

Start a class discussion of the trade-offs that are necessary to sustain economic growth. Point out that current consumption must be forgone for higher

consumption in the future. Ask students to examine the powerful effects of compounding should be used to examine the trade-offs involved with each of the public policies discussed. underscore the process of economic growth.

WHAT'S NEW IN THE SEVENTH EDITION:

There is a new *In the News* box on “Does Food Aid Help or Hurt?”

LEARNING OBJECTIVES:

By the end of this chapter, students should understand:

- ☐ how much economic growth differs around the world.
- ☐ why productivity is the key determinant of a country's standard of living.
- ☐ the factors that determine a country's productivity.
- ☐ how a country's policies influence its productivity growth.

CONTEXT AND PURPOSE:

Chapter 12 is the first chapter in a four-chapter sequence on the production of output in the long run. Chapter 12 addresses the determinants of the level and growth rate of output. We find that capital and labor are among the primary determinants of output. In Chapter 13, we address how saving and investment in capital goods affect the production of output, and in Chapter 14, we learn about some of the tools people and firms use when choosing capital projects in which to invest. In Chapter 15, we address the market for labor.

The purpose of Chapter 12 is to examine the long-run determinants of both the level and the growth rate of real GDP per person. Along the way, we will discover the factors that determine the productivity of workers and address what governments might do to improve the productivity of their citizens.

KEY POINTS:

- Economic prosperity, as measured by GDP per person, varies substantially around the world. The average income in the world's richest countries is more than ten times that in the world's poorest countries. Because growth rates of real GDP also vary substantially, the relative positions of countries can change dramatically over time.
- The standard of living in an economy depends on the economy's ability to produce goods and services. Productivity, in turn, depends on the amounts of physical capital, human capital, natural resources, and technological knowledge available to workers.
- Government policies can try to influence the economy's

growth rate in many ways: by encouraging saving and investment, encouraging investment from abroad, fostering education, promoting good health, maintaining property rights and political stability, allowing free trade, and promoting the research and development of new technologies.

- The accumulation of capital is subject to diminishing returns: The more capital an economy has, the less additional output the economy gets from an extra unit of capital. As a result, while higher saving leads to higher growth for a period of time, growth eventually slows down as capital, productivity, and income rise. Also because of diminishing returns, the return to capital is especially high in poor countries. Other things equal, these countries can grow faster because of the catch-up effect.
- Population growth has a variety of effects on economic growth. On the one hand, more rapid population growth may lower productivity by stretching the supply of natural resources and by reducing the amount of capital available for each worker. On the other hand, a larger population may enhance the rate of technological progress because there are more scientists and engineers.

CHAPTER OUTLINE:

I. Economic Growth around the World

- A. Table 1 shows data on real GDP per person for 13

countries during different periods of time.

1. The data reveal the fact that living standards vary a great deal between these countries.
2. Growth rates are also reported in the table. Japan has had the largest growth rate over time, 2.65% per year (on average).



3. Because of different growth rates, the ranking of countries by income per person changes over time.
 - a. In the late 19th century, the United Kingdom was the richest country in the world.
 - b. Today, income per person is lower in the United Kingdom than in the United States (a former colony of the United Kingdom).

B. *FYI: Are You Richer Than the Richest American?*

1. According to the magazine *American Heritage*, the richest American of all time is John B. Rockefeller, whose wealth today would be the equivalent of approximately \$200 billion.
2. Yet, because Rockefeller lived from 1839 to 1937, he did not get the chance to enjoy many of the conveniences we take for granted today such as television, air conditioning, and modern medicine.

3. Thus, because of technological advances, the average American today may enjoy a “richer” life than the richest American who lived a century ago.

C. *FYI: A Picture Is Worth a Thousand Statistics*

1. This box presents three photos showing a typical family in three countries – the United Kingdom, Mexico, and Mali. Each family was photographed outside their home, together with all of their material possessions.
2. These photos demonstrate the vast difference in the standards of living in these countries.

II. Productivity: Its Role and Determinants

A. Why Productivity Is So Important

1. Example: Robinson Crusoe
 - a. Because he is stranded alone, he must catch his own fish, grow his own vegetables, and make his own clothes.
 - b. His standard of living depends on his ability to produce goods and services.
2. Definition of **productivity: the quantity of goods and services produced from each unit of labor input.**
3. Review of Principle #8: A Country’s Standard of Living Depends on Its Ability to Produce Goods and Services.

B. How Productivity Is Determined

1. Physical Capital per Worker

- a. Definition of **physical capital**: the stock of **equipment and structures used to produce goods and services**.
- b. Example: Crusoe will catch more fish if he has more fishing poles.

