sellers. Although individuals differ greatly in terms of economic power, the relationships between individuals and firms are horizontal in nature, essentially voluntary, and nonhierarchical.

At the other end of the spectrum is the *command economy*, where decisions are made by government bureaucracy. In this approach, people are linked by a vertical relationship, and control is exercised by a multilevel hierarchy. The planning bureaucracy determines *what* goods are produced, *how* they are produced, and *for whom* output is produced. The highest level of the pyramid makes the major decisions and develops the elements of the plan for the economy. The plan is subdivided and transmitted down the bureaucratic ladder, with the lower levels of the hierarchy executing the plan with increasing attention to detail. Individuals are motivated by coercion and legal sanctions; organizations compel individuals to accept orders from above. Transactions and commands may or may not use money; trades may or may not take place at established prices.

In between are the socialist and the managed-market economies. In both cases government plays an important role in guiding and directing the economy, though much less so than in a command economy. The tension between markets and command runs through all discussions about alternative economic systems. Let us look in more detail at some of the alternatives to the mixed market economies.

## THE ASIAN MODELS

### *Asian Dragons*

Development specialists sometimes look to the countries of East Asia as examples of successful development strategies. The rapid economic growth over the last half-century in South Korea, Singapore, and Taiwan is sometimes called the *East Asian miracle*. Table 26-2 compares the performance of the "Asian dragons" with those of other major areas over recent years. Latin America and sub-Saharan Africa have been growing at a positive rate. However, look at the East Asian and Pacific region, and especially China. Countries in this region have had a phenomenal rate of growth, particularly in the last three decades.

A World Bank study analyzed the economic policies of different regions to see whether any patterns emerged.[1] The results confirmed common

[1] See this chapter's Further Reading section for the World Bank study on the East Asian miracle.

| | Average Growth of Real per Capita GDP | | |
|---|---|---|---|
| **Region** | **1962–1973** | **1973–1995** | **1995–2006** |
| East Asia and Pacific | 3.6 | 4.8 | 6.4 |
| China | 4.0 | 4.7 | 8.2 |
| South Asia | 2.0 | 2.5 | 4.4 |
| India | 2.2 | 2.3 | 4.9 |
| Latin America and Caribbean | 4.0 | 1.7 | 1.5 |
| Sub-Saharan Africa | 2.8 | 0.7 | 1.7 |

**TABLE 26-2. Attention to Fundamentals Spurred Growth for the Asian Dragons**

Source: *World Development Indicators* (2008), available at *www.worldbank.org/*.

views but also found a few surprises. Here are the high points:

- *Investment rates.* The Asian dragons followed the classic recipe of high investment rates to ensure that their economies benefited from the latest technology and could build up the necessary infrastructure. Investment rates among the Asian dragons were almost 20 percentage points higher than those of other regions.
- *Macroeconomic fundamentals.* Successful countries had a steady hand on macroeconomic policies, keeping inflation low and saving rates high. They invested heavily in human capital as well as in physical capital and did more to promote education than any other developing region. The financial systems were managed to ensure monetary stability and a sound currency.
- *Outward orientation.* The Asian dragons were outward-oriented, often keeping their exchange rates undervalued to promote exports, encouraging exports with fiscal incentives, and pursuing technological advance by adopting best-practice techniques of high-income countries.

### The Rise of China

One of the major surprises in economic development during the last three decades was the rapid growth of the Chinese economy. After the Chinese revolution of 1949, China initially adopted a Soviet-style central-planning system. The high-water mark of centralization came with the Cultural Revolution of 1966–1969, which led to an economic slowdown in China. After the death of the revolutionary leader Mao Tse-tung, a new generation concluded that economic reform was necessary if the Communist party was to survive. Under Deng Xiaoping's leadership from 1977 to 1997, China decentralized a great deal of economic power and promoted competition. Economic reform was, however, not accompanied by political reform; the democracy movement was ruthlessly repressed in Tiananmen Square in 1989, and the Communist party has continued to monopolize the political process.

To spur economic growth, the Chinese leadership has taken dramatic steps such as setting up "special economic zones" which allowed capitalist and foreign enterprises to operate. The most rapidly growing parts of China have been the coastal regions, such as the southern region near Hong Kong and in greater Shanghai. These areas have become closely integrated with countries outside China and have attracted considerable foreign investment. In addition, China has allowed private and foreign firms, free from government planning or control, to operate alongside state-owned firms. These innovative forms of ownership have grown rapidly and by the 2000s were producing more than half of China's GDP.

The continued rapid growth of the Chinese economy has surprised observers almost as much as did the collapse of the Soviet economy. As shown in Table 26-2, the growth in per capita GDP accelerated from 4.0 percent per year in 1962–1973 to 8.2 percent per year in 1995–2006. Exports from China to the United States grew over 17 percent per year during the last decade. By 2008, China had annual exports of almost $2 trillion and had accumulated $1½ trillion in foreign exchange reserves.

The future of the Chinese economic model is being watched closely around the world. The undoubted success of outward orientation, particularly to foreign investment, is an especially striking feature of Chinese economic policy.

## SOCIALISM

As a doctrine, socialism developed from the ideas of Karl Marx and other radical thinkers of the nineteenth century. Socialism is a middle ground between laissez-faire capitalism and the central-planning model, which we discuss in the next subsection. A few common elements characterize most socialist philosophies:

- *Government ownership of productive resources.* Socialists traditionally believed that the role of private property should be reduced. Key industries such as railroads and banking should be nationalized (that is, owned and operated by the state). In recent years, because of the poor performance of many state-owned enterprises, enthusiasm for nationalization has ebbed in most advanced democracies.
- *Planning.* Socialists are suspicious of the "chaos" of the marketplace and question the allocational efficiency of the invisible hand. They insist that a planning mechanism is needed to coordinate different sectors. In recent years, planners have

emphasized subsidies to promote the rapid development of high-technology industries, such as microelectronics, aircraft manufacturing, and biotechnology; these policies are sometimes called "industrial policies."

- *Redistribution of income.* Inherited wealth and the highest incomes are to be reduced by the militant use of government taxing powers; in some Western European countries, marginal tax rates have reached 98 percent. Government social security benefits, free medical care, and cradle-to-grave welfare services paid for with progressive taxes increase the well-being of the less privileged and guarantee minimum standards of living for all.
- *Peaceful and democratic evolution.* Socialists often advocate the peaceful and gradual extension of government ownership—evolution by ballot rather than revolution by bullet.

Socialist approaches fell out of favor with the collapse of communism, the stagnation in Europe, and the success of market-oriented economies. Thoughtful socialists are combing through the wreckage to find a future role for this branch of economic thought.

## THE FAILED MODEL: CENTRALLY PLANNED ECONOMIES

For many years, developing countries looked to the Soviet Union and other communist countries as role models on how to industrialize. Communism offered both a theoretical critique of Western capitalism and a seemingly workable strategy for economic development. We begin by reviewing the theoretical underpinnings of Marxism and communism and then examine how the Soviet-style command economy worked in practice.

### Karl Marx: Economist as Revolutionary

On the surface, Karl Marx (1818–1883) lived an uneventful life, studiously poring through books in the British Museum, writing newspaper articles, and working on his scholarly studies of capitalism. Although originally attracted to German universities, his atheism, pro-constitutionalism, and radical ideas led him to journalism. He was eventually exiled to Paris and London, where he wrote his massive critique of capitalism, *Capital* (1867, 1885, 1894).

The centerpiece of Marx's work is an incisive analysis of the strengths and weaknesses of capitalism. Marx argued that all commodity value is determined by labor content—both the direct labor and the indirect labor embodied in capital equipment. For example, the value of a shirt comes from the efforts of the textile workers who put it together, plus the efforts of the workers who made the looms. By imputing all the value of output to labor, Marx attempted to show that profits—the part of output that is produced by workers but received by capitalists—amount to "unearned income."

In Marx's view, the injustice of capitalists' receiving unearned income justifies transferring the ownership of factories and other means of production from capitalists to workers. He trumpeted his message in *The Communist Manifesto* (1848): "Let the ruling classes tremble at a Communist revolution. The proletarians have nothing to lose but their chains." And the ruling capitalist classes did tremble at Marxism for more than a century!

Like many great economists, but with more passion than most, Marx was deeply moved by the struggle of working people and hoped to improve their lives. He penned the words that appear on his gravestone: "Up 'til now philosophers have only interpreted the world in various ways. The point, though, is to change it!" Our epitaph for Marx might echo the appraisal of the distinguished intellectual historian, Sir Isaiah Berlin: "No thinker in the nineteenth century has had so direct, deliberate, and powerful an influence on mankind as Karl Marx."

### *Baleful Prophesies*

Marx saw capitalism as inevitably leading to socialism. In Marx's world, technological advances enable capitalists to replace workers with machinery as a means of earning greater profits. But this increasing accumulation of capital has two contradictory consequences. As the supply of available capital increases, the rate of profit on capital falls. At the same time, with fewer jobs, the unemployment rate rises and wages fall. In Marx's terms, the "reserve army of the unemployed" would grow, and the working class would become increasingly "immiserized"—by which he meant that working conditions would deteriorate and workers would grow progressively alienated from their jobs.

As profits decline and investment opportunities at home become exhausted, the ruling capitalist classes resort to imperialism. Capital tends to seek higher rates of profit abroad. And, according to this theory (particularly as later expanded by Lenin), the foreign policies of imperialist nations increasingly attempt to win colonies and then mercilessly milk surplus value from them.

Marx believed that the capitalist system could not continue this unbalanced growth forever. Marx predicted increasing inequality under capitalism, along with a gradual emergence of class consciousness among the downtrodden proletariat. Business cycles would become ever more violent as mass poverty resulted in macroeconomic underconsumption. Finally, a cataclysmic depression would sound the death knell of capitalism. Like feudalism before it, capitalism would contain the seeds of its own destruction.

The *economic interpretation of history* is one of Marx's lasting contributions to Western thought. Marx argued that economic interests lie behind and determine our values. Why do business executives vote for conservative candidates, while labor leaders support those who advocate raising the minimum wage or increasing unemployment benefits? The reason, Marx held, is that people's beliefs and ideologies reflect the material interests of their social and economic class. In fact, Marx's approach is hardly foreign to mainstream economics. It generalizes Adam Smith's analysis of self-interest from the dollar votes of the marketplace to the ballot votes of elections and the bullet votes of the barricades.

## From Textbooks to Tactics: Soviet-Style Command Economy

Marx wrote extensively about the faults of capitalism, but he left no design for the promised socialist land. His arguments suggested that communism would arise in the most highly developed industrial countries. Instead, it was feudal Russia that adopted the Marxist vision. Let's examine this fascinating and horrifying chapter of economic history.

***Historical Roots.*** An analysis of Soviet communism is of the utmost importance for economics because the Soviet Union served as a laboratory for theories about the functioning of a command economy. Some economists claimed that socialism simply could not work; the Soviet experience proved them wrong. Its advocates argued that communism would overtake capitalism; Soviet history also refutes this thesis.

Although czarist Russia grew rapidly from 1880 to 1914, it was considerably less developed than industrialized countries like the United States or Britain. World War I brought great hardship to Russia and allowed the communists to seize power. From 1917 to 1933, the Soviet Union experimented with different socialist models before settling on central planning. But dissatisfaction with the pace of industrialization led Stalin to undertake a radical new venture around 1928—collectivization of agriculture, forced-draft industrialization, and central planning of the economy.

Under the collectivization of Soviet agriculture between 1929 and 1935, 94 percent of Soviet peasants were forced to join collective farms. In the process, many wealthy peasants were deported, and conditions deteriorated so much that millions perished. The other part of the Soviet "great leap forward" came through the introduction of economic planning for rapid industrialization. The planners created the first 5-year plan to cover the period 1928–1933. The first plan established the priorities of Soviet planning: heavy industry was to be favored over light industry, and consumer goods were to be the residual sector after all the other priorities had been met. Although there were many reforms and changes in emphasis, the Stalinist model of a command economy applied in the Soviet Union and Eastern Europe countries until the fall of Soviet communism at the end of the 1980s.

***How the Command Economy Functioned.*** In the Soviet-style command economy, the broad categories of output were determined by political decisions. Military spending in the Soviet Union was always allocated a substantial part of output and scientific resources, while the other major priority was investment. Consumption claimed the residual output after the quotas of higher-priority sectors were filled.

In large part, decisions about how goods were to be produced were made by the planning authorities. Planners first decided on the quantities of final outputs (the *what*). Then they worked backward from outputs to the required inputs and the flows among different firms. Investment decisions were specified in great detail by the planners, while firms had

considerable flexibility in deciding upon their mix of labor inputs.

Clearly no planning system could specify all the activities of all the firms—this would have required trillions of commands every year. Many details were left to the managers of individual factories. It was here, in what is called the *principal-agent problem,* that the command economy ran into its deepest difficulties.

The principal-agent problem arises because the person at the top of a hierarchy (the "principal") wants to provide appropriate incentives for the people making the decisions down the hierarchy (the "agents") to behave according to the principal's wishes. In a market economy, profits and prices serve as the mechanism for coordinating consumers and producers. A command economy is plagued by an inability to find an efficient substitute for profits and prices as a way of motivating the agents.

A useful example of the failure to solve the principal-agent problem is found in Soviet book publishing. In a market economy, commercial decisions about books are made primarily on the basis of profit and loss. In the Soviet Union, because profits were taboo, planners instead used quantitative targets. A first approach was to reward firms according to the number of books produced, so publishers printed thousands of thin unread volumes. Faced with a clear incentive problem, the center (principal) changed the system so that the producers (agents) were rewarded on the basis of the number of pages printed, and the result was fat books with onion-skin paper and large type. The planners then changed the criterion to the number of words—to which the publishers responded by printing huge volumes with tiny type. None of these mechanisms was capable of signaling consumer wants effectively.

The principal-agent problem crops up in organizations in all countries, but the Soviet model had few mechanisms (like bankruptcy in markets and elections for public goods) to provide an ultimate check on waste.

***Comparative Economic Performance.*** From World War II until the mid-1980s, the United States and the Soviet Union engaged in a superpower competition for public opinion, military superiority, and economic dominance. How well did the command economies perform in the economic growth race? Any attempt at answering this question is bedeviled by the absence of reliable statistics. Most economists believed until recently that the Soviet Union grew rapidly from 1928 until the mid-1960s, with growth rates perhaps surpassing those in North America and Western Europe. After the mid-1960s, growth in the Soviet Union stagnated and output actually began to decline.

A revealing comparison of the performance of market and command economies can be made by contrasting the experiences of East Germany and West Germany. These countries started out with roughly equal levels of productivity and similar industrial structures at the end of World War II. After four decades of capitalism in the West and Soviet-style socialism in the East, productivity in East Germany had fallen to a level estimated between one-fourth and one-third of that in West Germany. Moreover, the East German growth tended to emphasize production of intermediate goods and commodities of little value to consumers. Quantity, not quality, was the goal.

***Balance Sheet.*** Is there a final balance sheet on Soviet central planning? The Soviet model demonstrated that a command economy can work—it is capable of mobilizing capital and labor and producing both guns and butter. But the Soviet economy, with borders closed to trade, technologies, and people, became increasingly obsolete over time. Innovation withered because of poor incentives. In competition with the open-market economies, particularly as the world turned to increasingly high-quality goods and services, Russia could export virtually nothing except raw materials and military equipment.

Growth slowed, and per capita income declined in the latest period of central planning. Its leaders finally abandoned Soviet central planning as it was seen to be morally, politically, and economically bankrupt.

## From Marx to Market

Beginning in 1989, the countries of Eastern Europe and the former Soviet Union rejected the communist experiment and introduced market economies. A cruel joke heard in Eastern Europe is "Question: What is communism? Answer: The longest road from capitalism to capitalism."

The road back to capitalism proved a rocky one for many countries. Among the challenges were the following: (1) liberalizing prices to allow supply and demand to determine prices, (2) imposing

hard budget constraints on subsidized enterprises, (3) privatizing enterprises so that the decisions about buying, selling, pricing, producing, borrowing, and lending would be made by private agents, and (4) establishing the institutions of the market, such as a modern banking system, the legal framework for commerce, and the tools for monetary and fiscal policy.

Some countries, like Slovenia and the Czech Republic, made the transition relatively quickly and are now increasingly integrated into the European Union as functioning market democracies. Russia has renationalized much of its energy industry and has become an energy powerhouse. Other countries, particularly the former Soviet Republics in Asia, are still mired in autocracy, corruption, and rigid economic structures. The lessons here are useful for any country attempting to establish the institutions of a market economy.

### *A Final Note of Cautious Optimism*

This chapter has described the problems and prospects of poor countries struggling to be rich and free—to provide the dry houses, education, electric lights, fast horses, automobiles, and long vacations of the excerpt that opened this chapter. What are the prospects of attaining these goals?

We close with a sober assessment by Jeffrey Sachs of Columbia University and the Earth Institute, one of the outstanding development economists of today, and his co-author Andrew Warner:

> The world economy [today] looks much like the world economy at the end of the nineteenth century. A global capitalist system is taking shape, drawing almost all regions of the world into arrangements of open trade and harmonized economic institutions. As in the nineteenth century, this new round of globalization promises to lead to economic convergence for the countries that join the system. . . .
>
> And yet there are also profound risks for the consolidation of market reforms in Russia, China, and Africa, as well as for the maintenance of international agreements among the leading countries. . . . The spread of capitalism in the [last] twenty-five years is an historic event of great promise and significance, but whether we will be celebrating the consolidation of a democratic and market-based world system [twenty-five years hence] will depend on our own foresight and good judgments in the years to come.

## SUMMARY

### A. Population Growth and Development

1. Malthus's theory of population rests on the law of diminishing returns. He contended that population, if unchecked, would tend to grow at a geometric (or exponential) rate, doubling every generation or so. But each member of the growing population would have less land and natural resources to work with. Because of diminishing returns, income could grow at an arithmetic rate at best; output per person would tend to fall so low as to stabilize population at a subsistence level of near-starvation.
2. Over the last two centuries, Malthus and his followers have been criticized on several grounds. Among the major criticisms are that Malthusians ignored the possibility of technological advance and overlooked the significance of birth control as a force in lowering population growth. The neo-Malthusians see limits to growth from environmental constraints, particularly global warming, where markets provide distorted signals.

### B. Economic Growth in Poor Countries

3. Most of the world's population lives in developing countries, which have relatively low per capita incomes. Such countries often exhibit rapid population growth, a low level of literacy, poor health, and a high proportion of their population living and working on farms.
4. The key to development lies in four fundamental factors: human resources, natural resources, capital, and technology. Explosive population causes problems as the Malthusian prediction of diminishing returns haunts the poorest countries. On the constructive agenda, improving the population's health, education, and technical training has high priority.
5. Investment and saving rates in poor countries are low because incomes are so depressed that little can be saved for the future. International financing of investment in poor countries has witnessed many crises over the last two centuries.

6. Technological change is often associated with investment and new machinery. It offers much hope to the developing nations because they can adopt the more productive technologies of advanced nations. This requires entrepreneurship. One task of development is to spur internal growth of the scarce entrepreneurial spirit.
7. Numerous theories of economic development help explain why the four fundamental factors are present or absent at a particular time. Development economists today emphasize the growth advantage of relative backwardness, the need to respect the role of agriculture, and the art of finding the proper boundary between state and market. The most recent consensus is on the advantages of openness.
8. Countries should be concerned about falling into the poverty trap, in which a vicious cycle of poverty leads to poor performance and locks a country into continued poverty.
9. Recall our summary judgment on the role of government policies: (*a*) Foster the rule of law. (*b*) Make the critical investments in human and social overhead capital. (*c*) Limit the public sector to clear areas of comparative advantage. (*d*) Maintain an economy open to trade and foreign investment.

### C. Alternative Models for Development

10. Many "isms" have competed with the mixed market economy as models for economic development. Alternative strategies include the managed-market approach of the East Asian countries, socialism, and the Soviet-style command economy.
11. The managed-market approach of Japan and the Asian dragons, such as South Korea, Hong Kong, Taiwan, and Singapore, proved remarkably successful over the last quarter-century. Among the key ingredients were macroeconomic stability, high investment rates, a sound financial system, rapid improvements in education, and an outward orientation in trade and technology policies.
12. Socialism is a middle ground between capitalism and communism, stressing government ownership of the means of production, planning by the state, income redistribution, and peaceful transition to a more egalitarian world.
13. Historically, Marxism took its deepest economic roots in semi-feudal Russia and was then imposed on the rest of the Soviet Union and Eastern Europe. Studies of resource allocation in these countries show that resources were allocated by central planning with severe distortions of prices and outputs. The Soviet economy depended primarily on energy-intensive heavy industry and the military in its early decades. Stagnation and poor incentives for innovation left Russia and other centrally planned countries at income levels far below those of North America, Japan, and Western Europe. These countries have all rejected the centralized command economy for some variant of the mixed market economy.

## CONCEPTS FOR REVIEW

**Population Theory**

Malthus's population theory
geometric vs. arithmetic growth

**Economic Development**

developing country
indicators of development
four elements in development
vicious cycles, virtuous circles, poverty trap
backwardness hypothesis

**Alternative Models for Development**

the central dilemma of market vs. command
socialism, communism
the principal-agent problem
command economy

## FURTHER READING AND INTERNET WEBSITES

### Further Reading

One of the most influential books of all times is T. R. Malthus, *Essay on Population* (1798, many publishers). An online version can be found at *www.ac.wwu.edu/~stephan/malthus/malthus.0.html*. The influential books by the new Malthusians Donella H. Meadows, Dennis L. Meadows, and Jørgen Randers are *The Limits to Growth* (Potomac, Washington, D.C., 1972) and *Beyond the Limits* (Chelsea Green, Post Mills, Vt., 1992).

