

This chapter investigates the causes of economic growth, what government policies appear to promote economic growth, and the controversies surrounding the benefits and costs of economic growth. As you will see, economic growth has been perhaps the most revolutionary and powerful force in history. Consequently, no study of economics is complete without a thorough understanding of the causes and consequences of economic growth.

Economic Growth

Economists define and measure **economic growth** as either:

- An increase in real GDP occurring over some time period.
- An increase in real GDP per capita occurring over some time period.

With either definition, economic growth is calculated as a percentage rate of growth per quarter (3-month period) or per year. For the first definition, for example, real GDP in the United States was \$11,319.4 billion in 2006 and \$11,566.8 billion in 2007. So the rate of economic growth in the United States for 2007 was 2.2 percent $\{= [(\$11,566.8 \text{ billion} - \$11,319.4 \text{ billion})/\$11,319.4 \text{ billion}] \times 100\}$.

The second definition takes into consideration the size of the population. **Real GDP per capita** (or per capita output) is found by dividing real GDP by the size of the population. The resulting number is then compared in percentage terms with that of the previous period. For example, in the United States real GDP was \$11,319.4 billion in 2006 and population was 299.8 million. So that year real U.S. GDP per capita was \$37,757. In 2007, real per capita GDP rose to \$38,301. So the rate of growth of GDP per capita for 2007 was 1.4 percent $\{= [(\$38,301 - \$37,757)/\$37,757] \times 100\}$.

For measuring expansion of military potential or political preeminence, the growth of real GDP is more useful. Unless specified otherwise, growth rates reported in the news and by international agencies use this definition of economic growth. For comparing living standards, however, the second definition is superior. While China's GDP in 2006 was \$2644 billion compared with Denmark's \$275 billion, Denmark's real GDP per capita was \$52,110 compared with China's meager \$2000. And in some cases growth of real GDP can be misleading. Madagascar's real GDP grew at a rate of 1.7 percent per year from 1990–2004. But over the same period its annual population growth was 2.9 percent, resulting in a decline in real GDP per capita of roughly 1.2 percent per year. (**Key Question 2**)

Growth as a Goal

Growth is a widely held economic goal. The expansion of total output relative to population results in rising real wages and incomes and thus higher standards of living. An economy that is experiencing economic growth is better able to meet people's wants and resolve socioeconomic problems. Rising real wages and income provide richer opportunities to individuals and families—a vacation trip, a personal computer, a higher education—without sacrificing other opportunities and pleasures. A growing economy can undertake new programs to alleviate poverty, embrace diversity, cultivate the arts, and protect the environment without impairing existing levels of consumption, investment, and public goods production.

In short, *growth lessens the burden of scarcity*. A growing economy, unlike a static economy, can consume more today while increasing its capacity to produce more in the future. By easing the burden of scarcity—by relaxing society's constraints on production—economic growth enables a nation to attain its economic goals more readily and to undertake new endeavors that require the use of goods and services to be accomplished.

Arithmetic of Growth

Why do economists pay so much attention to small changes in the rate of economic growth? Because those changes really matter! For the United States, with a current GDP of about \$13.8 trillion, the difference between a 3 percent and a 4 percent rate of growth is about \$138 billion of output each year. For a poor country, a difference of one-half of a percentage point in the rate of growth may mean the difference between starvation and mere hunger.

The mathematical approximation called the **rule of 70** provides a quantitative grasp of the effect of economic growth. The rule of 70 tells us that we can find the number of years it will take for some measure to double, given its annual percentage increase, by dividing that percentage increase into the number 70. So

$$\begin{array}{l} \text{Approximate} \\ \text{number of years} \\ \text{required to double} \\ \text{real GDP} \end{array} = \frac{70}{\text{annual percentage rate} \\ \text{of growth}}$$

Examples: A 3 percent annual rate of growth will double real GDP in about 23 ($= 70 \div 3$) years. Growth of 8 percent per year will double real GDP in about 9 ($= 70 \div 8$) years. The rule of 70 is applicable generally. For example, it works for estimating how long it will take the price level

or a savings account to double at various percentage rates of inflation or interest. When compounded over many years, an apparently

small difference in the rate of growth thus becomes highly significant. Suppose China and Italy start with identical GDPs, but then China grows at an 8 percent yearly rate, while Italy grows at 2 percent. China's GDP would double in about 9 years, while Italy's GDP would double in 35 years.