2. Human Capital per Worker

- a. Definition of **human capital**: the knowledge and **skills that workers acquire through education, training, and experience**.
- b. Example: Crusoe will catch more fish if he has been trained in the best fishing techniques or as he gains experience fishing.

3. Natural Resources per Worker

- a. Definition of **natural resources**: the inputs into **production that are provided by nature, such as land, rivers, and mineral deposits**.
- b. Example: Crusoe will have better luck catching fish if there is a plentiful supply around his island.

4. Technological Knowledge

- a. Definition of **technological knowledge**: society's

understanding of the best ways to produce goods and services.

- b. Example: Crusoe will catch more fish if he has invented a better fishing lure.

C. *FYI: The Production Function*

- 1. A production function describes the relationship between the quantity of inputs used in production and the quantity of output from production.
- 2. The production function generally is written like this:

where Y = output, L = quantity of labor, K = quantity of physical capital, H = quantity of human capital, N = quantity of natural resources, A reflects the available production technology, and $F()$ is a function that shows how inputs are combined to produce output.

- 3. Many production functions have a property called constant returns to scale.
 - a. This property implies that as all inputs are doubled, output will exactly double.
 - b. This implies that the following must be true:

where $x = 2$ if inputs are doubled.

- c. This also means that if we want to examine output per worker we could set $x = 1/L$ and we would get the following:

This shows that output per worker depends on the amount of physical capital per worker (K/L), the amount of human capital per worker (H/L), and the amount of natural resources per worker (N/L).

4. *Case Study: Are Natural Resources a Limit to Growth?*

- a. This section points out that as the population has grown over time, we have discovered ways to lower our use of natural resources. Thus, most economists are not worried about shortages of natural resources.

III. Economic Growth and Public Policy



A. Saving and Investment

1. Because capital is a produced factor of production, a society can change the amount of capital that it has.
2. However, there is an opportunity cost of doing so; if resources are used to produce capital goods, fewer goods and services are produced for current consumption.

B. Diminishing Returns and the Catch-Up Effect

1. Definition of **diminishing returns**: the property whereby the benefit from an extra unit of an input declines as the quantity of the input increases.
 - a. As the capital stock rises, the extra output produced from an additional unit of capital will fall.
 - b. This can be seen in Figure 1, which shows how the amount of capital per worker determines the amount of output per worker, holding constant all other determinants of output.
 - c. Thus, if workers already have a large amount of capital to work with, giving them an additional unit of capital will not increase their productivity by much.
 - d. In the long run, a higher saving rate leads to a higher level of productivity and income, but not to higher growth rates in these variables.
2. An important implication of diminishing returns is the catch-up effect.
 - a. Definition of **catch-up effect**: the property whereby countries that start off poor tend to grow more rapidly than countries that start off rich.
 - b. When workers have very little capital to begin with, an additional unit of capital will increase their productivity by a great deal.

C. Investment from Abroad

1. Saving by domestic residents is not the only way for a country to invest in new capital.
2. Investment in the country by foreigners can also occur.
 - a. Foreign direct investment occurs when a capital investment is owned and operated by a foreign entity.
 - b. Foreign portfolio investment occurs when a capital investment is financed with foreign money but operated by domestic residents.
3. Some of the benefits of foreign investment flow back to foreign owners. But the economy still experiences an increase in the capital stock, which leads to higher productivity and higher wages.
4. The World Bank is an organization that tries to encourage the flow of investment to poor countries.
 - a. The World Bank obtains funds from developed countries such as the United States and makes loans to less-developed countries so that they can invest in roads, sewer systems, schools, and other types of capital.
 - b. The World Bank also offers these countries advice on how best to use these funds.

D. Education

1. Investment in human capital also has an opportunity cost.
 - a. When students are in class, they cannot be producing goods and services for consumption.
 - b. In less-developed countries, this opportunity cost is considered to be high; as a result, children often drop out of school at a young age.
2. Because there are positive externalities in education, the effect of lower education on the economic growth rate of a country can be large.
3. Many poor countries also face a “brain drain”—the best educated often leave to go to other countries where they can enjoy a higher standard of living.

E. Health and Nutrition

1. Human capital can also be used to describe another type of investment in people: expenditures that lead to a healthier population.
2. Other things being equal, healthier workers are more productive.
3. Making the right investments in the health of the population is one way for a nation to increase productivity.

F. Property Rights and Political Stability

1. Protection of property rights and promotion of

political stability are two other important ways that policymakers can improve economic growth.