The study on the East Asian miracle is contained in World Bank, *The East Asia Miracle: Economic Growth and Government Policies* (World Bank, Washington, D.C., 1993). The quotation at the end is from Jeffrey Sachs and Andrew Warner, "Economic Reform and the Process of Global Integration," *Brookings Papers on Economic Activity,* no. 1, 1995, pp. 63–64.

A highly readable account of developments in Soviet economic history is contained in Alec Nove, *An Economic History of the U.S.S.R.,* 3d ed. (Penguin, Baltimore, 1990). A careful study of the Soviet economic system is provided by Paul R. Gregory and Robert C. Stuart, *Russian and Soviet Economic Performance and Structure,* 6th ed. (Harper & Row, New York, 1997).

### Websites

The World Bank has information on its programs and publications at its site, *www.worldbank.org;* the International Monetary Fund (IMF) provides similar information at *www.imf.org.* The United Nations website has links to most international institutions and their databases at *www.unsystem.org.* A good source of information about high-income countries is the Organisation for Economic Cooperation and Development (OECD) website, *www.oecd.org.* U.S. trade data are available at *www.census.gov.* You can find information on many countries through their statistical offices. A compendium of national agencies is available at *www.census.gov/main.*

Population data are available from the United Nations at *www.un.org/popin/.* One of the best sources for studies of developing countries is the World Bank, especially the annual *World Development Review* at *www.worldbank.org.* The quote from Klitgaard was published in *Finance and Development,* March 1998, and can be found at *www.gwdg.de/~uwvw/icr.htm.*

## QUESTIONS FOR DISCUSSION

1. A geometric progression is a sequence of terms $(g_1, g_2, \ldots, g_t, g_{t+1}, \ldots)$, in which each term is the same multiple of its predecessor:

$$\frac{g_2}{g_1} = \frac{g_3}{g_2} = \cdots = \frac{g_{t+1}}{g_t} = \beta$$

   If $\beta = 1 + i > 1$, the terms grow exponentially like compound interest, where $i$ is the interest rate. An arithmetic progression is a sequence $(a_1, a_2, a_3, \ldots, a_t, a_{t+1}, \ldots)$, in which the difference between each term and its predecessor is the same constant:

$$a_2 - a_1 = a_3 - a_2 = \cdots = a_{t+1} - a_t = \cdots = \lambda$$

   Give examples of each. Satisfy yourself that any geometric progression with $\beta > 1$ must eventually surpass any arithmetic progression. Relate this to Malthus's theory.
2. Recall that Malthus asserted that unchecked population would grow geometrically, while food supply—constrained by diminishing returns—would grow only arithmetically. Use a numerical example to show why per capita food production must decline if population is unchecked while diminishing returns lead food production to grow more slowly than labor inputs.
3. Do you agree with the celebration of material well-being expressed in the chapter's opening quotation? What would you add to the list of the benefits of economic development?
4. Delineate each of the four important factors driving economic development. With respect to these, how was it that the high-income oil-exporting countries became rich? What hope is there for a country like Mali, which has very low per capita resources of capital, land, and technology?
5. Some fear the "vicious cycle of underdevelopment." In a poor country, rapid population growth eats into whatever improvements in technology occur and lowers living standards. With a low per capita income, the country cannot save and invest and mainly engages in subsistence farming. With most of the population on the farm, there is little hope for education, decline in fertility, or industrialization. If you were to advise such a country, how would you break the vicious cycle?
6. Compare the situation a developing country faces today with the one it might have faced (at an equivalent level of per capita income) 200 years ago. Considering the four wheels of economic development, explain the advantages and disadvantages that today's developing country might experience.
7. Some economists today question whether it is wise to allow complete openness on both financial and current accounts. They argue that allowing free flow of short-term financial movements increases vulnerability to speculative attacks. Give the pros and cons of limiting short-term financial movements. Might you want to

use a tax on short-term flows rather than quantitative restrictions?

8. Analyze the way that *what, how,* and *for whom* are solved in a Soviet-style command economy, and compare your analysis with the solution of the three central questions in a market economy.
9. **Advanced problem** (relying upon the growth accounting of Chapter 25): We can extend our growth-accounting equation to include three factors and write the following equation:

$$g_Q = s_L g_L + s_K g_K + s_R g_R + \text{T.C.}$$

where $g_Q$ = the growth rate of output, $g_i$ = the growth rate of inputs ($i$ = inputs to production: $L$ for labor, $K$ for capital, and $R$ for land and other natural resources), and $s_i$ = the contribution of each input to output growth as measured by its share of national income ($0 \leq s_i \leq 1$ and $s_L + s_K + s_R = 1$). T.C. measures technological change.

   a. In the poorest developing countries, the share of capital is close to zero, the main resource is agricultural land (which is constant), and there is little technological change. Can you use this to explain the Malthusian hypothesis in which per capita output is likely to be stagnant or even to decline (i.e., $g_Q < g_L$)?
   b. In advanced economies, the share of land resources drops to virtually zero. Why does this lead to the growth-accounting equation studied in the previous chapter? Can you use this to explain how countries can avoid the Malthusian trap of stagnant incomes?
   c. According to economists who are pessimistic about future prospects (including a group of *neo-Malthusians* from the Club of Rome), T.C. is close to zero, the available supply of natural resources is declining, and the share of resources is large and rising. Does this explain why the future of industrial societies might be bleak? Which assumptions of the neo-Malthusians might you question?

CHAPTER

# Exchange Rates and the International Financial System

27

*The benefit of international trade—a more efficient employment of the productive forces of the world.*

John Stuart Mill

Economically, no nation is an island unto itself. When the bell tolls recession or financial crisis, the sound reverberates around the world.

We see this point illustrated dramatically in the twentieth century, which we can divide into two distinct periods. The period from 1914 to 1945 was characterized by destructive competition, shrinking international trade, growing financial isolation, hot and cold military and trade wars, dictatorships, and depression. By contrast, after World War II, most of the world enjoyed growing economic cooperation, widening trade linkages, increasingly integrated financial markets, an expansion of democracy, and rapid economic growth. This stark contrast emphasizes how high the stakes are in the wise management of our national and global economies.

What are the economic links among nations? The important economic concepts involve international trade and finance. International trade in goods and services allows nations to raise their standards of living by specializing in areas of comparative advantage, exporting products in which they are relatively efficient while importing ones in which they are relatively inefficient. In a modern economy, trade takes place using different currencies. The international financial system is the lubricant that facilitates trade and finance by allowing people to use and exchange different currencies.

International trade is sometimes seen as a zero-sum, Darwinian conflict. This view is misleading at best and wrong at worst. International trade and finance, like all voluntary exchange, can improve the well-being of all participants in the transactions. When the United States sells wheat to Japan and imports cars, using the medium of dollars and yen, these transactions lower prices and raise living standards in both countries.

But economic integration (sometimes called *globalization*) is not without its perils. Some periods, such as the early 2000s, were relatively tranquil, while others saw crisis after crisis. The 1930s saw the gold standard and the international trading regime collapse. The 1970s saw the failure of the fixed-exchange-rate system, oil embargoes, and a sharp increase in inflation. The 1990s saw a succession of financial crises: a crisis of confidence in the exchange-rate regime in Europe in 1991–1992, capital flight from Mexico in 1994–1995, banking and currency panics in East Asia in 1997, a default on Russian debt and a global liquidity freeze in 1998, and a series of currency problems in Latin America.

After a period of relative tranquility, the world was shocked in 2007–2009 by the bursting of a housing-price bubble, mortgage foreclosures, and financial failures in the world's most sophisticated

economy, the United States. The global nature of the economic system was seen in 2007–2009, when the financial crisis in the United States spread around the world. All of these crises required careful management by the fiscal and monetary authorities of the major countries involved.

This chapter and the next one survey international macroeconomics. This topic includes the principles governing the international monetary system, which is the major focus of the present chapter, as well as the impact of foreign trade on output, employment, and prices, which is covered in the next chapter.

International macroeconomics involves many of the most controversial questions of the day: Does foreign trade raise or lower our output and employment? What is the link between domestic saving, domestic investment, and the trade balance? What are the causes of the occasional financial crises that spread contagiously from country to country? What has been the effect of the European Monetary Union on Europe's macroeconomic performance? And why has the United States become the world's largest debtor country in the last decade? The economic stakes are high in finding wise answers to these questions.

## TRENDS IN FOREIGN TRADE

An economy that engages in international trade is called an **open economy.** A useful measure of openness is the ratio of a country's exports or imports to its GDP. Figure 27-1 shows the trend in the shares of imports and exports for the United States over the last half-century. It shows the large export surplus in the early years after World War II as America financed the reconstruction of Europe. But the share of imports and exports was low in the 1950s and 1960s. With growth abroad and a lowering of trade barriers, the share of trade grew steadily and reached an average of 13 percent of GDP in 2008.

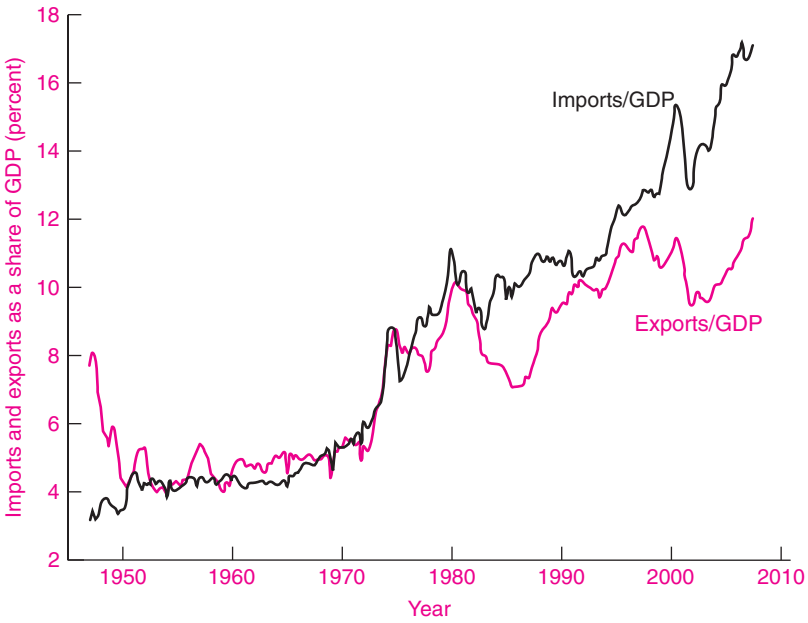


**FIGURE 27-1. Growing U.S. Openness**

Like all major market economies, the United States has increasingly opened its borders to foreign trade since World War II. This has led to a growing share of output and consumption involved in international trade. Since the 1980s, imports have far outdistanced exports, causing the United States to become the world's largest debtor nation.

Source: U.S. Bureau of Economic Analysis.

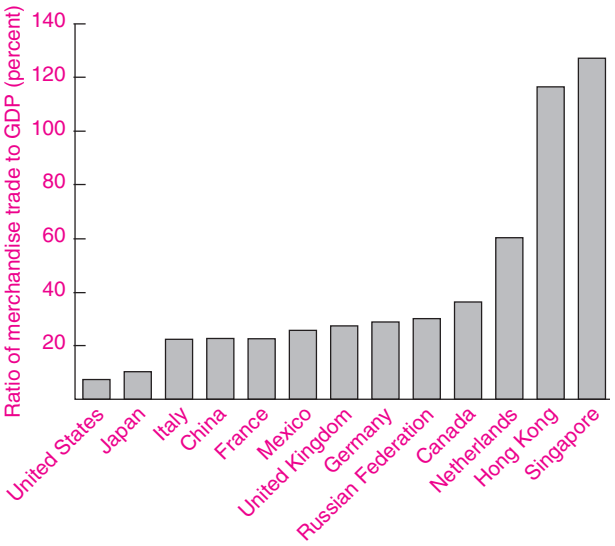


**FIGURE 27-2. Openness Varies Enormously across Regions**

Large countries like the United States have small trade shares, while tiny countries like Singapore trade more than they produce.

Source: World Trade Organization. Shares are the ratio of merchandise trade to GDP for the period 2002–2005.

You might be surprised to learn that the United States is a relatively self-sufficient economy. Figure 27-2 shows the trade proportions of selected countries. Small countries and those in highly integrated regions like Western Europe are more open than the United States. Moreover, the degree of openness is much higher in many U.S. industries than in the overall economy, particularly in manufacturing industries like steel, textiles, consumer electronics, and autos. Some industries, such as education and health care, are largely insulated from foreign trade.

# A. THE BALANCE OF INTERNATIONAL PAYMENTS

## BALANCE-OF-PAYMENTS ACCOUNTS

We begin this chapter with an overview of the way nations keep their international accounts. Economists keep score by looking at income statements and balance sheets. In the area of international economics, the key accounts are a nation's **balance of international payments.** These accounts provide a systematic statement of all economic transactions between that country and the rest of the world. Its major components are the current account and the financial account. The basic structure of the balance of payments is shown in Table 27-1, and each element is discussed below.

### Debits and Credits

Like other accounts, the balance of payments records each transaction as either a plus or a minus. The general rule in balance-of-payments accounting is the following:

If a transaction earns foreign currency for the nation, it is called a *credit* and is recorded as a plus item. If a transaction involves spending foreign currency, it is a *debit* and is recorded as a negative item. In general, exports are credits and imports are debits.

Exports earn foreign currency, so they are credits. Imports require spending foreign currency, so they are debits. How is the U.S. import of a Japanese camera recorded? Since we ultimately pay for it in Japanese yen, it is clearly a debit. How shall we

| | |
|---|---|
| **I.** | **Current account** |
| | Merchandise (or "trade balance") |
| | Services |
| | Investment income |
| | Unilateral transfers |
| **II.** | **Financial account** |
| | Private |
| | Government |
| | Official reserve changes |
| | Other |

**TABLE 27-1. Basic Elements of the Balance of Payments**

The balance of payments has two fundamental parts. The *current account* represents the spending and receipts on goods and services along with transfers. The *financial account* includes purchases and sales of financial assets and liabilities. An important principle is that the two must always sum to zero:

**Current account + financial account = I + II = 0**

treat interest and dividend income on investments received by Americans from abroad? Clearly, they are credit items like exports because they provide us with foreign currencies.

## Details of the Balance of Payments

***Balance on Current Account.*** The totality of items under section I in Table 27-1 is the **balance on current account.** This includes all items of income and outlay—imports and exports of goods and services, investment income, and transfer payments. The current-account balance is akin to the net income of a nation. It is conceptually similar to net exports in the national output accounts. In the past, many writers concentrated on the **trade balance,** which consists of merchandise imports and exports. The composition of merchandise imports and exports consists mainly of primary commodities (like food and fuels) and manufactured goods. In an earlier era, the mercantilists strove for a trade surplus (an excess of exports over imports), calling this a "favorable balance of trade." They hoped to avoid an "unfavorable trade balance," by which they meant a trade deficit (an excess of imports over exports). Even today, we find traces of mercantilism when nations seek to maintain trade surpluses.

Today, economists avoid this language because a trade deficit is not necessarily harmful. As we will see, the trade deficit is really a reflection of the imbalance between domestic investment and domestic saving. Often, a nation has a trade deficit because it has a low saving rate (perhaps because of a government deficit). It might also have a trade deficit because it has productive uses for domestic investment (as is the case for the United States). An opposite case of a trade surplus would arise when a country has high saving with few productive domestic investments for its saving (as, for example, Saudi Arabia, with vast oil revenues but meager investment opportunities).

In addition, *services* are increasingly important in international trade. Services consist of such items as shipping, financial services, and foreign travel. A third item in the current account is *investment income,* which includes the earnings on foreign investments (such as earnings on U.S. assets abroad). One of the major developments of the last two decades has been the growth in services and investment income. A final element is transfers, which represent payments not in return for goods and services.

Table 27-2 presents a summary of the U.S. balance of international payments for 2007. Note its two main components: current account and financial account. Each item is listed by name in column (a). Credits are listed in column (b), while column (c) shows the debits. Column (d) then lists the net credits or debits; it shows a credit if on balance the item added to our stock of foreign currencies or a debit if the total subtracted from our foreign-currency supply.

In 2007, America's merchandise exports led to credits of $1149 billion. But at the same time, merchandise imports led to debits of $1965 billion. The *net* difference was a merchandise trade deficit of $815 billion. This trade deficit is listed in column (d). (Be sure you understand why the algebraic sign is shown as − rather than as +.) From the table we see that net services and net investment income were positive. The total current-account deficit including merchandise trade, services, investment income, and unilateral transfers was $739 billion for 2007.

(We have omitted an additional item in the accounts called the capital account, which involves capital transfers. This item is extremely small and can be ignored in most circumstances.)

***Financial Account.*** We have now completed our analysis of the current account. But how did the United States "finance" its $739 billion current-account deficit in 2007? It must have either borrowed or reduced its foreign assets, for by definition, when you buy something, you must either pay for it or borrow for it. This identity means that *the balance of international payments as a whole must by definition show a final balance of zero.*

Financial-account transactions are asset transactions between Americans and foreigners. They occur, for example, when a Japanese pension fund buys U.S. government securities or when an American buys stock in a German firm.

Credits and debits are somewhat more complicated in the financial accounts. The general rule, which is drawn from double-entry business accounting, is this: Increases in a country's assets and

**U.S. Balance of Payments, 2007 (billions of dollars)**

| (a) Items | (b) Credits (+) | (c) Debits (−) | (d) Net credits (+) or debits (−) |
|---|---|---|---|
| **I. Current account** | | | **−739** |
| a. Merchandise trade balance | 1,149 | −1,965 | −815 |
| b. Services | 479 | −372 | 107 |
| c. Investment income | 782 | −708 | 74 |
| d. Unilateral transfers | | | −104 |
| **II. Financial account [lending (−) or borrowing (+)]** | | | **739** |
| a. Private borrowing or lending | 1,451 | −1,183 | 268 |
| b. Government | | | |
| Official U.S. reserve assets, changes | | | −24 |
| Foreign official assets in the U.S., changes | | | 413 |
| c. Statistical discrepancy | | | 83 |
| **III. Sum of current and financial accounts** | | | **0** |

**TABLE 27-2. Basic Elements of the U.S. Balance of Payments, 2007**

Source: U.S. Bureau of Economic Analysis. Note that the totals may not equal the sum of the components because of rounding.

decreases in its liabilities are entered as debits; conversely, decreases in a country's assets and increases in its liabilities are entered as credits. A debit entry is represented by a negative (−) sign and a credit entry by a positive (+) sign.

You can usually get the right answer more easily if you remember this simplified rule: Think of the United States as exporting and importing stocks, bonds, or other securities. Then you can treat these exports and imports of securities like other exports and imports. When we borrow abroad, we are sending IOUs (in the form of Treasury bills or corporate stocks) abroad and getting foreign currencies. Is this a credit or a debit? Clearly, this is a credit because it brought foreign currencies into the United States.

Similarly, if U.S. banks lend abroad to finance a computer assembly plant in Mexico, the U.S. banks are importing IOUs from the Mexicans and the United States is losing foreign currencies; this is clearly a debit item in the U.S. balance of payments.

Line II shows that in 2007 the United States was a net *borrower:* we borrowed abroad more than we lent to foreigners. The United States was a net exporter of IOUs (a net borrower) in the amount of $739 billion.[1]

### The Paradox of Wealthy Borrowers

What is the typical pattern of surpluses and deficits of nations? You might think that poor countries would have higher productivity of capital and would therefore borrow from rich countries, while rich countries would have used up their investment opportunities and should therefore lend to poor countries.

Indeed, this pattern did hold for most of U.S. history. During the nineteenth century, the United States imported more than it exported. Europe lent the difference, which allowed the United States to build up its capital stock. The

[1] As with all economic statistics, the balance-of-payments accounts necessarily contain statistical errors (called the "statistical discrepancy"). These errors reflect the fact that many flows of goods and finance (from small currency transactions to the drug trade) are not recorded. We include the statistical discrepancy in line II(c) of Table 27-2.

United States was a typical young and growing debtor nation. From about 1873 to 1914, the U.S. balance of trade moved into surplus. Then, during World War I and World War II, America lent money to its allies England and France for war equipment and postwar relief needs. The United States emerged from the wars a creditor nation, with a surplus from earnings on foreign investments matched by a deficit on merchandise trade.

The pattern around the world is quite different today because of financial globalization. In an open financial world, the pattern of trade surpluses and deficits is largely determined by the balance of saving and investment. Table 27-3 shows a summary of the major regions today. This table shows that the pattern of lending and borrowing has virtually no relationship to levels of economic development but is primarily determined by saving and investment patterns. The most interesting situation on the list is that of the United States, which is a wealthy country borrowing abroad. We will explore the reasons for this paradox of wealthy borrowers in the next chapter.

**Current Account Balance (billions of dollars)**

| Region | 2007 |
|---|---|
| **Rich and low saving:** | |
| United States | −739 |
| **Rich and high saving:** | |
| Japan | 211 |
| Other rich countries | 160 |
| **Resource-rich and diversifying:** | |
| OPEC/Middle East | 257 |
| Russia | 76 |
| **Poor and high saving:** | |
| China | 372 |
| **Poor and low saving:** | |
| Sub-Saharan Africa | −25 |
| **Other** | −45 |

**TABLE 27-3. Pattern of Current Accounts around the World, 2007**

The United States is the world's largest borrower with its low saving rate and stable investment climate. Important savers are rich and high-saving countries (such as Japan), resource-rich countries looking for financial diversification (such as Russia and OPEC countries), and poor and high-saving countries (such as China, which has a saving rate even higher than its high investment rate). The poorest countries do get some small net inflows.