WORKED PROBLEMS

W 25.1 GDP growth

Growth in the United States

Table 25.1 gives an overview of economic growth in the United States since 1950. Column 2 reveals strong growth as measured by increases in real GDP. Note that between 1950 and 2007 real GDP increased about sixfold. But the U.S. population also increased. Nevertheless, in column 4 we find that real GDP per capita rose more than threefold over these years.

What has been the *rate* of U.S. growth? Real GDP grew at an annual rate of about 3.5 percent between 1950 and 2007. Real GDP per capita increased 2.3 percent per year over that time. But we must qualify these raw numbers in several ways:

- **Improved products and services** Since the numbers in Table 25.1 do not fully account for the improvements in products and services, they understate the growth of economic well-being. Such purely quantitative data do not fully compare an era of vacuum tube computers and low-efficiency V8 hot rods with an era of digital cell phone networks and fuel-sipping, hybrid-drive vehicles.
- **Added leisure** The increases in real GDP and per capita GDP identified in Table 25.1 were accomplished despite increases in leisure. The standard workweek, once 50 hours, is now about 35 hours (excluding overtime hours). Again the raw growth numbers understate the gain in economic well-being.
- **Other impacts** These measures of growth do not account for any effects growth may have had on the environment and the quality of life. If growth debases the physical environment and creates a stressful work environment, the bare growth

TABLE 25.1 Real GDP and per Capita Real GDP, Selected Years, 1950–2007

(1) Year	(2) Real GDP, Billions of 2000 \$	(3) Population, Millions	(4) Real Per Capita GDP, 2000 \$ (2) ÷ (3)
1950	\$ 1773.3	152	\$11,666
1960	2501.8	181	13,822
1970	3771.9	205	18,400
1980	5161.7	228	22,639
1990	7112.7	250	28,451
2000	9817.0	267	36,768
2007	11,566.8	303	38,174

Source: Data are from the Bureau of Economic Analysis, www.bea.gov, and the U.S. Census Bureau, www.census.gov.

numbers will overstate the gains in well-being that result from growth. On the other hand, if growth leads to stronger environmental protections or a more secure and stress-free lifestyle, these numbers will understate the gains in well-being.

Two other points should be made about U.S. growth rates. First, they are not constant or smooth over time. Like those of other countries, U.S. growth rates vary quarterly and annually depending on a variety of factors such as the introduction of major new inventions and the economy's current position in the business cycle. Second, many countries share the U.S. experience of positive and ongoing economic growth. But, as previously noted, sustained growth is both a historically new occurrence and also one that is not shared equally by all countries.

QUICK REVIEW 25.1

- Economists measure economic growth as either (a) an increase in real GDP over time or (b) an increase in real GDP per capita over time.
- Real GDP in the United States has grown at an average annual rate of about 3.5 percent since 1950; real GDP per capita has grown at roughly a 2.3 percent annual rate over that same period.

Modern Economic Growth

We now live in an era of wireless high-speed Internet connections, genetic engineering, and space exploration. New inventions and new technologies drive continual economic growth and ongoing increases in living standards. But it wasn't always like this. Economic growth and sustained

increases in living standards are a historically recent phenomenon that started with the Industrial Revolution of the late 1700s. Before the Industrial Revolution, living standards were basically flat over long periods of time so that, for instance, Greek peasants living in the year 300 B.C. had about the same material standard of living as Greek peasants living in the year A.D. 1500. By contrast, our current era of **modern economic growth** is characterized by sustained and ongoing increases in living standards that can cause dramatic increases in the standard of living within less than a single human lifetime.