Source: International Monetary Fund, *World Economic Outlook*, available online at *www.imf.gov*.

## B. THE DETERMINATION OF FOREIGN EXCHANGE RATES

### FOREIGN EXCHANGE RATES

We are all familiar with domestic trade. When I buy Florida oranges or California computers, I naturally want to pay in dollars. Luckily, the orange grower and the computer manufacturer want payment in U.S. currency, so all trade can be carried out in dollars. Economic transactions within a country are relatively simple.

But suppose I am in the business of selling Japanese bicycles. Here, the transaction becomes more complicated. The bicycle manufacturer wants to be paid in Japanese currency rather than in U.S. dollars. Therefore, in order to import the Japanese bicycles, I must first buy Japanese yen (¥) and use those yen to pay the Japanese manufacturer. Similarly, if the Japanese want to buy U.S. merchandise, they must first obtain U.S. dollars. This new complication involves foreign exchange.

Foreign trade involves the use of different national currencies. The **foreign exchange rate** is the price of one currency in terms of another currency. The foreign exchange rate is determined in the **foreign exchange market,** which is the market where different currencies are traded.

We begin with the fact that most major countries have their own currencies—the U.S. dollar, the Japanese yen, the Mexican peso, and so forth. (European countries are an exception in that they have a common currency, the Euro.) We follow the convention of measuring exchange rates, which we denote by the symbol $e$, as the amount of foreign currency that can be bought with 1 unit of the domestic currency. For example, the foreign exchange rate of the dollar might be 100 yen per U.S. dollar (¥100/$).

When we want to exchange one nation's money for that of another, we do so at the relevant foreign exchange rate. For example, if you traveled to Mexico in the summer of 2008, you would have received

about 11 Mexican pesos for 1 U.S. dollar. There is a foreign exchange rate between U.S. dollars and the currency of every other country. In 2008, the foreign exchange rate per U.S. dollar was 0.68 Euro, 0.54 British pound, and 103 Japanese yen.

With foreign exchange, it is possible for me to buy a Japanese bicycle. Suppose its quoted price is 20,000 yen. I can look in the newspaper for the foreign exchange rate for yen. Suppose the rate is ¥100/$. I could go to the bank to convert my $200 into ¥20,000. With my Japanese money, I then can pay the exporter for my bicycle in the currency it wants.

You should be able to show what Japanese importers of American trucks have to do if they want to buy, say, a $36,000 truck from an American exporter. Here yen must be converted into dollars. You will see that, when the foreign exchange rate is 100 yen per dollar, the truck costs them ¥3,600,000.

Businesses and tourists do not have to know anything more than this for their import or export transactions. But the economics of foreign exchange rates cannot be grasped until we analyze the forces underlying the supply and demand for foreign currencies and the functioning of the foreign exchange market.

The foreign exchange rate is the price of one currency in terms of another currency. We measure the foreign exchange rate ($e$) as the amount of foreign currency that can be bought with 1 unit of domestic currency:

$$e = \frac{\text{foreign currency}}{\text{domestic currency}} = \frac{\text{yen}}{\$} = \frac{\text{Euros}}{\$} = \cdots$$

## THE FOREIGN EXCHANGE MARKET

Like most other prices, foreign exchange rates vary from week to week and month to month according to the forces of supply and demand. The *foreign exchange market* is the market in which currencies of different countries are traded and foreign exchange rates are determined. Foreign currencies are traded at the retail level in many banks and firms specializing in that business. Organized markets in New York, Tokyo, London, and Zurich trade hundreds of billions of dollars of currencies each day.

We can use our familiar supply and demand curves to illustrate how markets determine the price of foreign currencies. Figure 27-3 shows the supply and demand for U.S. dollars that arise in dealings with Japan.[2] The *supply* of U.S. dollars comes from people in the United States who need yen to purchase Japanese goods, services, or financial assets. The *demand* for dollars comes from people in Japan who buy U.S. goods, services, or investments and who, accordingly, need dollars to pay for these items. The price of foreign exchange—the foreign exchange rate—settles at that price where supply and demand are in balance.

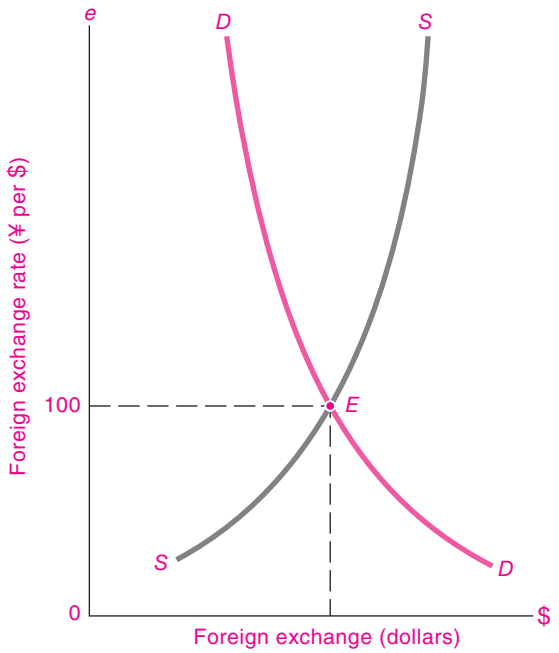


**FIGURE 27-3. Exchange-Rate Determination**

Behind the supplies and demands for foreign exchange lie purchases of goods, services, and financial assets. Behind the demand for dollars is the Japanese desire for American goods and investments. The supply of dollars comes from Americans desiring Japanese goods and assets. Equilibrium comes at $E$. If the foreign exchange rate were above $E$, there would be an excess supply of dollars. Unless the government bought this excess supply with official reserves, market forces would push the foreign exchange rate back down to balance supply and demand at $E$.

[2] This is a simplified example in which we consider only the bilateral trade between Japan and the United States.

Let us first consider the supply side. The supply of U.S. dollars to the foreign exchange market originates when Americans need yen to buy Japanese automobiles, cameras, and other commodities, to vacation in Tokyo, and so forth. In addition, foreign exchange is required if Americans want to purchase Japanese assets, such as shares in Japanese companies. In short, *Americans supply dollars when they purchase foreign goods, services, and assets.*

In Figure 27-3, the vertical axis is the foreign exchange rate ($e$), measured in units of foreign currency per unit of domestic currency—that is, in yen per dollar, in Mexican pesos per dollar, and so forth. Make sure you understand the units here. The horizontal axis shows the quantity of dollars bought and sold in the foreign exchange market.

The supply of U.S. dollars is represented by the upward-sloping *SS* curve. The upward slope indicates that as the foreign exchange rate rises, the number of yen that can be bought per dollar increases. This means, with other things held constant, that the prices of Japanese goods fall relative to those of American goods. Hence, Americans will tend to buy more Japanese goods, and the supply of U.S. dollars therefore increases.

To see why the supply curve slopes upward, take the example of bicycles. If the foreign exchange rate were to rise from ¥100/$ to ¥200/$, the bicycle which costs ¥20,000 would fall in price from $200 to $100. If other things are constant, Japanese bicycles would be more attractive, and Americans would sell more dollars in the foreign exchange market to buy more bicycles. Hence, the quantity supplied of dollars would be higher at a higher exchange rate.

What lies behind the demand for dollars (represented in Figure 27-3 by the *DD* demand curve? Foreigners demand U.S. dollars when they buy American goods, services, and assets. For example, suppose a Japanese student buys an American economics textbook or takes a trip to the United States. She will require U.S. dollars to pay for these items. Or when Japan Airlines buys a Boeing 787 for its fleet, this transaction increases the demand for U.S. dollars. If Japanese pension funds invest in U.S. stocks, this would require a purchase of dollars. *Foreigners demand U.S. dollars to pay for their purchases of American goods, services, and assets.*

The demand curve in Figure 27-3 slopes downward to indicate that as the dollar's value falls (and the yen therefore becomes more expensive), Japanese residents will want to buy more foreign goods, services, and investments. They will therefore demand more U.S. dollars in the foreign exchange market. Consider what happens when the foreign exchange rate on the dollar falls from ¥100/$ to ¥50/$. American computers, which had sold at $2000 × (¥100/$) = ¥200,000 now sell for only $2000 × (¥50/$) = ¥100,000. Japanese purchasers will therefore tend to buy more American computers, and the quantity demanded of U.S. foreign exchange will increase.

Market forces move the foreign exchange rate up or down to balance the supply and demand. The price will settle at the *equilibrium foreign exchange rate,* which is the rate at which the dollars willingly bought just equal the dollars willingly sold.

The balance of supply and demand for foreign exchange determines the foreign exchange rate of a currency. At the market exchange rate of 100 yen per dollar shown at point *E* in Figure 27-3, the exchange rate is in equilibrium and has no tendency to rise or fall.

We have discussed the foreign exchange market in terms of the supply and demand for dollars. But in this market, there are two currencies involved, so we could just as easily analyze the supply and demand for Japanese yen. To see this, you should sketch a supply-and-demand diagram with yen foreign exchange on the horizontal axis and the yen rate ($ per ¥) on the vertical axis. If ¥100/$ is the equilibrium looking from the point of view of the dollar, then $0.01/¥ is the *reciprocal exchange rate.* As an exercise, go through the analysis in this section for the reciprocal market. You will see that in this simple bilateral world, for every point made about dollars there is an exact yen counterpart: supply of dollars is demand for yen; demand for dollars is supply of yen.

There is just one further extension necessary to get to actual foreign exchange markets. In reality, there are many different currencies. We therefore need to find the supplies and demands for each and every currency. And in a world of many nations, it is the many-sided exchange and trade relationships, with demands and supplies coming from all parts of the globe, that determine the entire array of foreign exchange rates.

### Terminology for Exchange-Rate Changes

Foreign exchange markets have a special vocabulary. By definition, a fall in the price of one currency in terms of one or all others is called a *depreciation*. A rise in the price of a currency in terms of another currency is called an *appreciation*. In our example above, when the price of the dollar rose from ¥100/$ to ¥200/$, the dollar appreciated. We also know that the yen depreciated.

In the supply-and-demand diagram for U.S. dollars, a fall in the foreign exchange rate (e) is a depreciation of the U.S. dollar, and a rise in e represents an appreciation.

A different set of terms is used when a currency has a fixed exchange rate. When a country lowers the official price of its currency in the market, this is called a *devaluation*. A *revaluation* occurs when the official foreign exchange rate is raised.

For example, in December 1994 Mexico devalued its currency when it lowered the official price or parity of the peso from 3.5 pesos per dollar to 3.8 pesos per dollar. Mexico soon found it could not defend the new parity and "floated" its exchange rate. At that point, the peso fell, or depreciated, even further.

When a country's currency falls in value relative to that of another country, we say that the domestic currency has undergone a **depreciation** while the foreign currency has undergone an **appreciation.**

When a country's official foreign exchange rate is lowered, we say that the currency has undergone a **devaluation.** An increase in the official foreign exchange rate is called a **revaluation.**

## Effects of Changes in Trade

What would happen if there were changes in foreign exchange demand? For example, if Japan has a recession, its demand for imports declines. As a result, the demand for American dollars would decrease. The result is shown in Figure 27-4. The decline in purchases of American goods, services, and investments decreases the demand for dollars in the market. This change is represented by a leftward shift in the demand curve. The result will be a lower foreign exchange rate—that is, the dollar will depreciate and the yen will appreciate. At the lower exchange rate, the quantity of dollars supplied by Americans to the market will decrease because Japanese goods are now more expensive. Moreover, the quantity of dollars demanded by the Japanese will decline because of the recession. How much will exchange rates change? Just enough so that the supply and demand are again in balance. In the example shown in Figure 27-4, the dollar has depreciated from ¥100/$ to ¥75/$.

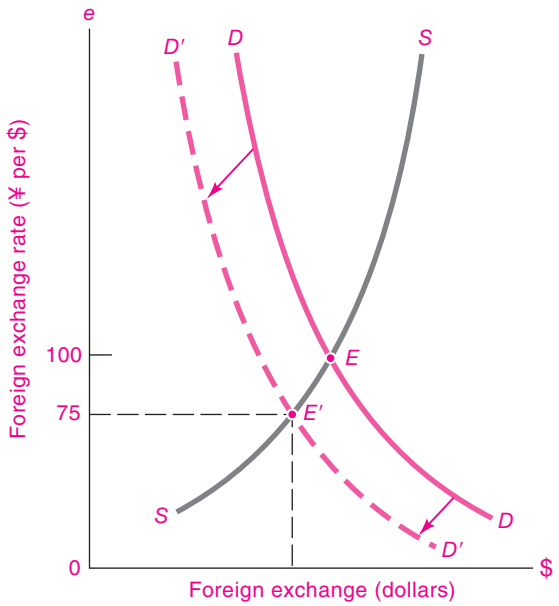


**FIGURE 27-4. A Decrease in Demand for Dollars Leads to Dollar Depreciation**

Suppose that a recession or deflation in Japan reduces the Japanese demand for dollars. This would shift the demand for dollars to the left from *DD* to *D′D′*. The exchange rate of the dollar depreciates, while the yen appreciates. Why would the new exchange rate discourage American purchases of Japanese goods?

In today's world, exchange rates often react to changes involving the financial account. Suppose that the Federal Reserve raises U.S. interest rates. This would make U.S. dollar assets more attractive than foreign assets as dollar interest rates rise relative to interest rates on foreign securities. As a result, the demand for dollars increases and the dollar appreciates. This sequence is shown in Figure 27-5.

## Exchange Rates and the Balance of Payments

What is the connection between exchange rates and adjustments in the balance of payments? In the simplest case, assume that exchange rates are

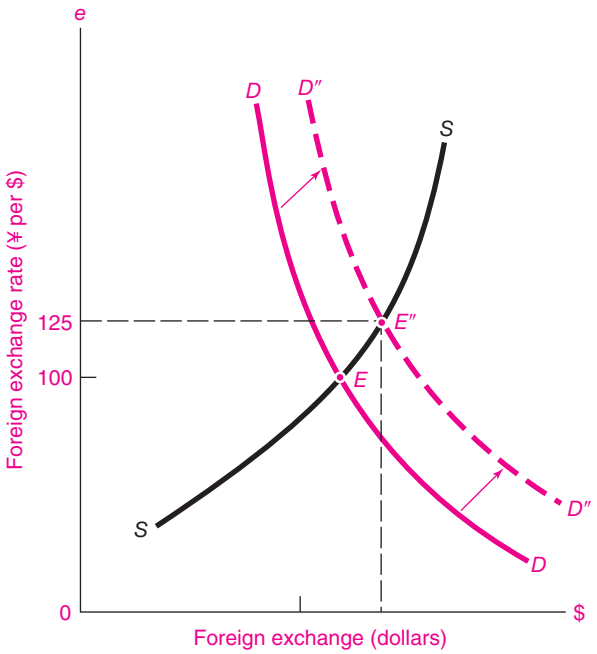


**FIGURE 27-5. Monetary Tightening Increases Demand for Dollars and Produces Dollar Appreciation**

Monetary policy can affect the exchange rate through the financial account. If the Federal Reserve raises dollar interest rates, this induces investors into dollar securities and raises the demand for dollar foreign exchange. The result is an appreciation of the dollar. (Explain why this leads to depreciation of the Euro.)

determined by private supply and demand with no government intervention. Consider what happened in 1990 after German unification when the German central bank decided to raise interest rates to curb inflation. After the monetary tightening, foreigners moved some of their assets into German marks to benefit from high German interest rates. This produced an excess demand for the German mark at the old exchange rate. In other words, at the old foreign exchange rate, people were, on balance, buying German marks and selling other currencies. (You can redraw Figure 27-5 to show this situation.)

Here is where the exchange rate plays its role as equilibrator. As the demand for German marks increased, it led to an appreciation of the German mark and a depreciation of other currencies, such as the U.S. dollar. The movement in the exchange rate continued until the financial and current accounts were back in balance.

Such a change in the foreign exchange rate has an important effect on trade flows. As the German mark appreciated, German goods became more expensive in foreign markets and foreign goods became less expensive in Germany. This led to a decrease in German exports and an increase in German imports. As a result, the trade balance moved toward deficit. The current-account deficit was the counterpart of the financial-account surplus induced by the higher interest rates.

Exchange-rate movements serve as a balance wheel to remove disequilibria in the balance of payments.

## Purchasing-Power Parity and Exchange Rates

In the short run, market-determined exchange rates are highly volatile in response to monetary policy, political events, and changes in expectations. But over the longer run, exchange rates are determined primarily by the relative prices of goods in different countries. An important implication is the *purchasing-power-parity (PPP) theory of exchange rates.* Under this theory, a nation's exchange rate will tend to equalize the cost of buying traded goods at home with the cost of buying those goods abroad.

The PPP theory can be illustrated with a simple example. Suppose the price of a market basket of goods (automobiles, jewelry, oil, food, and so forth) costs $1000 in the United States and 10,000 pesos in Mexico. At an exchange rate of 100 pesos to a dollar, this bundle would cost $100 in Mexico. Given these relative prices and the free trade between the two countries, we would expect to see American firms and consumers streaming across the border to take advantage of the lower Mexican prices. The result would be higher imports from Mexico and an increased demand for Mexican pesos. That would cause the Mexican peso to appreciate relative to the U.S. dollar, so you would need more dollars to buy the same number of pesos. As a result, the prices of the Mexican goods *in dollar terms* would rise even though the prices in pesos have not changed.

Where would this process end? Assuming that domestic prices are unchanged, it would end when the peso's exchange rate falls to 10 pesos to the dollar. Only at this exchange rate would the price of the

market basket of goods be equal in the two countries. At 10 pesos to the dollar, we say that the currencies have equal purchasing power in terms of the traded goods. (You can firm up your understanding of this discussion by calculating the price of the market basket in both Mexican pesos and U.S. dollars before and after the appreciation of the peso.)

The PPP doctrine also holds that countries with high inflation rates will tend to have depreciating currencies. For example, if Country A's inflation rate is 10 percent while inflation in Country B is 2 percent, the currency of Country A will tend to depreciate relative to that of Country B by the difference in the inflation rates, that is, 8 percent annually. Alternatively, let's say that runaway inflation leads to a hundredfold rise of prices in Russia over the course of a year, while prices in the United States are unchanged. According to the PPP theory, the Russian ruble should depreciate by 99 percent in order to bring the prices of American and Russian goods back into equilibrium.

We should caution that the PPP theory only approximates and cannot predict the precise movements in the exchange rate. One reason it does not hold exactly is that many of the goods and services covered in price indexes are not traded. For example, if the PPP uses the consumer price index, then we must take into account that housing is a nontraded service and that the prices for housing of comparable quality can vary greatly over space. Additionally, even for traded goods, there is no "law of one price" that applies uniformly to all goods. If you look at the price of the same item on amazon.com and amazon.co.uk, you will find that (even after applying the current exchange rate) the price is usually different. Price differences for the same good can arise because of tariffs, taxes, and transportation costs. In addition, financial flows can overwhelm the effects of prices in the short run. Therefore, while the PPP theory is a useful guide to exchange rates in the long run, exchange rates can diverge from their PPP levels for many years.

### PPP and the Size of Nations

By any measure, the United States still has the largest economy in the world. But which country has the second largest? Is it Japan, Germany, Russia, or some other country? You would think this would be an easy question to answer, like measuring height or weight. The problem, however, is that Japan totes up its national output in yen, while Russia's national output is given in rubles, and America's is in dollars. To be compared, they all need to be converted into the same currency.

The customary approach is to use the market exchange rate to convert each currency into dollars, and by that yardstick Japan has the second-largest economy. However, there are two difficulties with using the market rate. First, because market rates can rise and fall sharply, the "size" of countries might change by 10 or 20 percent overnight. Moreover, the use of market exchange rates tends to underestimate the national output of low-income countries.

Today, economists generally prefer to use PPP exchange rates to compare living standards in different countries. The difference between market exchange rates and PPP exchange rates can be dramatic, as Figure 27-6 shows. When market exchange rates are used, the incomes and outputs of low-income countries like China and India tend to be understated. This understatement occurs because a substantial part of the output of such countries comes from labor-intensive services, which are usually extremely inexpensive in low-wage countries. Hence, when we calculate PPP exchange rates including the prices of nontraded goods, the GDPs of low-income countries rise relative to those of high-income countries. For example, when PPP exchange rates are used, China's GDP is 2.3 times the level calculated using market exchange rates.

## C. THE INTERNATIONAL MONETARY SYSTEM

While the simple supply-and-demand diagrams for the foreign exchange market explain the major determinants, they do not capture the drama and central importance of the international monetary system. We saw crisis after crisis in international finance—in Europe in 1991–1992, in Mexico and Latin America in 1994–1995, in East Asia and Russia in 1997–1998, and then back to Latin America in 1998–2002.

What is the **international monetary system?** This term denotes the institutions under which payments

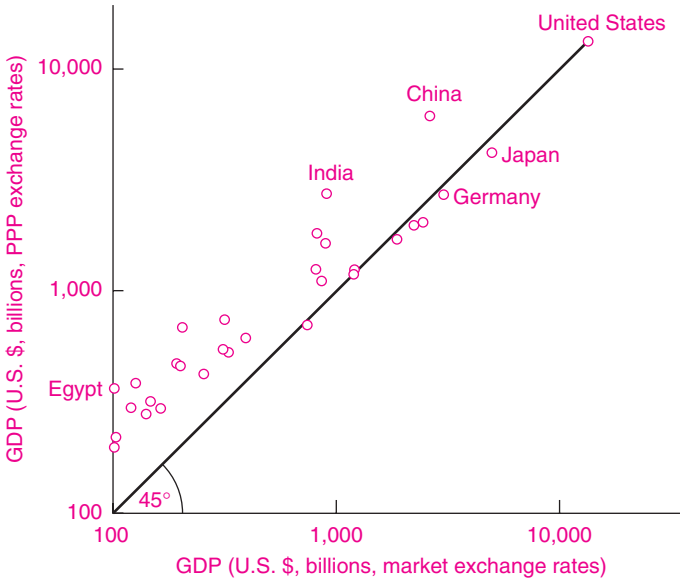


**FIGURE 27-6. PPP Calculations Change the Relative Sizes of Nations' Economies, 2006**

Using PPP exchange rates instead of market exchange rates changes the economic ranking of nations. After correcting for the purchasing power of incomes, China moves from being the fourth largest to being the second largest. Note that points along the 45° line are ones for which GDPs calculated using the two exchange rates are equal. Points above the line, such as China, are ones for which the PPP estimates of GDP are above those estimated using market exchange rates. Japan is below the line because relative prices in Japan are high due to high rents and trade barriers.

Source: World Bank. Note that outputs are shown on a ratio scale.

are made for transactions that cross national boundaries. In particular, the international monetary system determines how foreign exchange rates are set and how governments can affect exchange rates.

The importance of the international monetary system was well described by economist Robert Solomon:

> Like the traffic lights in a city, the international monetary system is taken for granted until it begins to malfunction and to disrupt people's lives. . . . A well-functioning monetary system will facilitate international trade and investment and smooth adaptation to change. A monetary system that functions poorly may not only discourage the development of trade and investment among nations but subject their economies to disruptive shocks when necessary adjustments to change are prevented or delayed.

The central element of the international monetary system involves the arrangements by which exchange rates are set. In recent years, nations have used one of three major exchange-rate systems:

- A system of fixed exchange rates
- A system of flexible or floating exchange rates, where exchange rates are determined by market forces
- Managed exchange rates, in which nations intervene to smooth exchange-rate fluctuations or to move their currency toward a target zone

## FIXED EXCHANGE RATES: THE CLASSICAL GOLD STANDARD

At one extreme is a system of **fixed exchange rates,** where governments specify the exact rate at which dollars will be converted into pesos, yen, and other currencies. Historically, the most important fixed-exchange-rate system was the **gold standard,** which

was used off and on from 1717 until 1936. In this system, each country defined the value of its currency in terms of a fixed amount of gold, thereby establishing fixed exchange rates among the countries on the gold standard.[3]

The functioning of the gold standard can be seen easily in a simplified example. Suppose people everywhere insisted on being paid in bits of pure gold metal. Then buying a bicycle in Britain would merely require payment in gold at a price expressed in ounces of gold. By definition there would be no foreign-exchange-rate problem. Gold would be the common world currency.

This example captures the essence of the gold standard. Once gold became the medium of exchange or money, foreign trade was no different from domestic trade; everything could be paid for in gold. The only difference between countries was that they could choose different *units* for their gold coins. Thus, Queen Victoria chose to make British coins about ¼ ounce of gold (the pound) and President McKinley chose to make the U.S. unit ½₀ ounce of gold (the dollar). In that case, the British pound, being 5 times as heavy as the dollar, had an exchange rate of $5/£1.

This was the essence of the gold standard. In practice, countries tended to use their own coins. But anyone was free to melt down coins and sell them at the going price of gold. So exchange rates were fixed for all countries on the gold standard. The exchange rates (also called "par values" or "parities") for different currencies were determined by the gold content of their monetary units.

### Hume's Adjustment Mechanism

The purpose of an exchange-rate system is to promote international trade and finance while facilitating adjustment to shocks. How exactly does the *international adjustment mechanism* function? What happens if a country's wages and prices rise so sharply that its goods are no longer competitive in the world market? Under flexible exchange rates, the country's exchange rate could depreciate to offset the domestic inflation. But under fixed exchange rates, equilibrium must be restored by deflation at home or inflation abroad.

Let's examine the international adjustment mechanism under a fixed-exchange-rate system with two countries, America and Britain. Suppose that American inflation has made American goods uncompetitive. Consequently, America's imports rise and its exports fall. It therefore runs a trade deficit with Britain. To pay for its deficit, America would have to ship gold to Britain. Eventually—if there were no adjustments in either America or Britain—America would run out of gold.

In fact, an automatic adjustment mechanism does exist, as was demonstrated by the British philosopher David Hume in 1752. He showed that the outflow of gold was part of a mechanism that tended to keep international payments in balance. His argument, though nearly 250 years old, offers important insights for understanding how trade flows get balanced in today's economy.

Hume's explanation rested in part upon the quantity theory of prices, which is a theory of the overall price level that is analyzed in macroeconomics. This doctrine holds that the overall price level in an economy is proportional to the supply of money. Under the gold standard, gold was an important part of the money supply—either directly, in the form of gold coins, or indirectly, when governments used gold as backing for paper money.

What would be the impact of a country's losing gold? First, the country's money supply would decline either because gold coins would be exported or because some of the gold backing for the currency would leave the country. Putting both these consequences together, a loss of gold leads to a reduction in the money supply. According to the quantity theory, the next step is that prices and costs would change proportionally to the change in the money supply. If the United States loses 10 percent of its gold to pay for a trade deficit, the quantity theory predicts that U.S. prices, costs, and incomes would fall 10 percent. In other words, the economy would experience a deflation.

***The Four-Pronged Mechanism.*** Now consider Hume's theory of international payments equilibrium. Suppose that America runs a large trade deficit and

[3] Why was gold used as the standard of exchange and means of payment, rather than some other commodity? Certainly other materials could have been used, but gold had the advantages of being in limited supply, being relatively indestructible, and having few industrial uses. Can you see why wine, wheat, or cattle would not be a useful means of payment among countries?

begins to lose gold. According to the quantity theory of prices, this loss of gold reduces America's money supply, driving down America's prices and costs. As a result, (1) America decreases its imports of British and other foreign goods, which have become relatively expensive; and (2) because America's domestically produced goods have become relatively inexpensive on world markets, America's exports increase.

The opposite effect occurs in Britain and other foreign countries. Because Britain's exports are growing rapidly, it receives gold in return. Britain's money supply therefore increases, driving up British prices and costs according to the quantity theory. At this point, two more prongs of the Hume mechanism come into play: (3) British and other foreign exports have become more expensive, so the volume of goods exported to America and elsewhere declines; and (4) British citizens, faced with a higher domestic price level, now import more of America's low-priced goods.

Figure 27-7 illustrates the logic in Hume's mechanism. Make sure you can follow the logical chain from

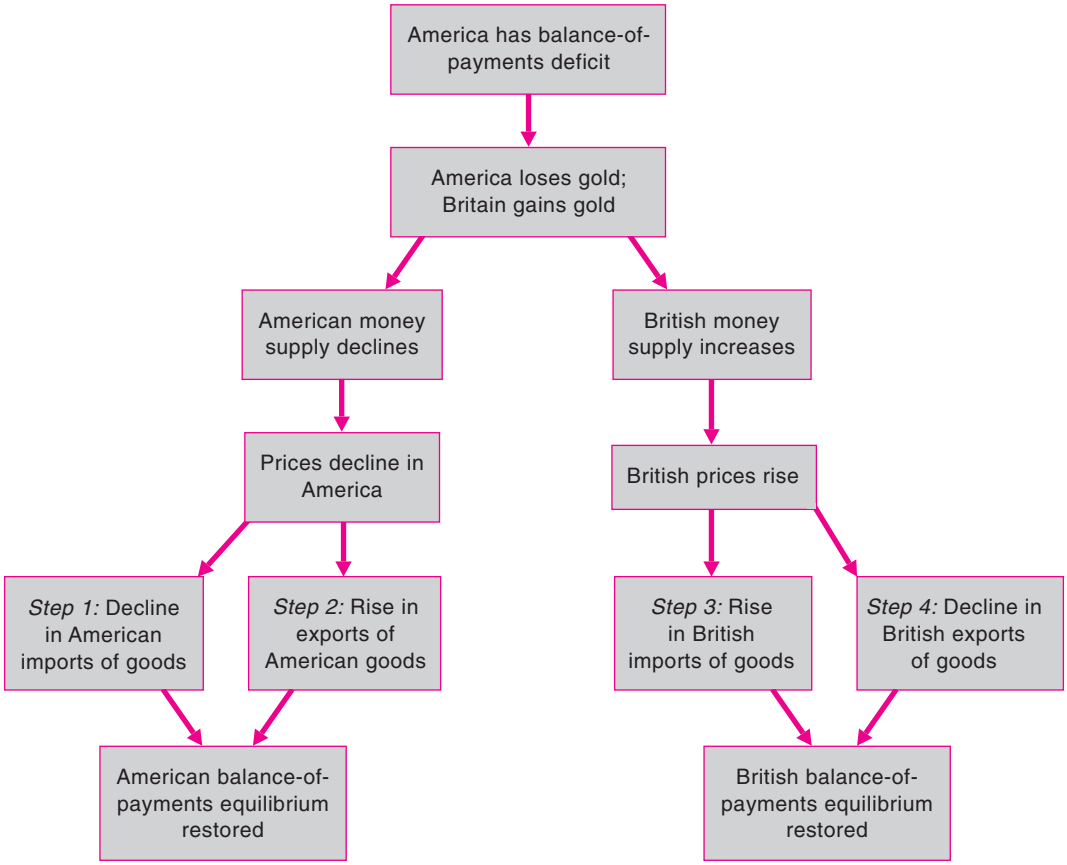


**FIGURE 27-7. Hume's Four-Pronged International Adjustment Mechanism**

Hume explained how a balance-of-payments disequilibrium would automatically produce equilibrating adjustments under a gold standard. Trace the lines from the original disequilibrium at the top through the changes in prices to the restored equilibrium at the bottom. This mechanism works in modified form under any fixed-exchange-rate system. Modern economics augments the mechanism by replacing the fourth row with "Prices, output, and employment decline in America" and "Prices, output, and employment rise in Britain."

the original deficit at the top through the adjustment to the new equilibrium at the bottom.

The result of Hume's four-pronged gold-flow mechanism is an improvement in the balance of payments of the country losing gold and a worsening in that of the country gaining gold. In the end, an equilibrium of international trade and finance is reestablished at new relative prices, which keep trade and international lending in balance with no net gold flow. This equilibrium is a stable one and requires no tariffs or other government intervention.

### Updating Hume to Modern Macroeconomics

Hume's theories are no longer completely relevant today. We do not have a gold standard, and the quantity theory of prices is no longer used to explain price movements. However, the basis of Hume's theory can be reinterpreted in the light of modern macroeconomics. The essence of Hume's argument is to explain the adjustment mechanism for imbalances between countries under a fixed exchange rate. The fixed exchange rate might be a gold standard (as existed before 1936), a dollar standard (as under the Bretton Woods system from 1945 to 1971), or a Euro standard (among European Union countries today).

If exchange rates are not free to move when the prices or incomes of different countries get out of line, *then domestic output and prices must adjust to restore equilibrium.* If, under a fixed exchange rate, domestic prices become too high relative to import prices, full adjustment can come only when domestic prices fall. This will occur when domestic output falls sufficiently so that the country's price level will decline relative to world prices. At that point, the country's balance of payments will return to equilibrium. Suppose that Greece's prices rise too far above those in the rest of the European Union and it becomes uncompetitive in the market. Greece will find its exports declining and its imports rising, lowering net exports. Eventually, as wages and prices in Greece decline relative to those in the rest of Europe, Greece will once again be competitive and will be able to restore full employment.

When a country adopts a fixed exchange rate, it faces an inescapable fact: Domestic real output and employment must adjust to ensure that the country's relative prices are aligned with those of its trading partners.

## INTERNATIONAL MONETARY INSTITUTIONS AFTER WORLD WAR II

In the early part of the twentieth century, even nations which were ostensibly at peace engaged in debilitating trade wars and competitive devaluations. After World War II, international institutions were developed to foster economic cooperation among nations. These institutions continue to be the means by which nations coordinate their economic policies and seek solutions to common problems.

The United States emerged from World War II with its economy intact—able and willing to help rebuild the countries of friends and foes alike. The postwar international political system responded to the needs of war-torn nations by establishing durable institutions that facilitated the quick recovery of the international economy. The major international economic institutions of the postwar period were the General Agreement on Tariffs and Trade (rechartered as the World Trade Organization in 1995), the Bretton Woods exchange-rate system, the International Monetary Fund, and the World Bank. These four institutions helped the industrial democracies rebuild themselves and grow rapidly after the devastation of World War II, and they continue to be the major international institutions today.

### The International Monetary Fund

An integral part of the Bretton Woods system was the establishment of the International Monetary Fund (or IMF), which still administers the international monetary system and operates as a central bank for central banks. Member nations subscribe by lending their currencies to the IMF; the IMF then relends these funds to help countries in balance-of-payments difficulties. The main function of the IMF is to make temporary loans to countries which have balance-of-payments problems or are under speculative attack in financial markets.

### The World Bank

Another international financial institution created after World War II was the World Bank. The Bank is capitalized by high-income nations that subscribe in proportion to their economic importance in terms of GDP and other factors. The Bank makes long-term low-interest loans to countries for projects which are

economically sound but which cannot get private-sector financing. As a result of such long-term loans, goods and services flow from advanced nations to developing countries.

### The Bretton Woods System

After World War II, governments were determined to replace the gold standard with a more flexible system. They set up the **Bretton Woods system,** which was a system with fixed exchange rates. The innovation here was that exchange rates were *fixed but adjustable.* When one currency got too far out of line with its appropriate or "fundamental" value, the parity could be adjusted.

The Bretton Woods system functioned effectively for the quarter-century after World War II. The system eventually broke down when the dollar became overvalued. The United States abandoned the Bretton Woods system in 1973, and the world moved into the modern era.

#### How to Ensure a Credibly Fixed Exchange Rate through the "Hard Fix"

Although the collapse of the Bretton Woods system marked the end of a predominantly fixed exchange-rate system, many countries continue to opt for fixed exchange rates. A recurrent problem with fixed-exchange-rate systems is that they are prey to speculative attacks when the country runs low on foreign exchange reserves. (We will return to this problem in the next chapter.) How can countries improve the credibility of their fixed-exchange-rate systems? Are there "hard" fixed-exchange-rate systems that will better withstand speculative attacks?

Specialists in this area emphasize the importance of establishing credibility. In this instance, credibility may be enhanced by creating a system that would actually make it *hard* for the country to change its exchange rate. This approach is similar to a military strategy of burning the bridges behind the army so that there is no retreat and the soldiers will have to fight to the death. Indeed, Argentina's president tried to instill credibility in Argentina's system by proclaiming that he would choose "death before devaluation."

One solution is to create **currency boards.** A currency board is a monetary institution that issues only currency that is fully backed by foreign assets in a key foreign currency, usually the U.S. dollar or the Euro. A currency board defends an exchange rate that is fixed by law rather than just by policy, and the currency board is usually independent, and sometimes even private. Under currency boards, a payments deficit will generally trigger Hume's automatic adjustment mechanism. That is, a balance-of-payments deficit will reduce the money supply, leading to an economic contraction, eventually reducing domestic prices and restoring equilibrium. A currency board system has worked effectively in Hong Kong, but the system in Argentina was unable to withstand economic and political turmoil and collapsed in 2002.

A fixed exchange rate is even more credible when countries adopt a **common currency** through monetary union. The United States has had a common currency since 1789. The most important recent example is the Euro, which has been adopted by 15 countries of the European Union. This is a most unusual arrangement because the currency joins together many powerful sovereign countries. From a macroeconomic point of view, a common currency is the hardest fix of all because the currencies of the different countries are all defined to be the same. A variant of this approach is called "dollarization," which occurs when a country (usually a small one) adopts a key currency for its own money. About a dozen small countries, such as El Salvador, have gone this route.

Fixed exchange rates have fallen out of favor among large countries. Only China continues to use a fixed exchange rate, and it is under intense pressure from other countries to allow the yuan to float. Aside from China, every large region of the world has adopted some variant of flexible exchange rates, which we will analyze shortly.

### Intervention

When a government fixes its exchange rate, it must "intervene" in foreign exchange markets to maintain the rate. Government exchange-rate **intervention** occurs when the government buys or sells foreign exchange to affect exchange rates. For example, the Japanese government on a given day might buy $1 billion worth of Japanese yen with U.S. dollars. This would cause a rise in value, or an appreciation, of the yen.

Let's take the case of China. China is the last major country to operate under a fixed exchange rate. The official exchange rate in 2008 was $0.144 per yuan. However, at that exchange rate, China had an enormous current-account surplus, as Table 27-3 on page 548 shows. China has used a strategy of export-led growth, and this requires a below-market

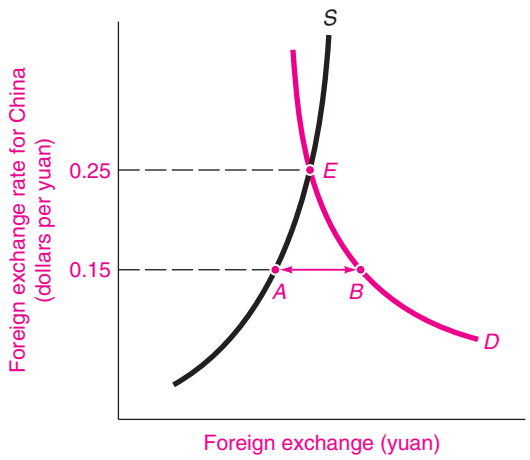


**FIGURE 27-8. Chinese Government Intervenes to Maintain Fixed Exchange Rates**

Because China has established a fixed exchange rate, it must intervene in the foreign exchange market to defend its established rate. Assume that the market equilibrium without intervention would be $0.25 per yuan, shown as point *E* at the intersection of market supply and demand. However, the government has established an official exchange rate of $0.15 per yuan. At that lower rate, there is excess demand for yuan, shown by the segment *AB*. (Make sure you understand why this is excess demand.) The Chinese government therefore sells a quantity of yuan, shown by the segment *AB,* to keep its exchange rate from appreciating.

exchange rate to make its exports so competitive. So while American and European policymakers have been urging China to revalue its currency, China has insisted that it will continue with its current fixed-exchange-rate policy.

How exactly does China maintain this system? Figure 27-8 illustrates the mechanism. Let us assume that the forces of supply and demand would lead to an equilibrium at point *E*, with a market-determined exchange rate of $0.25 per yuan. At the fixed exchange rate of $0.15 per yuan, the yuan is "undervalued" relative to the market-determined rate. What can the Chinese government do to keep the yuan below its market value?

- One approach is to intervene by *buying dollars and selling yuan.* In this approach, if China's central bank sells a quantity of yuan shown by the segment *AB,* this will increase the supply of yuan to match the quantity demanded and maintain the official exchange rate.
- An alternative would be to use monetary policy. China could *induce the private sector to increase its supply of yuan* by lowering interest rates. Lower interest rates would make dollar investments relatively more attractive and yuan investments relatively less attractive. This would lead investors to sell yuan and shift the yuan supply curve to the right so that it would pass through point *B* and produce the desired exchange rate. (You can pencil in a new *S′* curve that would lead to the induced equilibrium.)

These two operations are not really as different as they sound. In one case, the Chinese government sells yuan and buys dollars; in the other case, the private sector does the same. Both approaches involve monetary expansion. Indeed, we will see that one of the complications of managing an open economy with a fixed exchange rate is that the need to use monetary policy to manage the exchange rate can collide with the desire to use monetary policy to stabilize the domestic business cycle.

## FLEXIBLE EXCHANGE RATES

The international monetary system for major countries today relies primarily on **flexible exchange rates.** (Another term often used is **floating exchange rates,** which means the same thing.) Under this system, exchange rates are determined by supply and demand. Here, the government neither announces an official exchange rate nor takes steps to enforce one, and the changes in exchange rates are determined primarily by private supply of and demand for goods, services, and investments.

As noted above, virtually all large and medium-sized countries except China rely upon flexible exchange rates. We can use the example of Mexico to illustrate how such a system works. In 1994, the peso was under attack in foreign exchange markets, and the Mexicans allowed the peso to float. At the original exchange rate of approximately 4 pesos per U.S. dollar, there was an excess supply of pesos. This meant that at that exchange rate, the supply of pesos by Mexicans who wanted to buy American and other foreign goods and assets outweighed the demand for pesos by Americans and others who wanted to purchase Mexican goods and assets.

What was the outcome? As a result of the excess supply, the peso depreciated relative to the dollar. How far did the exchange rates move? Just far enough so that—at the depreciated exchange rate of about 6 pesos to the dollar—the quantities supplied and demanded were balanced.

What is behind the equilibration of supply and demand? Two main forces are involved: (1) With the dollar more expensive, it costs more for Mexicans to buy American goods, services, and investments, causing the supply of pesos to fall off in the usual fashion. (2) With the depreciation of the peso, Mexican goods and assets become less expensive for foreigners. This increases the demand for pesos in the marketplace. (Note that this simplified discussion assumes that all transactions occur only between the two countries; a more complete discussion would involve the demands and supplies of currencies from all countries.)