Economic historians informally date the start of the Industrial Revolution to the year 1776, when the Scottish inventor James Watt perfected a powerful and efficient steam engine. This steam engine inaugurated the modern era since the device could be used to drive industrial factory equipment, steamships, and steam locomotives.

The new industrial factories mass-produced goods for the first time. This meant that nearly all manufacturing shifted from items produced by hand by local craftsmen to items mass-produced in distant factories. The new steamships and steam locomotives meant that resources could easily flow to factories and that the products of factories could be shipped to distant consumers at low cost. The result was a huge increase in long-distance trade and a major population shift as people left farms to go work in the towns and cities where the new industrial factories were concentrated.

Steam power would later be largely replaced by electric power and many more inventions would follow the steam engine that started the Industrial Revolution. But the key point is that the last 200 or so years of history have been fundamentally different from anything that went before.

The biggest change has been change itself. Whereas in earlier times material standards of living and the goods and services that people produced and consumed changed very little even over the course of an entire human lifespan, nowadays people living in countries experiencing modern economic growth are constantly exposed to new technologies, new products, and new services.

What is more, modern economic growth has vastly affected cultural, social, and political arrangements.

- Culturally, the vast increases in wealth and living standards have allowed ordinary people for the first time in history to have significant time for leisure activities and the arts.
- Socially, countries experiencing modern economic growth have abolished feudalism, instituted universal public education, and largely eliminated ancient social norms and legal restrictions against women and minorities doing certain jobs or holding certain positions.

- Politically, countries experiencing modern economic growth have tended to move toward democracy, a form of government that was extremely rare before the start of the Industrial Revolution.

In addition, the average human lifespan has more than doubled, from an average of less than 30 years before modern economic growth began in the late 1700s to a worldwide average of over 67 years today. Thus, for the first time in world history, the average person can expect to live into old age. These and other changes speak to the truly revolutionary power of economic growth and naturally lead economists to consider the causes of economic growth and what policies could be pursued to sustain and promote it. Their desire is intensified by the reality that economic growth is distributed so unevenly around the world.