## TODAY'S HYBRID SYSTEM

Unlike the earlier uniform system under either the gold standard or Bretton Woods, today's exchange-rate system fits into no tidy mold. Without anyone's having planned it, the world has moved to a hybrid exchange-rate system. The major features are as follows:

- A few countries allow their currencies to *float freely*. In this approach, a country allows markets to determine its currency's value and it rarely intervenes. The United States has fit this pattern for most of the last three decades. While the Euro is just an infant as a common currency, Europe is clearly in the freely floating group.
- Some major countries have *managed but flexible* exchange rates. Today, this group includes Canada, Japan, and many developing countries. Under this system, a country will buy or sell its currency to reduce the day-to-day volatility of currency fluctuations. In addition, a country will sometimes engage in systematic intervention to move its currency toward what it believes to be a more appropriate level.
- A few small countries and China peg their currencies to a major currency or to a "basket" of currencies in a *fixed exchange rate*. Sometimes, the peg is allowed to glide smoothly upward or downward in a system known as a gliding or crawling peg. A few countries have the hard fix of a currency board, and others set their currencies equal to the dollar in a process called dollarization.
- In addition, almost all countries tend to intervene either when markets become "disorderly" or when exchange rates seem far out of line with the "fundamentals"—that is, when they are highly inappropriate for existing price levels and trade flows.

### *Concluding Thoughts*

The world has made a major transition in its international financial system over the last three decades. In earlier periods, most currencies were linked together in a system of fixed exchange rates, with parities linked either to gold or to the dollar. Today, with the exception of China, all major countries have flexible exchange rates. This new system has the disadvantage that exchange rates are volatile and can deviate greatly from underlying economic fundamentals. But this system also has the advantage of reducing the perils of speculation that undermined earlier fixed-rate systems. Even more important in a world of increasingly open financial markets is that flexible exchange rates allow countries to pursue monetary policies designed to stabilize domestic business cycles. It is this macroeconomic advantage that most economists find most important about the new regime.

## SUMMARY

### A. The Balance of International Payments

1. The balance of international payments is the set of accounts that measures all the economic transactions between a nation and the rest of the world. It includes exports and imports of goods, services, and financial instruments. Exports are credit items, while imports are debits. More generally, credit items are transactions that increase a country's holdings of foreign currencies; debit items are ones that reduce its holdings of foreign currencies.

2. The major components of the balance of payments are:
   - **I.** Current account (merchandise trade, services, investment income, transfers)
   - **II.** Financial account (private, government, and official-reserve changes)

   The fundamental rule of balance-of-payments accounting is that the sum of all items must equal zero: I + II = 0

### B. The Determination of Foreign Exchange Rates

3. International trade and finance involve the new element of different national currencies, which are linked by relative prices called foreign exchange rates. When Americans import Japanese goods, they ultimately need to pay in Japanese yen. In the foreign exchange market, Japanese yen might trade at ¥100/$ (or, reciprocally, ¥1 would trade for $0.01). This price is called the foreign exchange rate.
4. In a foreign exchange market involving only two countries, the supply of U.S. dollars comes from Americans who want to purchase goods, services, and investments from Japan; the demand for U.S. dollars comes from Japanese who want to import commodities or financial assets from America. The interaction of these supplies and demands determines the foreign exchange rate. More generally, foreign exchange rates are determined by the complex interplay of many countries buying and selling among themselves. When trade or financial flows change, supply and demand shift and the equilibrium exchange rate changes.
5. A fall in the market price of a currency is a depreciation; a rise in a currency's value is called an appreciation. In a system where governments announce official foreign exchange rates, a decrease in the official exchange rate is called a devaluation, while an increase is a revaluation.
6. According to the purchasing-power-parity (PPP) theory of exchange rates, exchange rates tend to move with changes in relative price levels of different countries. The PPP theory applies better to the long run than the short run. When this theory is applied to measure the purchasing power of incomes in different countries, it raises the per capita outputs of low-income countries.

### C. The International Monetary System

7. A well-functioning international economy requires a smoothly operating exchange-rate system, which denotes the institutions that govern financial transactions among nations. Two important exchange-rate systems are (*a*) flexible exchange rates, in which a country's foreign exchange rate is determined by market forces of supply and demand; and (*b*) fixed exchange rates, such as the gold standard or the Bretton Woods system, in which countries set and defend a given structure of exchange rates.
8. Classical economists like David Hume explained international adjustments to trade imbalances by the gold-flow mechanism. Under this process, gold movements would change the money supply and the price level. For example, a trade deficit would lead to a gold outflow and a decline in domestic prices that would (*a*) raise exports and (*b*) curb imports of the gold-losing country while (*c*) reducing exports and (*d*) raising imports of the gold-gaining country. This mechanism shows that under fixed exchange rates, countries which have balance-of-payments problems must adjust through changes in domestic price and output levels.
9. After World War II, countries created a group of international economic institutions to organize international trade and finance. Under the Bretton Woods system, countries "pegged" their currencies to the dollar and to gold, providing fixed but adjustable exchange rates. After the Bretton Woods system collapsed in 1973, it was replaced by today's hybrid system. Today, virtually all large and medium-sized countries (except China) have flexible exchange rates.

## CONCEPTS FOR REVIEW

**Balance of Payments**

balance of payments
  I. current account
  II. financial account
balance-of-payments identity:
  I + II = 0
debits and credits

**Foreign Exchange Rates**

foreign exchange rate, foreign exchange market
supply of and demand for foreign exchange
exchange-rate terminology:
  appreciation and depreciation
  revaluation and devaluation

**International Monetary System**

exchange-rate systems:
  flexible
  fixed rates (gold standard, Bretton Woods, currency board)
  common currency
international adjustment mechanism
Hume's four-pronged gold-flow mechanism

## FURTHER READING AND INTERNET WEBSITES

### Further Reading

A fascinating collection of essays on international macroeconomics is Paul Krugman, *Pop International* (MIT Press, Cambridge, Mass., 1997). The quotation on the international monetary system is from Robert Solomon, *The International Monetary System, 1945–1981: An Insider's View* (Harper & Row, New York, 1982), pp. 1, 7.

### Websites

Data on trade and finance for different countries can be found in the websites listed for Chapter 26.

Some of the best popular writing on international economics is found in *The Economist*, which is available on the Web at *www.economist.com*. One of the best sources for policy writing on international economics is *www.iie.com/homepage.htm*, the website of the Peterson Institute for International Economics. One of the leading scholar-journalists of today is Paul Krugman of Princeton. His blog at *krugman.blogs.nytimes.com* contains many interesting readings on international economics.

## QUESTIONS FOR DISCUSSION

1. Table 27-4 shows some foreign exchange rates (in units of foreign currency per dollar) as of late 2008. Fill in the last column of the table with the reciprocal price of the dollar in terms of each foreign currency, being especially careful to write down the relevant units in the parentheses.
2. Figure 27-3 shows the demand and supply for U.S. dollars in an example in which Japan and the United States trade only with each other.
   a. Describe and draw the reciprocal supply and demand schedules for Japanese yen. Explain why the supply of yen is equivalent to the demand for dollars. Also explain and draw the schedule that corresponds to the supply of dollars. Find the equilibrium price of yen in this new diagram and relate it to the equilibrium in Figure 27-3.
   b. Assume that Americans develop a taste for Japanese goods. Show what would happen to the supply and demand for yen. Would the yen appreciate or depreciate relative to the dollar? Explain.
3. Draw up a list of items that belong on the credit side of the balance of international payments and another list of items that belong on the debit side. What is meant by a trade surplus? By the balance on current account?
4. Suppose that China operates a fixed-exchange-rate system and is running a large current-account surplus. The government supports the system by buying large quantities of dollars in the foreign exchange market.

| | Price | | |
|---|---|---|---|
| Currency | Units of foreign currency per U.S. dollar | U.S. dollars per unit of foreign currency | |
| Dollar (Canada) | 0.9861 | 1.014 | (US$/Canadian dollar) |
| Real (Brazil) | 1.656 | _____ | (_____) |
| Yuan (China) | 6.942 | _____ | (_____) |
| Peso (Mexico) | 10.38 | _____ | (_____) |
| Pound (Britain) | 0.5054 | _____ | (_____) |
| Euro | 0.6368 | _____ | (_____) |
| Dollar (Zimbabwe) | 255,771,415 | _____ | (_____) |

TABLE 27-4.

Assume that the resulting increase in the supply of yuan leads to an increase in bank reserves.

**a.** Explain why this would lead to a monetary expansion and lower interest rates in China. Further explain why this would lead to an expansion in aggregate demand, higher output, and a higher price level. (This answer relies on the analysis presented in Chapters 23 and 24.)

**b.** Explain why, as prices rise because of the effects you described in **a,** Hume's four-pronged mechanism would eventually reduce the Chinese current-account surplus. Interpret your answer as the modern, updated version of Hume's mechanism.

**5.** Consider the situation for Germany described on page 552. Using a figure like Figure 27-3, show the supply and demand for German marks before and after the shock. Identify on your figure the excess demand for marks *before* the appreciation of the mark. Then show how an appreciation of the mark would wipe out the excess demand.

**6.** A Middle East nation suddenly discovers huge oil resources. Show how its balance of trade and current account suddenly turn to surplus. Show how it can acquire assets in New York as a financial-account offset. Later, when it uses the assets for domestic capital investment, show how its current and financial items reverse their roles.

**7.** Consider the following quotation from the 1984 *Economic Report of the President:*

> In the long run, the exchange rate tends to follow the differential trend in the domestic and foreign price level. If one country's price level gets too far out of line with prices in other countries, there will eventually be a fall in demand for its goods, which will lead to a real depreciation of its currency.

Explain how the first sentence relates to the PPP theory of exchange rates. Explain the reasoning behind the PPP theory. In addition, using a supply-and-demand diagram like that of Figure 27-3, explain the sequence of events, described in the second sentence of the quotation, whereby a country whose price level is relatively high will find that its exchange rate depreciates.

**8.** A nation records the following data for 2008: exports of automobiles ($100) and corn ($150); imports of oil ($150) and steel ($75); tourist expenditures abroad ($25); private lending to foreign countries ($50); private borrowing from foreign countries ($40); official-reserve changes ($30 of foreign exchange bought by domestic central bank). Calculate the statistical discrepancy and include it in private lending to foreign countries. Create a balance-of-payments table like Table 27-2.

**9.** Consider the following three exchange-rate systems: the classical gold standard, freely flexible exchange rates, and the Bretton Woods system. Compare and contrast the three systems with respect to the following characteristics:

**a.** Role of government vs. market in determining exchange rates

**b.** Degree of exchange-rate volatility

**c.** Method of adjustment of relative prices across countries

**d.** Need for international cooperation and consultation in determining exchange rates

**e.** Potential for establishment and maintenance of severe exchange-rate misalignment

**10.** Consider the European monetary union. List the pros and cons. How do you come down on the question of the advisability of monetary union? Would your answer change if the question concerned the United States?

CHAPTER

# 28

# Open-Economy Macroeconomics

*Before I built a wall I'd ask to know*
*What I was walling in or walling out . . .*

Robert Frost

The international business cycle exerts a powerful effect on every nation of the globe. Shocks in one area can have ripple effects around the world. Political disturbances in the Middle East can set off a spiral in oil prices that triggers inflation and unemployment. Defaults can rock stock markets and shake business confidence in distant lands. The interconnectedness of countries was illustrated dramatically in the financial crisis of 2007–2009. When U.S. financial institutions suffered huge losses, stock and bond markets around the world also declined, and a banking crisis in Europe erupted almost simultaneously with that in the United States.

The previous chapter surveyed the major concepts of international macroeconomics—the balance of payments, the determination of exchange rates, and the international monetary system. The present chapter continues the story by showing how macroeconomic shocks in one country have ripple effects on the output and inflation of other countries. We explore the paradoxical finding that trade balances are largely determined by the balances between domestic saving and investment. The chapter concludes with a review of some of the key international issues of today.

## A. FOREIGN TRADE AND ECONOMIC ACTIVITY

### *Net Exports and Output in the Open Economy*

Open-economy macroeconomics is the study of how economies behave when the trade and financial linkages among nations are considered. The previous chapter described the basic concepts of the balance of payments. We can restate those concepts here in terms of the national income and product accounts.

Foreign trade involves imports and exports. Although the United States produces most of what it consumes, it nonetheless has a large quantity of **imports,** which are goods and services produced abroad and consumed domestically. **Exports** are goods and services produced domestically and purchased by foreigners.

**Net exports** are defined as exports of goods and services minus imports of goods and services. In 2007, net exports for the United States were minus $708 billion, as calculated from $1662 billion worth

of exports minus $2370 billion worth of imports. When a country has positive net exports, it is accumulating foreign assets. The counterpart of net exports is **net foreign investment,** which denotes net U.S. savings abroad and is approximately equal to the value of net exports. Because the U.S. had negative net exports, its net foreign investment was negative, implying that the U.S. foreign indebtedness was growing.

In other words, *foreigners were making a significant contribution to U.S. investment.* Why is it that rich America borrowed so much from abroad? As we will see later in this chapter, this paradoxical phenomenon is explained by a relatively low U.S. saving rate, a high foreign saving rate, and an attractive investment climate in the United States.

In an open economy, a nation's expenditures may differ from its production. Total *domestic expenditures* (sometimes called *domestic demand*) are equal to consumption plus domestic investment plus government purchases. This measure differs from total *domestic product* (or GDP) for two reasons. First, some part of domestic expenditures will be on goods produced abroad, these items being imports (denoted by *Im*) like Mexican oil and Japanese automobiles. In addition, some part of America's domestic production will be sold abroad as exports (denoted by *Ex*)—items like Iowa wheat and Boeing aircraft. The difference between national output and domestic expenditures is exports minus imports, which equals net exports, or $Ex - Im = X$.

To calculate the *total production* of American goods and services, we need to add trade to domestic demand. That is, we need to know the total production for American residents as well as the net production for foreigners. This total includes domestic expenditures ($C + I + G$) plus sales to foreigners ($Ex$) minus domestic purchases from foreigners ($Im$). Total output, or GDP, equals consumption plus domestic investment plus government purchases plus net exports:

$$\text{Total domestic output} = \text{GDP} = C + I + G + X$$

## Determinants of Trade and Net Exports

What determines the levels of exports and imports and therefore of net exports? It is best to think of the import and export components of net exports separately.

Imports into the United States are positively related to U.S. income and output. When U.S. GDP rises, imports into the U.S. increase (1) because some of the increased $C + I + G$ purchases (such as cars and shoes) come from foreign production and also (2) because America uses foreign-made inputs (like oil or lumber) in producing its own goods. The demand for imports depends upon the relative price of foreign and domestic goods. If the price of domestic cars rises relative to the price of Japanese cars, say, because the dollar's exchange rate appreciates, Americans will buy more Japanese cars and fewer American ones. Hence *the volume and value of imports will be affected by domestic output and the relative prices of domestic and foreign goods.*

Exports are the mirror image of imports: U.S. exports are other countries' imports. American exports therefore depend primarily upon foreign output as well as upon the prices of U.S. exports relative to the prices of foreign goods. As foreign output rises, or as the exchange rate of the dollar depreciates, the volume and value of American exports tend to grow.

Figure 28-1 shows the ratio of U.S. net exports to GDP. For most of the period after World War II, the U.S. external accounts were in surplus or balance. Starting in the early 1980s, a decline in national saving, fueled by large federal budget deficits, led to a sharp appreciation of the dollar. Foreign economies grew less rapidly than the U.S. economy, depressing exports. The net effect was a large trade deficit and growing foreign indebtedness. Was it a good thing or a bad thing? The following discussion by the president's Council of Economic Advisers puts the U.S. trade deficit in an economic context:

> By themselves, external trade and current account deficits are neither inherently good nor inherently bad. What matters are the reasons for the deficits. The main reason for the deficits today appears to be the strength of the U.S. economic expansion relative to the slow or negative growth in many other countries. . . . These deficits are essentially a macroeconomic phenomenon, reflecting a higher rate of domestic investment than of national saving. The deficit's growth . . . reflects rising investment rather than falling saving.


**FIGURE 28-1. U.S. Net Exports Have Been in Deficit for Many Years**

The United States had a large trade surplus after World War II as it helped rebuild Europe. Note how net exports turned sharply negative in the early 1980s as America's saving declined. Net exports grew even more negative in the last decade with the global savings glut.

Source: U.S. Bureau of Economic Analysis.

## SHORT-RUN IMPACT OF TRADE ON GDP

How do changes in a nation's trade flows affect its GDP and employment? We first analyze this question in the context of our short-run model of output determination, the multiplier model of Chapter 22. The multiplier model shows how, in the short run when there are unemployed resources, changes in trade will affect aggregate demand, output, and employment.

There are two major new macroeconomic elements in the presence of international trade: First, we have a fourth component of spending, net exports, which adds to aggregate demand. Second, an open economy has different multipliers for private investment and government domestic spending because some spending leaks out to the rest of the world.

Table 28-1 on the next page shows how introducing net exports affects output determination. This table begins with the same components as those for a closed economy. (Look back to Table 22-2 on page 440 to refresh your memory about the major components and the way they sum to total spending.) Total domestic demand in

**Output Determination with Foreign Trade (billions of dollars)**

| (1) Initial level of GDP | (2) Domestic demand ($C + I + G$) | (3) Exports *Ex* | (4) Imports *Im* | (5) Net exports ($X = Ex - Im$) | (6) Total spending ($C + I + G + X$) | (7) Resulting tendency of economy |
|---|---|---|---|---|---|---|
| 4,100 | 4,000 | 250 | 410 | −160 | 3,840 | Contraction |
| 3,800 | 3,800 | 250 | 380 | −130 | 3,670 | Contraction |
| **3,500** | **3,600** | **250** | **350** | **−100** | **3,500** | **Equilibrium** |
| 3,200 | 3,400 | 250 | 320 | −70 | 3,330 | Expansion |
| 2,900 | 3,200 | 250 | 290 | −40 | 3,160 | Expansion |

**TABLE 28-1. Net Exports Add to Aggregate Demand of Economy**

To the domestic demand of $C + I + G$, we must add net exports of $X = Ex - Im$ to get total aggregate demand for a country's output. Higher net exports affect aggregate demand just as do investment and government purchases.

column (2) is composed of the consumption, investment, and government purchases we analyzed earlier. Column (3) then adds the exports of goods and services. As described above, exports depend upon foreign incomes and outputs and upon prices and exchange rates, all of which are also taken as given for this analysis. Exports are assumed to be a constant level of $250 billion of foreign spending on domestic goods and services.

The interesting new element arises from imports, shown in column (4). Like exports, imports depend upon exogenous variables such as prices and exchange rates. But, in addition, imports depend upon domestic incomes and output, which clearly change in the different rows of Table 28-1. For simplicity, we assume that the country always imports 10 percent of its total output, so imports in column (4) are 10 percent of column (1).

Subtracting column (4) from column (3) gives net exports in column (5). Net exports are a negative number when imports exceed exports and a positive number when exports are greater than imports. Net exports in column (5) are the net addition to the spending stream contributed by foreign trade. Total spending on domestic output in column (6) equals domestic demand in column (2) plus net exports in column (5). Equilibrium output in an open economy occurs where total net domestic and foreign spending in column (6) exactly equals total domestic output in column (1). In this case, equilibrium comes with net exports of −100, indicating that the country is importing more than it is exporting. At this equilibrium, note as well that domestic demand is greater than output.

Figure 28-2 shows the open-economy equilibrium graphically. The upward-sloping blue line marked $C + I + G$ is the same curve used in Figure 22-10. To this line we must add the level of net exports that is forthcoming at each level of GDP. Net exports from column (5) of Table 28-1 are added to get the green line of total aggregate demand or total spending. When the green line lies below the blue curve, imports exceed exports and net exports are negative. When the green line is above the blue line, the country has a net-export surplus and output is greater than domestic demand.

Equilibrium GDP occurs where the green line of total spending intersects the 45° line. This intersection comes at exactly the same point, at $3500 billion, that is shown as equilibrium GDP in Table 28-1. Only at $3500 billion does GDP exactly equal what consumers, businesses, governments, and foreigners want to spend on goods and services produced in the domestic economy.

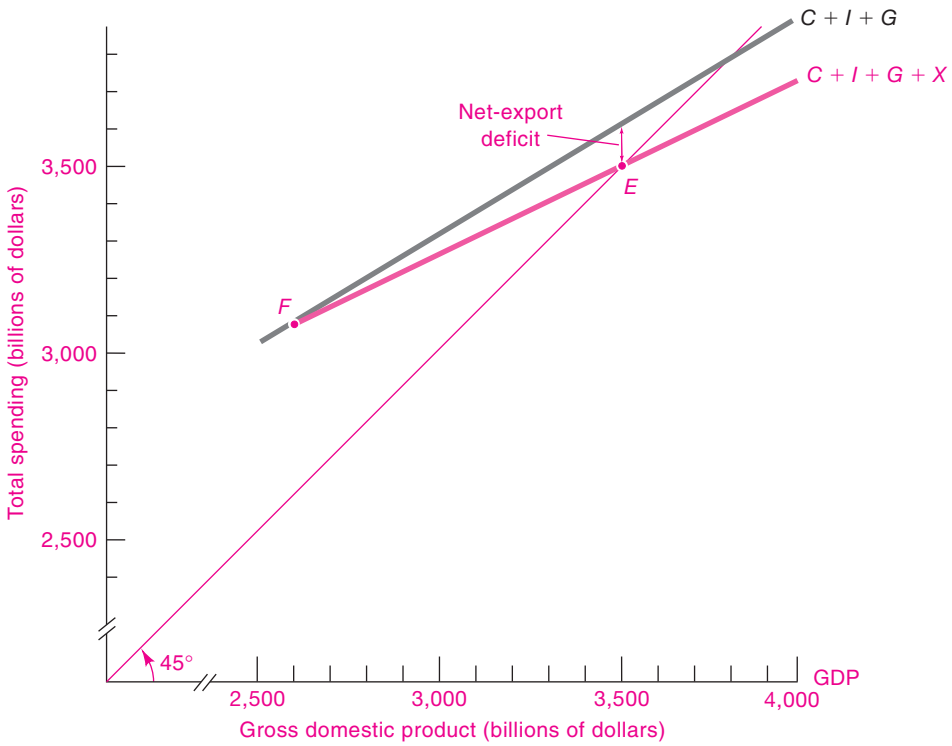


**FIGURE 28-2. Adding Net Exports to Domestic Demand Gives Equilibrium GDP in the Open Economy**

The blue line represents domestic demand ($C + I + G$), which are purchases by domestic consumers, businesses, and governments. To this must be added net foreign spending. Net exports plus domestic demand give the green line of total spending. Equilibrium comes at point *E*, where total GDP equals total spending on goods and services produced in the United States. Note that the slope of the green total demand curve is less than that of domestic demand to reflect the leakage from spending into imports.