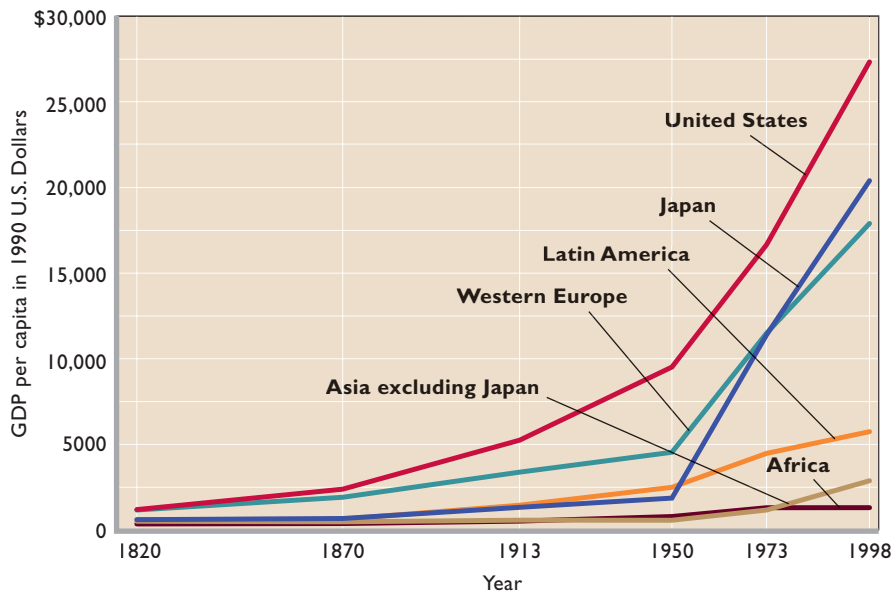
The Uneven Distribution of Growth

Modern economic growth has spread only slowly from its British birthplace. It first advanced to France, Germany, and other parts of western Europe in the early 1800s before spreading to the United States, Canada, and Australia by the mid 1800s. Japan began to industrialize in the 1870s, but the rest of Asia did not follow until the early to mid 1900s, at which time large parts of Central and South America as well as the Middle East also began to experience modern economic growth. Most recent has been Africa, which for the most part did not experience modern economic growth until the last few decades. Notably, some parts of the world have yet to experience modern economic growth at all.

The different starting dates for modern economic growth in various parts of the world are the main cause of the vast differences in per capita GDP levels seen today. The current huge gaps between rich countries like the United States and Japan and poor countries like North Korea and Burundi were shown previously in Global Perspective 23.1. But the huge divergence in living standards caused by the fact that different countries started modern economic growth at different times is best seen in Figure 25.1, which shows how GDP per capita has evolved since 1820 in the United States, western Europe, Latin America, Asia, and Africa.

To make the comparison of living standards easier, income levels in all places and at all times have been converted into 1990 U.S. dollars. Using this convention, it is clear that in 1820 per capita incomes in all areas were quite similar, with the richest area in the world in 1820, western Europe, having an average per capita income of \$1232, while the poorest area of the world at that time, Africa, had an average per capita income of \$418. Thus, in 1820, average incomes in the richest area were only about three times larger than those in the poorest area.

FIGURE 25.1 The great divergence. Income levels around the world were very similar in 1820. But they are now very different because certain areas, including the United States and western Europe, began experiencing modern economic growth much earlier than other areas.



Source: Angus Maddison, *The World Economy: A Millennial Perspective*, (Paris: OECD, 2001), p. 264.

But because western Europe and the United States started experiencing modern economic growth earlier than other areas, they have now ended up vastly richer than other areas, despite the fact that per capita incomes in nearly all places have increased at least a bit. For instance, per capita GDP in the United States in 1998 was \$27,331 while it was only \$1,368 in Africa. Thus, because modern economic growth has occurred for nearly two centuries in the United States compared to a few decades in Africa, average living standards in the United States in 1998 were nearly 20 times higher than those in Africa.

Catching Up Is Possible

Do not get the wrong impression looking at Figure 25.1. Countries that began modern economic growth more recently are *not* doomed to be permanently poorer than the countries that began modern economic growth at an earlier date. This is true because people can adopt technology more quickly than they can invent it. Broadly speaking, the richest countries today have achieved that status because they have the most advanced technology. But because they already have the most advanced technology, they must invent new technology to get even richer. Because inventing and implementing new technology is slow and costly, real GDP per capita in the richest **leader countries** typically grows by an average annual rate of just 2 or 3 percent per year.

By contrast, poorer **follower countries** can grow much faster because they can simply adopt existing technologies from rich leader countries. For instance, in many places in Africa today, the first telephones most people have ever been able to use are cell phones. That is, these countries have not even bothered to install the copper wires necessary for land-line telephones, which are basically a nineteenth-century technology. Instead, they have gone directly for Internet-capable mobile phone networks, a twenty-first-century technology. By doing so, they skip past many stages of technology and development that the United States and other currently rich countries had to pass through. In effect, they jump directly to the most modern, most highly productive technology. The result is that, under the right circumstances, it is possible for poorer countries to experience extremely rapid increases in living standards. This can continue until they have caught up with the leader countries and become leader countries themselves. Once that happens, their growth rates typically fall down to the 2 or 3 percent rate typical of leader countries. This happens because once they are also rich and using the latest technology, their growth rates are limited by the rate at which new technology can be invented and applied.

Table 25.2 shows both how the growth rates of leader countries are constrained by the rate of technological progress as well as how certain follower countries have been able to catch up by adopting more advanced technologies

TABLE 25.2 Real GDP per Capita in 1960 and 2004 Plus Average Annual Growth Rates of GDP per Capita from 1960–2004 for Eight Selected Countries. (Figures are in 1996 dollars.)

Country	Real GDP per Capita, 1960	Real GDP per Capita, 2004	Average Annual Growth Rate, 1960–2004
United States	\$12,892	\$36,098	2.3
United Kingdom	10,323	26,762	2.2
France	8,531	26,168	2.5
Ireland	5,294	28,957	3.9
Japan	4,509	24,661	3.9
Singapore	4,219	29,404	4.4
Hong Kong	3,322	29,642	5.0
South Korea	1,458	18,424	5.8

Note: GDP figures for all countries are measured in “international dollars” of equal value to U.S. dollars in 1996.

Source: Penn World Table version 6.2, pwt.econ.upenn.edu. Used by permission.

and growing rapidly. Table 25.2 shows real GDP per capita in 1960 and 2004 as well as the average annual growth rate of real GDP per capita between 1960 and 2004 for three countries—the United States, the United Kingdom, and France—that were already rich leader countries in 1960 as well as for five other nations that were relatively poor follower countries at that time. To make comparisons easy, the GDPs and GDPs per capita for all countries are expressed in terms of 1996 U.S. dollars. The countries are ordered by their respective GDPs per capita in 1960, so that the richest country in the world at the time, the United States, is listed first while the poorest of the eight selected countries at the time, South Korea, is listed last.

First, notice that the average annual growth rates of the three leader countries—the United States, the United Kingdom, and France—have all been between 2.2 and 2.5 percent per year because their growth rates are limited by the rate at which new technologies can be invented and applied. By contrast, the five countries that were follower countries in 1960 have been able to grow much faster, between 3.9 percent per year and 5.8 percent per year. This has had remarkable effects on their standards of living relative to the leader countries. For instance, Ireland’s GDP per capita was only about half that of its neighbor, the United Kingdom, in 1960. But because Ireland grew at a 3.9 percent rate for the next 44 years while the United Kingdom grew at only a 2.2 percent rate over that time period, by 2004 Irish GDP per capita was actually higher than United Kingdom GDP per capita. Ireland had become a leader country, too.

The growth experiences of the other four nations that were poor in 1960 have been even more dramatic. Hong Kong, for instance, moved from a GDP per capita that was

less than one-third of that enjoyed by the United Kingdom in 1960 to a GDP per capita nearly 10 percent higher than that of the United Kingdom in 2004. The nearby Consider This box emphasizes how quickly small differences in growth rates can change both the level of real GDP per capita and how countries stand in relation to each other in terms of real GDP per capita. This chapter’s Last Word on rapid economic growth in China also reinforces our point.

Finally, you may be puzzled as to why the GDP per capita of the United States in 2004 in Table 25.2 is so much higher than that of other rich leader countries. Why, for instance, is U.S. GDP per capita 40 percent higher than French GDP per capita? One important reason is that U.S. citizens put in substantially more labor time than do the citizens of most other leader countries. First, a much larger fraction of the U.S. population is employed than in other rich leader countries. Second, U.S. employees work many

CONSIDER THIS . . .



Economic Growth Rates Matter!

When compounded over many decades, small absolute differences in rates of economic growth add up to substantial

differences in real GDP and standards of living. Consider three hypothetical countries—Slogo, Sumgo, and Speedo. Suppose that in 2008 these countries have identical levels of real GDP (\$6 trillion), population (200 million), and real GDP per capita (\$30,000). Also, assume that annual real GDP growth is 2 percent in Slogo, 3 percent in Sumgo, and 4 percent in Speedo.

How will these alternative growth rates affect real GDP and real GDP per capita over a long period, say, a 70-year life span? By 2078 the 2, 3, and 4 percent growth rates would boost real GDP from \$6 trillion to:

- \$24 trillion in Slogo.
- \$47 trillion in Sumgo.
- \$93 trillion in Speedo.