### The Marginal Propensity to Import and the Spending Line

Note that the aggregate demand curve, the green $C + I + G + X$ curve in Figure 28-2, has a slightly smaller slope than the blue curve of domestic demand. The explanation of this is that *there is an additional leakage from spending into imports.* This new leakage arises from our assumption that 10 cents of every dollar of income is spent on imports. To handle this requires introducing a new term, the **marginal propensity to import.** The marginal propensity to import, which we will denote *MPm,* is the increase in the dollar value of imports for each $1 increase in GDP.

The marginal propensity to import is closely related to the marginal propensity to save (*MPS*). Recall that the *MPS* tells us what fraction of an additional dollar of income is not spent but leaks into saving. The marginal propensity to import tells how much of additional output and income leaks into imports. In our example, the *MPm* is 0.10 because every $300 billion of increased income leads to $30 billion of increased imports. (What is the marginal propensity to import in an economy with no foreign trade? Zero.)

Now examine the slope of the total spending line in Figure 28-2—that line shows total spending on $C + I + G + X$. Note that the slope of the total spending line is less than the slope of the domestic demand line of $C + I + G$. As GDP and total incomes rise by \$300, spending on consumption rises by the income change times the *MPC* (assumed to be two-thirds), or by \$200. At the same time, spending on imports, or foreign goods, also rises by \$30. Hence spending on domestic goods rises by only \$170(= \$200 − \$30), and the slope of the total spending line falls from 0.667 in our closed economy to \$170/\$300 = 0.567 in our open economy.

### The Open-Economy Multiplier

Surprisingly, opening up an economy lowers the expenditure multiplier.

One way of understanding the expenditure multiplier in an open economy is to calculate the rounds of spending and respending generated by an additional dollar of government spending, investment, or exports. Suppose that Germany needs to buy American computers to modernize antiquated facilities in what used to be East Germany. Each extra dollar of U.S. computers will generate \$1 of income in the United States, of which \$2/3 = \$0.667 will be spent by Americans on consumption. However, because the marginal propensity to import is 0.10, one-tenth of the extra dollar of income, or \$0.10, will be spent on foreign goods and services, leaving only \$0.567 of spending on domestically produced goods. That \$0.567 of domestic spending will generate \$0.567 of U.S. income, from which 0.567 × \$0.567 = \$0.321 will be spent on consumption of domestic goods and services in the next round. Hence the total increase in output, or the open-economy multiplier, will be

$$\begin{aligned}\text{Open-economy multiplier} &= 1 + 0.567 + (0.567)^2 + \cdots \\ &= 1 + (\tfrac{2}{3} - \tfrac{1}{10}) + (\tfrac{2}{3} - \tfrac{1}{10})^2 + \cdots \\ &= \frac{1}{1 - \tfrac{2}{3} + \tfrac{1}{10}} = \frac{1}{\tfrac{13}{30}} = 2.3\end{aligned}$$

This compares with a closed-economy multiplier of $1/(1 - \frac{2}{3}) = 3$.

Another way of calculating the multiplier is as follows: Recall that the multiplier in our simplest model was $1/MPS$, where *MPS* is the "leakage" into saving. As we noted above, imports are another leakage. The total leakage is the dollars leaking into saving (the *MPS*) plus the dollars leaking into imports (the *MPm*). Hence, the open-economy multiplier should be $1/(MPS + MPm) = 1/(0.333 + 0.1) = 1/0.433 = 2.3$. Note that both the leakage analysis and the rounds analysis provide exactly the same answer.

To summarize:

Because a fraction of any income increase leaks into imports in an open economy, the **open-economy multiplier** is smaller than the multiplier for a closed economy. The exact relationship is

$$\text{Open-economy multiplier} = \frac{1}{MPS + MPm}$$

where *MPS* = marginal propensity to save and *MPm* = marginal propensity to import.

## TRADE AND FINANCE FOR THE UNITED STATES UNDER FLEXIBLE EXCHANGE RATES

We begin with a review of major trends in trade and finance for the United States over the period of flexible exchange rates, which began after the abandonment of the Bretton Woods system in 1973 (recall the discussion in the previous chapter).

First, examine the movements in the dollar exchange rate, shown in Figure 28-3. This is an index of the *real exchange rate* of the U.S. dollar against other major currencies. The real exchange rate corrects for movements in the price levels in different countries. Note how the exchange rate was relatively stable under fixed rates. Then, as with all market-determined asset prices, exchange rates became volatile in the flexible-rate era.

Figure 28-4 shows the *real* component of net exports. This is the ratio of real net exports to real GDP. We saw above that an increase in real net exports tends to be expansionary, while a decrease in real net exports tends to reduce output. We describe two periods in the history of the United States to help understand the role of international trade in domestic production.

#### Trade Movements Reinforce Tight Money in the 1980s.

The decade of the 1980s witnessed a dramatic cycle of dollar appreciation and depreciation. The rise in the value of the dollar began in 1980 after tight

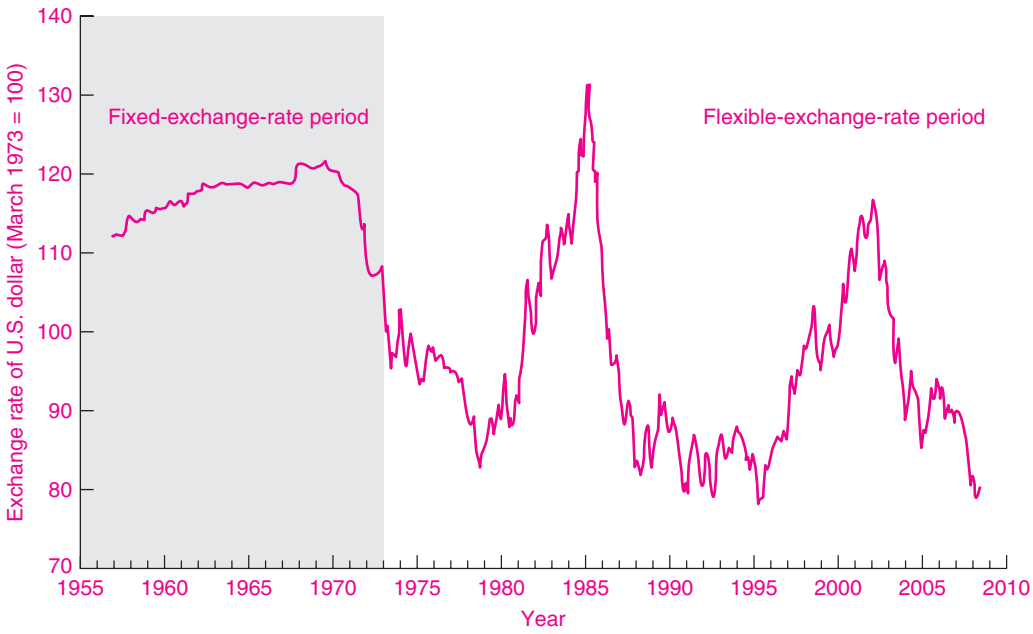


**FIGURE 28-3. The Foreign Exchange Rate of the Dollar**

During the fixed-exchange-rate (Bretton Woods) period, the dollar's value was stable in exchange markets. After the United States moved to flexible exchange rates in 1973, the dollar's value became more volatile. When the United States pursued its tight-money policies in the early 1980s, the high interest rates pulled up the dollar. With large current-account deficits and the foreign accumulation of dollar-denominated assets, the dollar began to depreciate after 2000.

Source: Federal Reserve System, at *www.federalreserve.gov/releases/h10/summary*.

U.S. monetary policy and loose U.S. fiscal policy drove interest rates up sharply. High interest rates at home and economic turmoil abroad attracted funds into financial investments in U.S. dollars. Figure 28-3 shows that during the period from 1979 to early 1985, the real exchange rate on the dollar rose by 80 percent. Many economists believe the dollar was overvalued in 1985—an *overvalued currency* is one whose value is high relative to its long-run or sustainable level.

As the dollar rose, American export prices increased and the prices of goods imported into the United States fell. Figure 28-5 shows the important relationship between real exchange rates and the trade deficit. It illustrates the dramatic effect of the appreciating dollar on trade flows. From the trough in 1980 to the peak in 1986, the trade deficit increased by 3 percent of GDP as the dollar appreciated.

By itself, this sharp increase in the trade deficit would be contractionary. The decline in net exports reinforced a decline in domestic demand induced by tight monetary policy. The result was the deepest recession in 50 years.

***Countercyclical Net Exports in the 1995–2000 Period.*** The late 1990s were the opposite story. After 1995, the combination of low real interest rates and a booming stock market led to the rapid growth of domestic demand in the United States, particularly in private investment. Unemployment fell sharply. A rapid increase in foreign demand for U.S. assets led to the sharp appreciation of the dollar.

In contrast with the early 1980s, the macroeconomic impact of the dollar appreciation in this period was appropriate. As the American economy approached full employment, import prices rose, net exports declined, and the foreign sector exercised

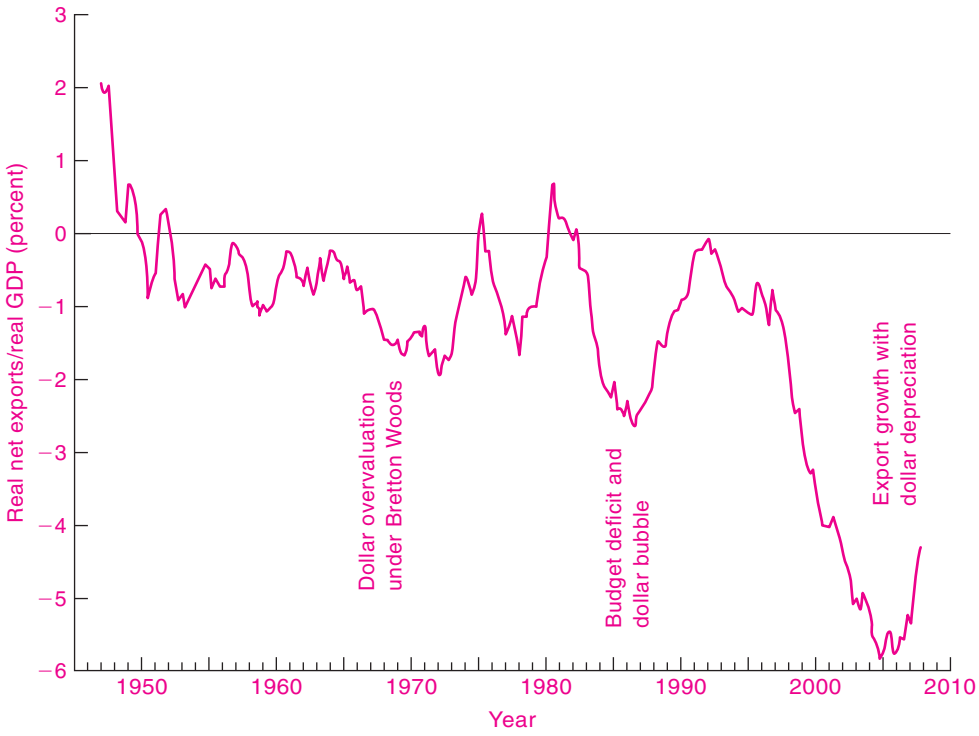


**FIGURE 28-4. Real Net Exports Have Been an Important Component of Demand**

With a strong rise in the dollar exchange rate and weak economic growth abroad, U.S. real net exports turned sharply negative in the early 1980s. This shift produced a massive drag on aggregate spending in the $C + I + G + X$ equation and helped produce the deep recession of 1982. The growing deficit from the period after 1990 moderated the growth of output. Note how net exports increased after the dollar's depreciation in the late 2000s.

Source: U.S. Bureau of Economic Analysis.

a drag on the economy. Had the dollar depreciated rather than appreciated, the foreign sector would have been expansionary, the American economy would have experienced rising inflation, and the Fed would have found it necessary to tighten money to choke off the boom. In the late 1990s, therefore, an appreciation of the dollar and a decline in net exports were just what the macroeconomic doctor ordered.

## THE MONETARY TRANSMISSION MECHANISM IN AN OPEN ECONOMY

Our earlier multiplier analysis of business cycles and economic growth focused on policies in a closed economy. We analyzed the way that monetary and fiscal policies can help stabilize the business cycle. How do the impacts of macroeconomic policies change in an open economy? How is the monetary transmission mechanism different in this situation? Surprisingly, the answer to these questions depends crucially on whether the country has a fixed or a flexible exchange rate.

Our survey here will concentrate on high-income countries whose financial markets are closely linked together—the United States, Japan, and the countries of the European Union. When financial investments can flow easily among countries and the regulatory barriers to financial investments are low, we say that these countries have *high mobility of financial capital.*

***Fixed Exchange Rates.*** The key feature of countries with fixed exchange rates and high capital mobility is

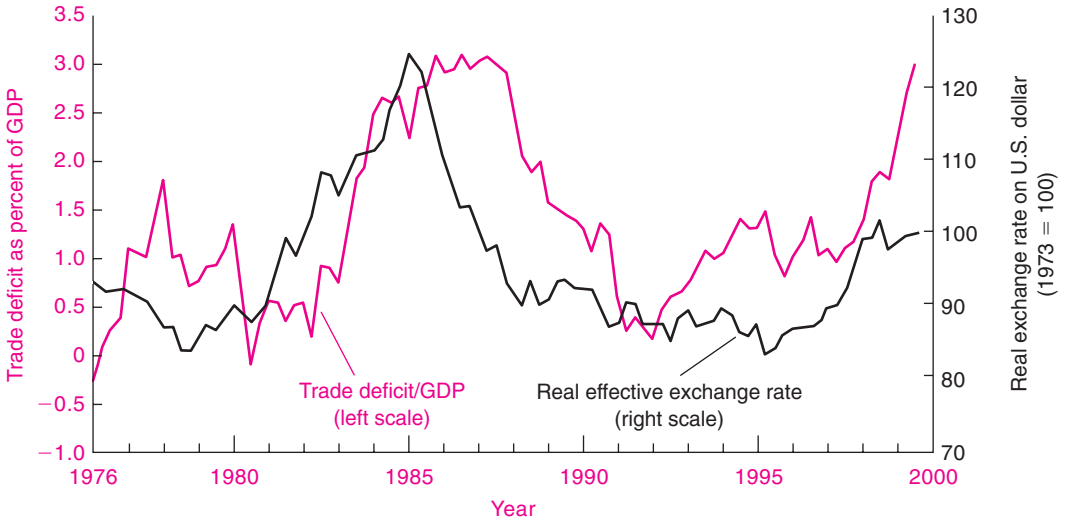


**FIGURE 28-5. Trade and Exchange Rates**

Trade flows respond to exchange-rate changes, but with a time lag. The real appreciation of the dollar during the early 1980s increased U.S. export prices and reduced prices of goods imported into the United States. As a result, the trade deficit rose sharply. When the dollar depreciated after 1985, the trade deficit began to shrink. The increase in the current-account deficit resulted from dollar appreciation and slow growth outside the United States.

Source: Council of Economic Advisers, *Economic Report of the President, 2000.*

that their interest rates must be very closely aligned. Any divergence in the interest rates between two such countries will attract speculators who will sell one currency and buy the other until the interest rates are equalized.

Consider a small country which pegs its exchange rate to the currency of a larger country. *Because the small country's interest rates are determined by the monetary policy of the large country, the small country can no longer conduct independent monetary policy.* The small country's monetary policy must be devoted to ensuring that its interest rates are aligned with those of its partner.

Macroeconomic policy in such a situation is therefore exactly the case described in our multiplier model discussed earlier. From the small country's point of view, investment is exogenous, because it is determined by world interest rates. Fiscal policy is highly effective because there is no monetary reaction to changes in government spending or taxes.

***Flexible Exchange Rates.*** One important insight in this area is that macroeconomic policy with flexible exchange rates operates in quite a different way from the case of fixed exchange rates. A flexible exchange rate has a reinforcing effect on monetary policy.

Let's consider the case of the United States. The monetary transmission mechanism in the United States has changed significantly in recent decades as a result of increased openness and the change to a flexible exchange rate. In the modern era, international trade and finance have come to play an increasingly important role in U.S. macroeconomic policy.

Figure 28-6 shows the monetary transmission mechanism under flexible exchange rates. Panel (*a*) shows the relationship between net exports and the exchange rate, the actual history of which we saw in Figure 28-5. This is an inverse relationship because a depreciation stimulates exports and discourages imports. Suppose that the Fed decides to reduce interest rates to stimulate the economy. The decline in interest rates would lead to a depreciation in the dollar as financial investors moved from

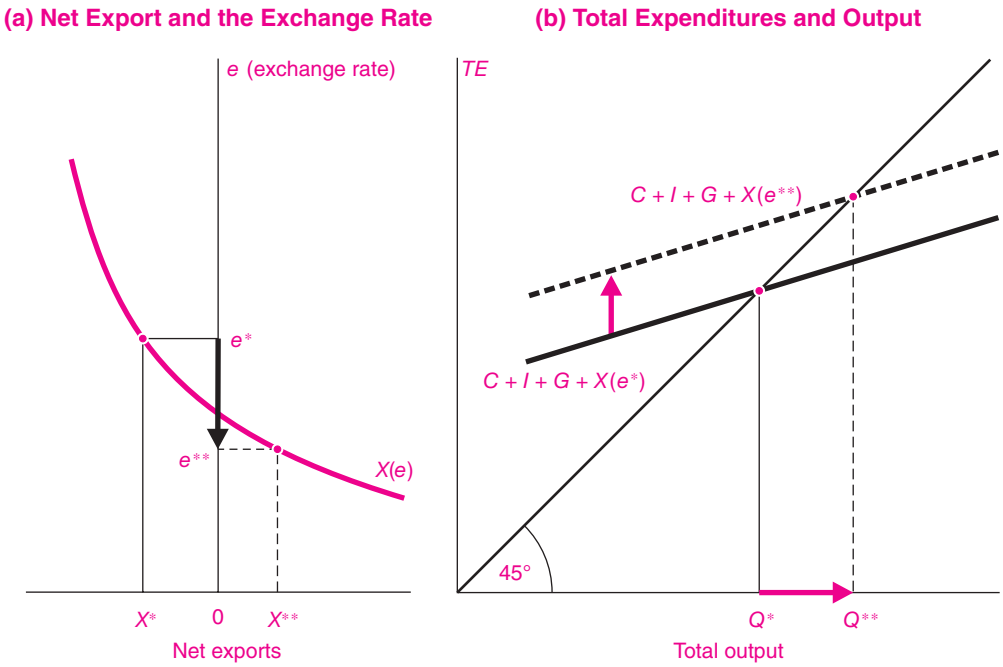


**FIGURE 28-6. With Flexible Exchange Rates, the Monetary Transmission Mechanism Is Reinforced**

Suppose that the central bank lowers interest rates. This will tend to lower the exchange rate from $e^*$ to $e^{**}$ in a flexible-exchange-rate system. Such a depreciation will stimulate net exports by moving down *along* the net-export curve. This increase in net exports from $X(e^*)$ to $X(e^{**})$ shifts up the total expenditure curve, increasing total output from $Q^*$ to $Q^{**}$.

dollar to nondollar stocks and bonds. The depreciation is shown in Figure 28-6 as a movement from $e^*$ to $e^{**}$. This depreciation changes a net export deficit of $X^*$ to a net export surplus of $X^{**}$. The decline in interest rates would also tend to increase domestic investment, but we omit that effect from our discussion.

We show the result of this net export expansion in Figure 28-6($b$). (This assumes, as with all our multiplier analyses, a situation where there are unemployed resources.) The increase in net exports shifts the total expenditure curve up from $C + I + G + X(e^*)$ to $C + I + G + X(e^{**})$. The result is an increase in total expenditure and an increase in output from $Q^*$ to $Q^{**}$. All the changes shown in Figure 28-6 illustrate the policies and reactions during the 1995–2000 period discussed in the previous section.

Alternatively, take the opposite case. Suppose that the Fed decides to slow the economy, as it did after 1979. The monetary tightening raised U.S. interest rates, which attracted funds into dollar securities. This increase in the demand for dollars led to an appreciation of the dollar. The high dollar exchange rate reduced net exports and contributed to the recession of 1981–1983, as we described earlier. The impact on net exports in such a situation would be the opposite of that shown in Figure 28-6.

Foreign trade produces a new and powerful link in the monetary transmission mechanism when a country has a flexible exchange rate. When monetary policy changes interest rates, this affects exchange rates and net exports as well as domestic investment. Monetary tightening leads to an appreciation in the exchange rate and a corresponding decline in net exports; monetary easing does the opposite. The impact of changes in interest rates on net exports reinforces the impact on domestic investment.

## B. INTERDEPENDENCE IN THE GLOBAL ECONOMY

### ECONOMIC GROWTH IN THE OPEN ECONOMY

The first section described the short-run impact of international trade and policy changes in the open economy. These issues are crucial for open economies combating unemployment and inflation. But countries must also keep their eye on the implications of their policies for long-run economic growth. Particularly for small open economies, effective use of international trade and international finance is central for promoting economic growth.

Economic growth involves a wide variety of issues, as we saw in Chapter 25. Perhaps the single most important approach for promoting rapid economic growth is to ensure high levels of saving and investment.

But economic growth involves more than just capital. It requires moving toward the technological frontier by adopting the best technological practices. It requires developing institutions that nurture investment and the spirit of enterprise. Other issues—trade policies, intellectual property rights, policies toward direct investment, and the overall macroeconomic climate—are essential ingredients in the growth of open economies.

### SAVING AND INVESTMENT IN THE OPEN ECONOMY

In a closed economy, total investment equals domestic saving. Open economies, however, can draw upon world financial markets for investment funds, and other countries can be an outlet for domestic saving. (Recall Table 27-3, which shows the net saving of important regions.) We first review the investment-saving relationship, and then we examine the mechanisms for allocating saving among different countries.

#### The Saving-Investment Relation in an Open Economy

Let's pause to recall our saving-investment identities from Chapter 20:

$$I_T = I + X = S + (T - G)$$

This states that total national investment ($I_T$) consists of investment in domestic capital ($I$) plus net foreign

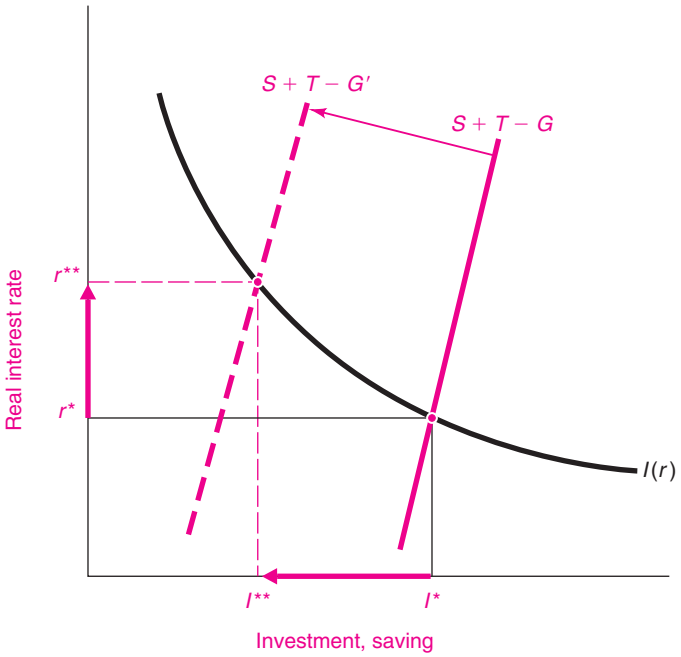


**FIGURE 28-7. Saving and Investment in the Closed Economy**

Investment is inversely related to the real interest rate, while private saving and public saving are relatively unresponsive to the interest rate. Equilibrium saving and investment comes at $r^*$. Suppose that government military spending increases. This increases the government deficit and therefore reduces public saving. The result is a shift in the national saving curve to the left to $S + T - G'$, raising the market interest rate to $r^{**}$ and reducing national saving and investment to $I^{**}$.

investment or net exports ($X$). This must equal total private saving ($S$) by households and businesses plus total public saving, which is given by the government surplus ($T - G$).

We can rewrite the identity as follows to emphasize the components of net exports:

$$X = S + (T - G) - I$$

or

$$\text{Net exports} = (\text{private saving} + \text{government saving}) - \text{domestic investment}$$

This important equation shows that net exports are the difference between domestic saving and domestic investment. The components of total U.S. national investment for recent decades are shown in Table 28-2.

## Determination of Saving and Investment at Full Employment

We need to go beyond the identities to understand the *mechanism* by which saving and investment are equalized in the open economy. This analysis concerns primarily the long run in which there is full employment and output equals its potential. That is, we consider how saving and investment are allocated in the long run in a "classical" economy.

***Closed Economy.*** We begin with a closed economy where there is no inflation and no uncertainty. In this situation, investment must equal private saving plus the government surplus. The equilibrating price is the real interest rate, which adjusts to balance the levels of saving and investment.

Figure 28-7 shows how national saving and investment are equilibrated in a full-employment closed economy. The $S + T - G$ curve shows national saving, which is assumed to increase slightly with the real interest rate. Additionally, as we learned in Chapter 21, there is an inverse relationship between investment and the interest rate. Higher interest rates reduce spending on housing and on business plant and equipment. We therefore write our investment schedule as $I(r)$ to indicate that investment depends upon the real interest rate, $r$.

The saving and investment schedules intersect in Figure 28-7 to determine an interest rate at $r^*$ with high levels of saving and investment.

Now suppose that the government increases its purchases without increasing taxes, say, because of an increase in military spending to fight foreign wars. This will shift the saving schedule to the left to $S + T - G'$. As a result, the real interest rate increases to equilibrate saving and investment, and the level of investment falls. A similar outcome would occur if the government lowered taxes or if the private sector lowered its desired savings.

In a full-employment closed economy (always holding other things constant), higher government

**Saving and Investment as Percentage of NNP**

| Sector | 1959–1981 | 1982–2001 | 2002–2007 |
|---|---|---|---|
| **Net domestic saving** | **11.5** | **6.4** | **1.7** |
| Net private saving | 11.6 | 8.8 | 4.6 |
| Net government saving | −0.1 | −2.5 | −2.8 |
| **Net domestic investment** (in capital) | **11.1** | **8.5** | **7.7** |
| **Net foreign investment** | **0.4** | **−2.1** | **−6.0** |

**TABLE 28-2. The Declining U.S. Saving Rate**

This table shows the changing structure of U.S. saving over the last half-century. For most of the 1959–1981 period, saving and investment were about equal and at a high level. Then, after 1981, government saving declined as the federal budget moved into deficit. This decline was reinforced in the 2000s as personal and other private saving dropped sharply. By the 2002–2007 period, most U.S. capital investment was financed by foreign saving, which is the counterpart to the large current-account deficit.

Source: Bureau of Economic Analysis.

spending, lower taxes, or lower desired private saving will raise the real interest rate and lower equilibrium saving and investment.

***Open-Economy Equilibrium.*** Now consider the situation of an open economy in which financial markets are integrated with world markets. An open economy has alternative sources of investment and alternative outlets for saving. We simplify by assuming that the economy is small and cannot affect world interest rates. We show this situation in Figure 28-8 for a small open economy with a high degree of mobility of financial capital. A small open economy must equate its domestic real interest rate with the world real interest rate, $r^W$. Because financial markets are open, financial capital will move to equilibrate interest rates at home and abroad.

Figure 28-8 helps explain the determination of saving, investment, and net exports in the open economy. At the prevailing world interest rate, domestic investment is shown at point *A*, which is the intersection of the investment schedule and the interest rate. Total national saving is given at point *B* on the total saving schedule, $S + T - G$. The difference between them—given by the line segment *AB*—is net exports. (This equality is shown by the saving-investment identity in the box on page 574.)

Hence net exports are determined by the difference between national saving and national

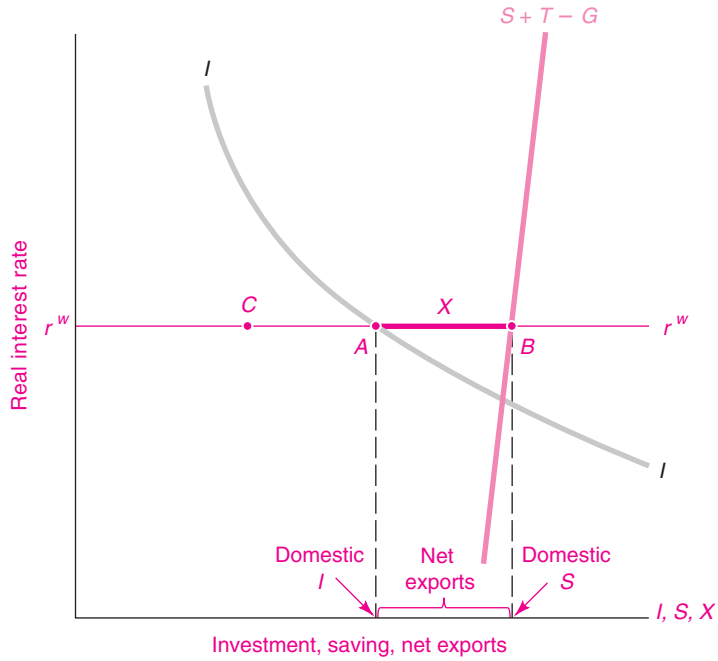


**FIGURE 28-8. Saving and Investment in a Small Open Economy**

Domestic investment and domestic saving are determined by income, interest rates, and government fiscal policy, as in Fig. 28-7. But the small open economy with mobile financial capital has its real interest rates determined in world financial markets. At the relatively high real interest rate at $r^W$, domestic saving exceeds domestic investment and the excess saving flows to more lucrative investment opportunities abroad. The difference between national saving and domestic investment is net exports (also equal to net foreign investment), shown as *X* in the figure. A trade surplus such as has been seen in Japan and China is caused by the interaction of high domestic saving and low domestic investment.

investment, which is determined by domestic factors plus the world interest rate.

This discussion pushes into the background the mechanism by which a country adjusts its trade, saving, and investment. It is here that the exchange rate plays the crucial equilibrating role. *Changes in exchange rates are the mechanism by which saving and investment adjust.* That is, exchange rates move to ensure that the level of net exports balances the difference between domestic saving and investment.

This analysis can help explain the trends in saving, investment, and trade patterns in major countries in recent years. Figure 28-8 describes well the role of Japan in the world economy. Japan has traditionally had a high domestic saving rate. Yet in recent years—because of high production costs at home and competitive conditions in neighboring newly industrialized countries—the return on Japanese capital has been depressed. Japanese saving therefore seeks outlets abroad, with the consequence that Japan has had a large trade surplus and high net exports.

The United States has seen an interesting twist in its saving and investment position, as was shown in Table 28-2. Until 1980, the United States had a modestly positive net-export position. But in the early 1980s the U.S. government's fiscal position shifted sharply toward deficit. You can depict this by drawing a new $S + T' - G'$ line in Figure 28-8 that intersects the real-interest-rate line at point *C*. You can see that total national saving would decline with a larger government deficit. Domestic investment would be unchanged. Net exports would turn negative and be given by the line segment *CA*.

We can also use this analysis to explain the mechanism by which net exports adjust to provide the necessary investment when the government runs a budget deficit. Consider a country with a net-export surplus as shown in Figure 28-8. Suppose that the government suddenly begins to run a large budget deficit. This change will lead to an imbalance in the saving-investment market, which would tend to push up domestic interest rates relative to world interest rates. The rise in domestic interest rates will attract funds from abroad and will lead to an appreciation in the foreign exchange rate of the country running the budget deficit. The appreciation will lead to falling exports and rising imports, or a decrease in net exports. This trend will continue until net exports have fallen sufficiently to close the saving-investment gap.

Other important examples of the open-economy saving-investment theory in the small open economy are the following:

- An increase in private saving or lower government spending will increase national saving as represented by a rightward shift in the national saving schedule in Figure 28-8. This will lead to a depreciation of the exchange rate until net exports have increased enough to balance the increase in domestic saving.
- An increase in domestic investment, say, because of an improved business climate or a burst of innovations, will lead to a shift in the investment schedule. This will lead to an appreciation of the exchange rate until net exports decline enough to balance saving and investment. In this case, domestic investment crowds out foreign investment.
- An increase in world interest rates will reduce the level of investment. This will lead to an increase in the difference between saving and investment, to a depreciation in the foreign exchange rate, and to an increase in net exports and foreign investment. (This would be a shift along the investment schedule.)

Table 28-3 summarizes the major results for the small open economy. Make sure you can also work through the cases of decreases in the government's fiscal deficit, in private saving, in investment, and in world interest rates. This handy table and its explanation deserve careful study.[1]

Integration of a country into the world economy adds an important new dimension to macroeconomic performance and policy. Key findings are:

- The foreign sector provides an important source of domestic investment and a potential outlet for domestic saving.
- Higher saving at home—whether in the form of higher private saving or higher public saving—will lead to higher net exports.

[1] This discussion covers "small" open economies that cannot affect the world interest rate. For "large" open economies like the United States, the impact would be somewhere between the small-economy and the closed-economy cases. This more complex case is covered in intermediate textbooks (see the Further Reading section in Chapter 19).

| Change in policy or exogenous variable | Change in exchange rate | Change in investment | Change in net exports |
|---|---|---|---|
| Increase in $G$ or decrease in $T$ | $e\uparrow$ | 0 | $X\downarrow$ |
| Increase in private $S$ | $e\downarrow$ | 0 | $X\uparrow$ |
| Increase in investment demand | $e\uparrow$ | $I\uparrow$ | $X\downarrow$ |
| Increase in world interest rates | $e\downarrow$ | $I\downarrow$ | $X\uparrow$ |

**TABLE 28-3. Major Conclusions of Saving-Investment Model in Small Open Economy**

Make sure you understand the mechanism by which each of these occurs.

- A country's trade balance is primarily a reflection of its national saving and investment balance rather than of its absolute productivity or wealth.
- Adjustments in a country's trade accounts require a change in domestic saving or investment.
- In the long run, adjustments in trade accounts will be brought about by movements in the country's relative prices, often through exchange-rate changes.

## PROMOTING GROWTH IN THE OPEN ECONOMY

Increasing the growth of output in open economies involves more than just waving a magic wand that will attract investors or savers. A favorable saving and investing climate involves a wide array of policies, including a stable macroeconomic environment, secure property rights, and, above all, a predictable and attractive returns on investment. We review in this section some of the ways that open economies can improve their growth rates by using the global marketplace to their best advantage.

Over the long run, the single most important way of increasing per capita output and living standards is to ensure that the country *adopts best-practice techniques* in its production processes. It does little good to have a high investment rate if the investments are in the wrong technology. This point was abundantly shown in the last years of Soviet central planning (discussed in Chapter 26), when the investment rate was extremely high but much investment was poorly designed, left unfinished, or put in unproductive sectors. Moreover, individual poor countries do not need to start from scratch in designing their own turbines, machinery, computers, and management systems. Often, reaching the technological frontier will involve engaging in joint ventures with foreign firms, which in turn requires that the institutional framework be hospitable to foreign capital.

Another important set of policies is *trade policies*. Evidence shows that an open trading system promotes competitiveness and adoption of best-practice technologies. By keeping tariffs and other barriers to trade low, countries can ensure that domestic firms feel the spur of competition and that foreign firms are permitted to enter domestic markets when domestic producers sell at inefficiently high prices or monopolize particular sectors.

When countries consider their saving and investment, they must not concentrate entirely on physical capital. *Intangible capital* is just as important. Studies show that countries that invest in human capital through education tend to perform well and be resilient in the face of shocks. Many countries have valuable stocks of natural resources—forests, minerals, oil and gas, fisheries, and arable land—that must be managed carefully to ensure that they provide the highest yield for the country.

One of the most complex factors in a country's growth involves *immigration* and *emigration*. Historically, the United States has attracted large flows of immigrants that not only have increased the size of its labor force but also have enhanced the quality of its culture and scientific research. More recently, however, the immigrants have possessed less education and lower skills than the domestic labor force. As a result, according to some studies, immigration has depressed the relative wages of low-wage workers in the United States. Countries that "export" workers, such as Mexico, often

have a steady stream of earnings that are sent home by citizens to their relatives, and this can provide a nice supplement to export earnings.

One of the most important yet subtle influences concerns the *institutions of the market*. The most successful open economies—like the Netherlands and Luxembourg in Europe or Taiwan and Hong Kong in Asia—have provided a secure environment for investment and entrepreneurship. This involved establishing a secure set of property rights, guided by the rule of law. Increasingly important is the development of intellectual property rights so that inventors and creative artists are assured that they will be able to profit from their activities. Countries must fight corruption, which is a kind of private taxation system that preys on the most profitable enterprises, creates uncertainty about property rights, raises costs, and has a chilling effect on investment.

A *stable macroeconomic climate* means that taxes are reasonable and predictable and that inflation is low, so lenders need not worry about inflation confiscating their investments. It is crucial that exchange rates be relatively stable, with a convertibility that allows easy and inexpensive entry into and exit out of the domestic currency. Countries that provide a favorable institutional structure attract large flows of foreign financial capital, while countries that have unstable institutions attract relatively little foreign funds and suffer "capital flight," in which local residents move their funds abroad to avoid taxes, expropriation, or loss of value.

Figure 28-9 illustrates the impact of the investment climate on national investment. The left-hand panel

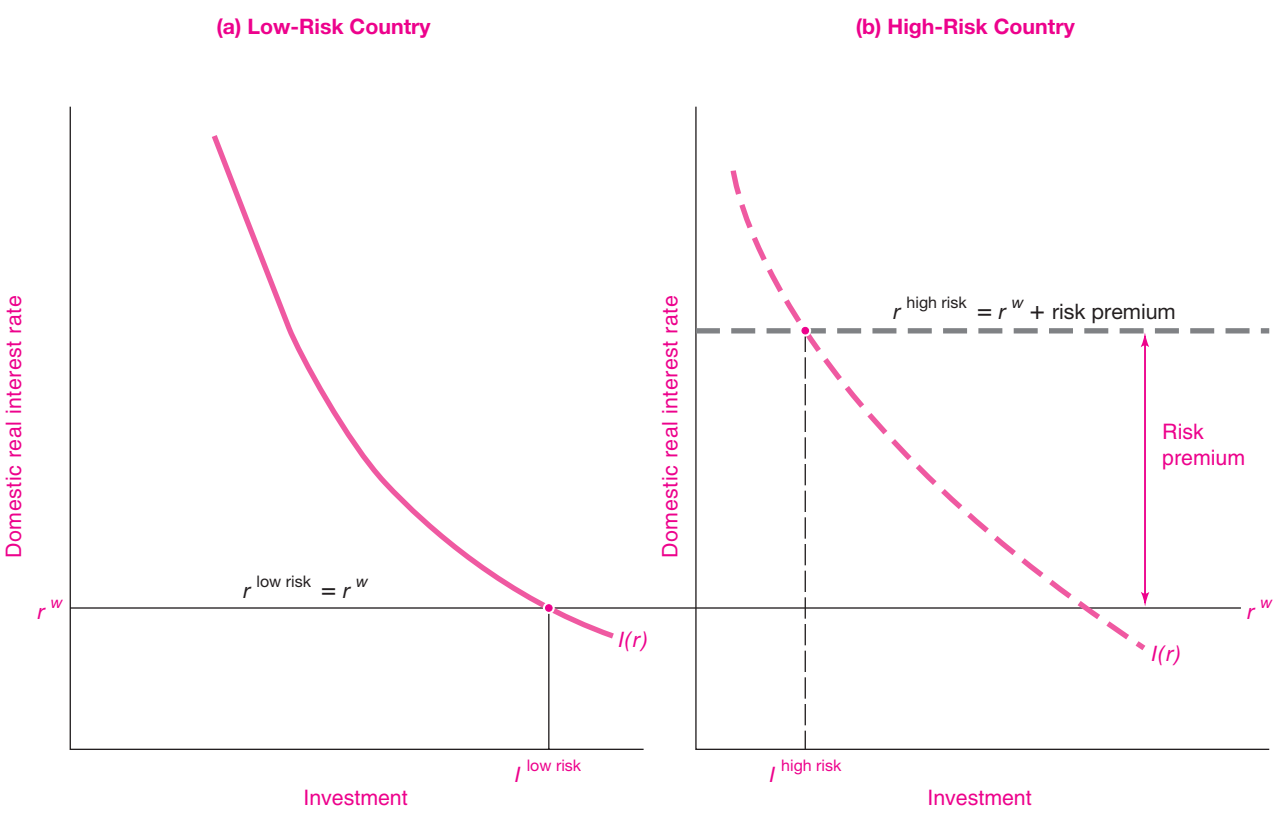


**FIGURE 28-9. Business Climate Affects Interest Rate and Investment Level**

In the low-risk country in (**a**), a stable economic climate leads to a low domestic interest rate at $r^W$ and a high level of investment at $I^{\text{low risk}}$. In the high-risk country, racked by political turmoil, corruption, and economic uncertainty, investors require a large risk premium on their investments, so the domestic interest rate is far above the world interest rate. The result is a depressed level of investment as foreign investors seek safer terrain.

depicts a country that has a favorable investment climate, so the domestic interest rate is equal to the world interest rate. The overall level of investment there is high, and the country can attract foreign funds to finance domestic investment.

Panel (*b*) shows a high-risk country. Look back at Figure 26-2 on page 528, which shows the premium on emerging-market bonds. In periods of crisis, these countries might pay interest rates 8 or 10 or 12 percentage points above the rate paid by investors in advanced countries. The high risk premium might arise because of high inflation, unpredictable taxes, nationalizations, default, corruption, an unstable foreign exchange rate, or sometimes just panic and contagion. The real cost of capital would therefore be extremely high. The risky country will have trouble attracting both domestic *and* foreign investment, and the resulting level of investment will be low. Compare the equilibrium level of investment in low-risk panel (*a*) to that of high-risk panel (*b*).