For illustration, let’s assume that each country experienced an average annual population growth of 1 percent over the 70 years. Then, in 2078 real GDP per capita would be about:

- \$60,000 in Slogo.
- \$118,000 in Sumgo.
- \$233,000 in Speedo.

Even small differences in growth rates matter!

more hours per year than do employees in other rich leader countries. For example, 62.1 percent of the working-age population of the United States was employed in 2005 compared to 51.0 percent in France. That's a difference of about 20 percent. And American employees worked an average of 1804 total hours during 2005, compared to an average of 1505 total hours for French workers. That's also a difference of about 20 percent. Added together, these two differences between U.S. and French labor supply imply about a 40 percent difference in the total number of hours worked in the French and American economies. Thus, differences in labor supply can go a long way to explaining differences between rich leader countries in terms of their differing levels of GDP per person.

But why do Americans supply so much more labor than workers in France and other rich leader countries? Explanations put forth by economists include cultural differences regarding the proper balance between work and leisure, stronger unions in France and other rich leader countries, and more generous unemployment and welfare programs in France and other rich leader countries. France and other rich leader countries also tend to have higher tax rates than the United States—something that may significantly discourage employment. And, finally, the legal work-week is shorter in some countries than it is in the United States.

QUICK REVIEW 25.2

- Before the advent of modern economic growth starting in England in the late 1700s, living standards showed no sustained increases over time. Modern economic growth brings with it not only ongoing increases in GDP per capita but also profound cultural, social, and political changes.
- Large differences in standards of living exist today because certain areas like the United States have experienced nearly 200 years of modern economic growth while other areas have had only a few decades of economic growth.
- Poor follower countries can catch up with and even surpass the living standards of rich leader countries. The growth rates of rich country GDPs per capita are limited to about 2 percent per year because, in order to further increase their standards of living, rich countries must invent and apply new technologies. By contrast, poor follower countries can grow much faster because they can simply adopt the cutting-edge technologies and institutions already developed by rich leader countries.
- Substantial differences in living standards can be caused by differences in labor supply. This explains why U.S. GDP per capita is nearly a third higher than French GDP per capita despite both countries being technologically advanced leader countries.

Institutional Structures That Promote Growth

Table 25.2 demonstrates that poor follower countries can catch up and become rich leader countries by growing rapidly. But how does a country start that process and enter into modern economic growth? And once it has started modern economic growth, how does it keep the process going?

Economic historians have identified several institutional structures that promote and sustain modern economic growth. Some structures increase the savings and investment that are needed to fund the construction and maintenance of the huge amounts of infrastructure required to run modern economies. Other institutional structures promote the development of new technologies. And still others act to ensure that resources flow efficiently to their most productive uses. These growth-promoting institutional structures include

- **Strong property rights** These appear to be absolutely necessary for rapid and sustained economic growth. People will not invest if they believe that thieves, bandits, or a rapacious and tyrannical government will steal their investments or their expected returns.
- **Patents and copyrights** These are necessary if a society wants a constant flow of innovative new technologies and sophisticated new ideas. Before patents and copyrights were first issued and enforced, inventors and authors usually saw their ideas stolen before they could profit from them. By giving inventors and authors the exclusive right to market and sell their creations, patents and copyrights give a strong financial incentive to invent and create.
- **Efficient financial institutions** These are needed to channel the savings generated by households toward the businesses, entrepreneurs, and inventors that do most of society's investing and inventing. Banks as well as stock and bond markets appear to be institutions crucial to modern economic growth.
- **Literacy and widespread education** Without highly educated inventors, new technologies do not get developed. And without a highly educated work-force, it is impossible to implement those technologies and put them to productive use.
- **Free trade** Free trade promotes economic growth by allowing countries to specialize so that different types of output can be produced in the countries where they can be made most efficiently. In addition,