Promoting economic growth in an open economy involves ensuring that business is attractive for foreign and domestic investors who have a wide array of investment opportunities in the world economy. The ultimate goals of policy are to have high rates of saving and investment in productive channels and to ensure that businesses use best-practice techniques. Achieving these goals involves setting a stable macroeconomic climate, guaranteeing dependable property rights for both tangible investments and intellectual property, providing exchange-rate convertibility that allows investors to take home their profits, and maintaining confidence in the political and economic stability of the country.

## C. INTERNATIONAL ECONOMIC ISSUES

In this final section, we apply the tools of international economics to examine two of the central issues that have concerned nations in recent years. In the first part, we examine the issue of the difference between competitiveness and productivity. In the second part, we examine the birth of the European Monetary Union.

### COMPETITIVENESS AND PRODUCTIVITY

#### *"The Deindustrialization of America"*

Often, when the trade deficit becomes large, people become concerned and worry about the nation's productivity and competitiveness. Just such a situation occurred in the United States in the 1980s, and later resurfaced in the 2000s. A review of this history is a helpful reminder about the determinants of trade flows.

The appreciation of the dollar in the 1980s produced severe economic hardships in many U.S. sectors exposed to international trade. Industries like automobiles, steel, and textiles found the demand for their products shrinking as an appreciation of the exchange rate led to a rise in their prices relative to those of their foreign competitors. Unemployment in America's manufacturing heartland increased sharply, factories were closed, and the Midwest became known as the "rust belt."

Many noneconomists interpreted U.S. trade problems as indicative of "America in decline." They fretted that America's technological leadership was eroding because of what they saw as unfair trade practices, excessive regulation, declining innovation, and managerial sloth. Some called for a reversal of trade agreements such as the North American Free Trade Agreement (NAFTA). America was pictured as a land condemned to serving potato chips while others were manufacturing our computer chips.

Economists saw a different syndrome at work—this situation is a classic disease of an overvalued exchange rate. To understand the fundamentals, we must distinguish a nation's competitiveness from its productivity. *Competitiveness* refers to the extent to which a nation's goods can compete in the marketplace; this depends primarily upon the relative prices of domestic and foreign products. Competitiveness should not be confused with *productivity,* which is measured by the output per unit of input. Productivity is fundamental to the growth of living standards in a nation; to a first approximation, a nation's real income grows in step with its productivity growth.

It is true that U.S. competitiveness fell sharply during the 1980s and again in the early 2000s. However, these changes were not caused by a deterioration in productivity growth. Actually, productivity

growth increased just as the trade deficit increased. Macroeconomists believe that deteriorating competitiveness arose because the decline in national saving in the United States led to an appreciation of the dollar and raised American prices relative to those of its trading partners.

### Trends in Productivity

The real story about U.S. real incomes is not about competitiveness but about productivity. Recall that productivity measures the output per unit of input (such as labor-hours). Our chapter on economic growth showed that increases in real wages depend primarily on the growth of domestic labor productivity.

Competitiveness is important for trade but has no intrinsic relationship to the level or growth of real incomes. China enjoyed a massive trade surplus in the 2000s at the same time as the United States ran a large trade deficit. But would Americans therefore trade their living standards for those in China with jobs paying $1 an hour? Loss of competitiveness in international markets results from a nation's *prices* being out of line with those of its trading partners; it has no necessary connection with how a nation's *productivity* compares with that of other countries.

Studies of productivity differences among countries emphasize the importance of *competition* and *outward orientation*. An essential aspect of policy designed to increase productivity is to force domestic industries to compete with foreign firms, who often have superior, frontier technologies. Foreign direct investment by the most productive countries (such as the Japanese automobile plants operating in the United States) has contributed to dramatic productivity improvements through both the introduction of cutting-edge technologies and the stimulation of competition.

*Conclusion on productivity and competitiveness:* As the theory of comparative advantage demonstrates, nations are not inherently uncompetitive. Rather, they become uncompetitive when their prices move out of line with those of their trading partners. The surest route to high productivity and high living standards is to expose domestic industries to world markets and to encourage vigorous domestic competition with foreign companies that have adopted the most advanced technologies.

## THE EUROPEAN MONETARY UNION

An ideal exchange-rate system is one that allows high levels of predictability of relative prices while stabilizing the economy in the face of economic shocks. In a well-functioning system, people can trade and invest in other countries without worrying that exchange rates will suddenly change and make their ventures unprofitable.

From the early 1990s, however, fixed-exchange-rate systems were often *destabilizing* rather than stabilizing. Time and again, fixed-exchange-rate systems were the subject of intense speculative attacks that spread to other countries through contagion. They were seen in Europe in 1991–1992, Mexico in 1994–1995, Russia and East Asia in 1997–1998, and Latin America from 1998 to 2002.

Nowhere were problems with the exchange-rate system more persistent and profound than in Western Europe. As a result, the countries of the European Union took the giant step of linking their economic fortunes through the European Monetary Union, which forged a common currency, the Euro.

#### The Fundamental Trilemma of Fixed Exchange Rates

"You can't have it all" is one of the central tenets of economics. This was driven home in macroeconomic affairs on several occasions during the 1990s. As countries on fixed exchange rates liberalized their financial markets, they encountered a *fundamental trilemma of fixed exchange rates: A country can have only two of the following (a) a fixed but adjustable exchange rate, (b) free capital and financial movements, and (c) an independent domestic monetary policy.*

This inconsistency among the three objectives was explained by Paul Krugman as follows:

> The point is that you can't have it all: A country must pick two out of three. It can fix its exchange rate without emasculating its central bank, but only by maintaining controls on capital flows (like China today); it can leave capital movement free and retain monetary autonomy, but only by letting the exchange rate fluctuate (like Britain—or Canada); or it can choose to leave capital free and stabilize the currency, but only by abandoning any ability to adjust interest rates to fight inflation or recession (like Argentina today, or for that matter most of Europe).[2]

[2] See this chapter's Further Reading section.

### Toward a Common Currency: The Euro

Since World War II, the democratic countries of Western Europe have pursued ever-closer economic integration, primarily to promote political stability after two devastating wars. Peace and trade go hand in hand, according to many political scientists. Beginning in 1957 with a free-trade agreement, Western Europeans gradually removed all barriers to trade in goods, services, and finance. The final step in economic integration was to adopt a common currency. This would not only foster closer economic ties but also resolve the problem of unstable currencies that plagued the earlier fixed-exchange-rate systems.

Eleven European countries joined the European Monetary Union (EMU) in 1999. These countries, sometimes called Euroland, adopted the Euro as their unit of account and medium of exchange. The first step was to begin transactions in Euros. The trickiest step came on January 1, 2002, when the countries of Euroland replaced their national currencies with Euro coins and notes, saying, in effect, "*Au revoir,* French franc; *bonjour,* Euro." The Euro was launched smoothly and has now taken its place among the world's major currencies.

The monetary structure under the European Monetary Union resembles that of the United States. Control over European monetary policy is exercised by the *European Central Bank (ECB),* which conducts monetary policy for countries in the accord. The ECB undertakes open-market operations and thereby determines interest rates for the Euro.

One of the major questions for monetary policy involves the objectives of the central bank. The ECB is directed under its charter to pursue "price stability" as its primary objective, although it can pursue other communitywide goals as long as these do not compromise price stability. The ECB defines price stability as an increase in Euroland consumer prices of below 2 percent per year over the medium term.

### Costs and Benefits of Monetary Union

What are the costs and benefits of European monetary union? Advocates of monetary union see important *benefits.* Under a common currency, exchange-rate volatility within Europe will be reduced to zero, so trade and finance will no longer have to contend with the uncertainties about prices induced by changing exchange rates. The primary result will be a reduction in transactions costs among countries. To the extent that national financial markets are segmented, moving to a common currency may allow a more efficient allocation of capital across countries. Some believe that firm macroeconomic discipline will be preserved by having an independent European central bank committed to strict inflation targets. Perhaps the most important benefit may be political integration and stability of Western Europe—a region that has been at peace for half a century after being at war with itself for most of its recorded history.

Some economists are skeptical about the wisdom of monetary union in Europe and point to significant *costs* of such a union. The dominant concern is that the individual countries will lose the use of both monetary policy and exchange rates as tools for macroeconomic adjustment. This question concerns the optimal currency area, a concept first proposed by Columbia's Robert Mundell, who won the 1999 Nobel Prize for his contributions in this field. An **optimal currency area** is one whose regions have high labor mobility or have common and synchronous aggregate supply or demand shocks. In an optimal currency area, significant changes in exchange rates are not necessary to ensure rapid macroeconomic adjustment.

Most economists believe that the United States is an optimal currency area. When the United States is faced with a shock that affects the different regions asymmetrically, labor migration tends to restore balance. For example, workers left the hard-hit northern states and migrated to the oil-rich southwestern states after the oil shocks of the 1970s.

Is Europe an optimal currency area? Some economists think it is not because of the rigidity of its wage structures and the low degree of labor mobility among the different countries. When a shock has occurred—for example, after the 1990 reunification of Germany—inflexible wages and prices led to rising inflation in the regions with a demand increase and rising unemployment in depressed regions. Monetary union might therefore condemn unfortunate regions to persistent low growth and high unemployment.

What is the initial verdict on the European Monetary Union? The creation of the Euro has removed one of the major sources of instability in the European economy—intra-European exchange-rate movements. In addition, it has led to a convergence of interest rates and inflation rates among European countries. On the other hand, Europe has

continued to experience high unemployment rates since the Euro's introduction. The financial crisis of 2007–2009 was the first major test of the European Monetary System, and economists will study how well this new multinational institution weathers the storm.

The European Monetary Union is one of history's great economic experiments. Never before has such a large and powerful group of countries turned its economic fortunes over to a multinational body like the European Central Bank. Never before has a central bank been charged with the macroeconomic fortunes of a large group of nations with 325 million people producing $16 trillion of goods and services. While optimists point to the microeconomic benefits of a larger market and lower transactions costs, pessimists worry that monetary union threatens stagnation and unemployment because of the lack of price and wage flexibility and insufficient labor mobility among countries. The financial crisis of 2007–2009 is the first major test of this new monetary system.

## FINAL ASSESSMENT

This survey of international economics must acknowledge a mixed picture, with both successes and failures. It is true that market economies occasionally suffer from inflation and recession. Moreover, in the most recent downturn in 2007–2009, unemployment rose sharply and many financial giants teetered on the edge of bankruptcy. Nonetheless, if we step back, an impartial jury of historians would surely rate the last half-century as one of unparalleled success for the countries of North America and Western Europe:

- *Robust economic performance.* The period has seen the most rapid and sustained economic growth in recorded history. It is the only period since the Industrial Revolution in which these countries have avoided deep depression and the cancer of hyperinflation.
- *The emerging monetary system.* The international monetary system continues to be a source of turmoil, with frequent crises as countries encounter balance-of-payments or currency difficulties. Nonetheless, we can see an emerging system in which the major economic regions—the United States, Europe, and Japan—conduct independent monetary policies with flexible exchange rates, while smaller countries either float or have "hard" fixed exchange rates tied to one of the major blocks. A major challenge for the future will be to integrate the Asian giants China and India into the international trade and financial systems.
- *The reemergence of free markets.* You often hear that imitation is the sincerest form of flattery. In economics, imitation occurs when a nation adopts the economic structure of another in the hope that it will produce growth and stability. In the last two decades, country after country threw off the shackles of communism and stifling central planning. This occurred not only because economics textbooks explained the miracle of the free market but primarily because people could see with their own eyes how the market-oriented countries of the West prospered while the centrally planned command economies collapsed. *For the first time, an empire collapsed because it could not produce sufficient butter along with its guns.*

## SUMMARY

### A. Foreign Trade and Economic Activity

1. An open economy is one that engages in international exchange of goods, services, and investments. Exports are goods and services sold to buyers outside the country, while imports are those purchased from foreigners. The difference between exports and imports of goods and services is called net exports.

2. When foreign trade is introduced, domestic demand can differ from national output. Domestic demand comprises consumption, investment, and government purchases ($C + I + G$). To obtain GDP, exports ($Ex$) must be added and imports ($Im$) subtracted, so

$$\text{GDP} = C + I + G + X$$

where $X$ = net exports = $Ex - Im$. Imports are determined by domestic income and output along with the prices of domestic goods relative to those of foreign goods; exports are the mirror image, determined by foreign income and output along with relative prices. The dollar increase of imports for each dollar increase in GDP is called the marginal propensity to import ($MPm$).

3. Foreign trade has an effect on GDP similar to that of investment or government purchases. As net exports rise, there is an increase in aggregate demand for domestic output. Net exports hence have a multiplier effect on output. But the expenditure multiplier in an open economy will be smaller than that in a closed economy because of leakages from spending into imports. The multiplier is

$$\text{Open-economy multiplier} = \frac{1}{MPS + MPm}$$

Clearly, other things equal, the open-economy multiplier is smaller than the closed-economy multiplier, where $MPm = 0$.

4. The operation of monetary policy has new implications in an open economy. An important example involves the operation of monetary policy in a small open economy that has a high degree of capital mobility. Such a country must align its interest rates with those in the countries to whom it pegs its exchange rate. This means that countries operating on a fixed exchange rate essentially lose monetary policy as an independent instrument of macroeconomic policy. Fiscal policy, by contrast, becomes a powerful instrument because fiscal stimulus is not offset by changes in interest rates.

5. An open economy operating with flexible exchange rates can use monetary policy for macroeconomic stabilization which operates independently of other countries. In this case, the international link adds another powerful channel to the domestic monetary transmission mechanism. A monetary tightening leads to higher interest rates, attracting foreign financial capital and leading to a rise (or appreciation) of the exchange rate. The exchange-rate appreciation tends to depress net exports, so this impact reinforces the contractionary impact of higher interest rates on domestic investment.

## B. Interdependence in the Global Economy

6. In the longer run, operating in the global marketplace provides new constraints and opportunities for countries to improve their economic growth. Perhaps the most important element concerns saving and investment, which are highly mobile and respond to incentives and the investment climate in different countries.

7. The foreign sector provides another source of funds for investment and another outlet for saving. Higher domestic saving—whether through private saving or government fiscal surpluses—will increase the sum of domestic investment and net exports. Recall the identity

$$X = S + (T - G) - I$$

or

$$\begin{aligned}\text{Net exports} = {} & \text{private saving} \\ & + \text{government saving} \\ & - \text{domestic investment}\end{aligned}$$

In the long run, a country's trade position primarily reflects its national saving and investment rates. Reducing a trade deficit requires changing domestic saving and investment. One important mechanism for bringing trade flows in line with domestic saving and investment is the exchange rate.

8. Besides promoting high saving and investment, countries increase their growth through a wide array of policies and institutions. Important considerations are a stable macroeconomic climate, strong property rights for both tangible investments and intellectual property, a convertible currency with few restrictions on financial flows, and political and economic stability.

## C. International Economic Issues

9. Popular analysis looks at large trade deficits and sees "deindustrialization." But this analysis overlooks the important distinction between productivity and competitiveness. Competitiveness refers to how well a nation's goods can compete in the global marketplace and is determined primarily by relative prices. Productivity denotes the level of output per unit of input. Real incomes and living standards depend primarily upon productivity, whereas the trade and current-account positions depend upon competitiveness. There is no close linkage between competitiveness and productivity.

10. Fixed exchange rates are a source of instability in a world of highly mobile financial capital. Recall the fundamental trilemma of fixed exchange rates: A country cannot simultaneously have a fixed but adjustable exchange rate, free capital and financial movements, and an independent domestic monetary policy.

11. In 1999, European countries chose to move to a common currency and a unitary central bank. A common currency is appropriate when a region forms an optimal currency area. Advocates of European monetary union point to the improved predictability, lower transactions costs, and potential for better capital allocation. Skeptics worry that a common currency—like any irrevocably fixed exchange-rate system—will require flexible wages and prices to promote adjustment to macroeconomic shocks.

## CONCEPTS FOR REVIEW

$C + I + G + X$ curve for open economy
net exports = $X = Ex - Im$
domestic demand vs. spending on GDP
marginal propensity to import ($MPm$)
expenditure multiplier:
in closed economy = $1/MPS$
in open economy = $1/(MPS + MPm)$
impact of trade flows and exchange rates on GDP
saving-investment identity in open economies: $X = S + (T - G) - I$
equilibration in saving-investment market in closed and open economies
growth policies in the open economy
competitiveness vs. productivity

## FURTHER READING AND INTERNET WEBSITES

### Further Reading

The quotation from the *Economic Report of the President, 2000* (Government Printing Office, Washington, D.C., 2000), can also be found at *fraser.stlouisfed.org/publications/ERP,* pp. 231–235.

### Websites

Data on trade and finance for different countries can be found in the section on websites for Chapter 26.

Robert Mundell won the Nobel Prize in 1999 for his contribution to international macroeconomics. Visit *www.nobel.se/laureates* to read about his contribution.

The website of the European Central Bank, at *www.ecb.int/ecb/html/index.en.html,* explains some of the issues involved in the management of the Euro. Also see the sites listed for Chapter 26.

## QUESTIONS FOR DISCUSSION

1. Assume that an expansionary monetary policy leads to a decline or depreciation of the U.S. dollar relative to the currencies of America's trading partners in the short run with unemployed resources. Explain the mechanism by which this will produce an economic expansion in the United States. Explain how the trade impact reinforces the impact on domestic investment.
2. Explain the short-run impact upon net exports and GDP of the following in the multiplier model, using Table 28-1 where possible:
   a. An increase in investment ($I$) of $100 billion
   b. A decrease in government purchases ($G$) of $50 billion
   c. An increase in foreign output which increased exports by $10 billion
   d. A depreciation of the exchange rate that raised exports by $30 billion and lowered imports by $20 billion at every level of GDP
3. What would the expenditure multiplier be in an economy without government spending or taxes where the $MPC$ is 0.8 and the $MPm$ is 0? Where the $MPm$ is 0.1? Where the $MPm$ is 0.9? Explain why the multiplier might even be less than 1.
4. Consider Table 28-3.
   a. Explain each of the entries in the table.
   b. Add another column with the heading "Change in interest rates" to Table 28-3. Then, on the basis of the graph in Figure 28-7, fill in the table for a closed economy.
5. An eminent macroeconomist recently wrote: "Moving toward a monetary union by adopting a common currency is not really about the currency. The most important factor is that countries in the union must agree on a single monetary policy for the entire region." Explain this statement. Why might adopting a single monetary policy cause troubles?
6. Consider the city of New Heaven, which is a very open economy. The city exports reliquaries and has no investment or taxes. The city's residents consume 50 percent of their disposable incomes, and 90 percent

of all purchases are imports from the rest of the country. The mayor proposes levying a tax of $100 million to spend on a public-works program. Mayor Cains argues that output and incomes in the city will rise nicely because of something called "the multiplier." Estimate the impact of the public-works program on the incomes and output of New Heaven. Do you agree with the mayor's assessment?

7. Review the bulleted list of the three interactions of saving, investment, and trade on page 577. Make a graph like that of Figure 28-8 to illustrate each of the impacts. Make sure that you can explain the reverse cases mentioned in the paragraph that follows the bulleted list.
8. Politicians often decry the large trade deficit of the United States. Economists reply that to reduce the trade deficit would require a tax increase or a cut in government expenditures. Explain the economists' view using the analysis of the saving-investment balance in Figure 28-8. Also, explain the quotation from the *Economic Report 2000* on page 565.
9. Look back at Figure 26-2 and make sure you understand it. Now, consider an emerging-market country like Brazil or Argentina.
   a. Draw a diagram like Figure 28-9(*b*) for the country in good times, when the risk premium on its borrowing is low. Call this Figure A.
   b. Next, consider a shock that raises the risk premium by a large amount. Draw a new figure with the high premium and the new equilibrium. Call this Figure B.
   c. Now compare the equilibria in Figures A and B. Specifically, explain the difference in (i) the equilibrium domestic real interest rate, (ii) domestic investment, (iii) the exchange rate, and (iv) net exports.
10. Consider the example of small open economies like Belgium and the Netherlands that have highly mobile financial capital and fixed exchange rates but also have high government budget deficits. Suppose that these countries find themselves in a depressed economic condition, with low output and high unemployment. Explain why they cannot use monetary policy to stimulate their economies. Why would fiscal expansion be effective if they could tolerate higher budget deficits?
11. **Advanced problem.** After the reunification of Germany, payments to rebuild the former East Germany led to a major expansion of aggregate demand in Germany. The German central bank responded by raising German real interest rates. These actions took place in the context of the European Monetary System, in which most countries had fixed exchange rates and where the German central bank was dominant in monetary policy.
   a. Explain why European countries having fixed exchange rates and following the lead of the German central bank would find their interest rates rising along with German interest rates. Explain why other European countries would thereby be plunged into deep recessions.
   b. Explain why countries would prefer the European Monetary Union to the earlier system.
   c. Trace through why this German monetary tightening would be expected to lead to a depreciation of the dollar. Explain why the depreciation would stimulate economic activity in the United States.
12. **Advanced problem.** Reread the definition of the fundamental trilemma as well as the discussion by Paul Krugman on page 581. Explain why the three elements cannot go together. Why is there not a fundamental trilemma for the fixed-exchange-rate system between "California dollars" and "Texas dollars"? Explain how the trilemma would apply to China today. Explain the arguments for and against each of the three possible choices in the trilemma described by Krugman.