2. There is little incentive to produce products if there is no guarantee that they cannot be taken. Contracts must also be enforced.
3. Countries with questionable enforcement of property rights or an unstable political climate will also have difficulty in attracting foreign (or even domestic) investment.
4. *In the News: Does Food Aid Help or Hurt?*
 - a. Economic policies designed to improve productivity sometimes have adverse unintended effects.
 - b. This article from *The Wall Street Journal*, *Real Time Economics* blog discusses economic research on the effects of food aid to poor countries on armed conflict in a recipient country.

G. Free Trade

1. Some countries have tried to achieve faster economic growth by avoiding transacting with the rest of the world.
2. However, trade allows a country to specialize in what it does best and thus consume beyond its production possibilities.
3. When a country trades wheat for steel, it is as well off as it would be if it had developed a new technology for

turning wheat into steel.

4. The amount a nation trades is determined not only by government policy but also by geography.
 - a. Countries with good, natural seaports find trade easier than countries without this resource.
 - b. Countries with more than 80 percent of their population living within 100 kilometers of a coast have an average GDP per person that is four times as large as countries with less than 20 percent of their population living near a coast.

H. Research and Development

1. The primary reason why living standards have improved over time has been due to large increases in technological knowledge.
2. Knowledge can be considered a public good.
3. The U.S. government promotes the creation of new technological information by providing research grants and providing tax incentives for firms engaged in research.
4. The patent system also encourages research by granting an inventor the exclusive right to produce the product for a specified number of years.

I. Population Growth

1. Stretching Natural Resources

- a. Thomas Malthus (an English minister and early economic thinker) argued that an ever-increasing population meant that the world was doomed to live in poverty forever.
 - b. However, he failed to understand that new ideas would be developed to increase the production of food and other goods, including pesticides, fertilizers, mechanized equipment, and new crop varieties.
2. Diluting the Capital Stock
- a. High population growth reduces GDP per worker because rapid growth in the number of workers forces the capital stock to be spread more thinly.
 - b. Countries with a high population growth have large numbers of school-age children, placing a burden on the education system.
3. Some countries have already instituted measures to reduce population growth rates.
4. Policies that foster equal treatment for women should raise economic opportunities for women leading to lower rates of population.
5. Promoting Technological Progress
- a. Some economists have suggested that population growth has driven technological progress and economic prosperity.

- b. In a 1993 journal article, economist Michael Kremer provided evidence that increases in population lead to technological progress.



J. *In the News: One Economist's Answer*

1. Why do some nations thrive while others do not?
2. This article by economist Daron Acemoglu provides his ideas on the answers to this question.

SOLUTIONS TO TEXT PROBLEMS:

Quick Quizzes

1. The approximate growth rate of real GDP per person in the United States is 1.77 percent (based on Table 1) from 1870 to 2010. Countries that have had faster growth include Japan, Brazil, Mexico, China, Germany, and Canada; countries that have had slower growth include Argentina, India, United Kingdom, Indonesia, Pakistan, and Bangladesh.
2. The four determinants of a country's productivity are:
(1) physical capital, which is the stock of equipment and structures that are used to produce goods and services;
(2) human capital, which is the knowledge and skills that workers acquire through education, training, and experience; (3) natural resources, which are inputs into

production that are provided by nature, such as land, rivers, and mineral deposits; and (4) technological knowledge, which is society's understanding of the best ways to produce goods and services.

3. Ways in which a government policymaker can try to raise the growth in living standards in a society include:
 - (1) investing more current resources in the production of capital, which has the drawback of reducing the resources used for producing current consumption;
 - (2) encouraging investment from abroad, which has the drawback that some of the benefits of investment flow to foreigners;
 - (3) increasing education, which has an opportunity cost in that students are not engaged in current production;
 - (4) protecting property rights and promoting political stability, which has the drawback of enforcement costs;
 - (5) pursuing outward-oriented policies to encourage free trade, which may have the drawback of making a country more dependent on its trading partners;
 - (6) reducing the rate of population growth, which may have the drawbacks of reducing individual freedom and lowering the rate of technological progress;
 - and (7) encouraging research and development, which (like investment) may have the drawback of reducing current consumption.

Questions for Review

1. The level of a nation's GDP measures both the total income earned in the economy and the total expenditure on the economy's output of goods and services. The level of real GDP is a good gauge of economic prosperity, and

the growth rate of real GDP is a good gauge of economic progress. You would rather live in a nation with a high level of GDP, even though it had a low growth rate, than in a nation with a low level of GDP and a high growth rate, because the level of GDP is a measure of prosperity.

2. The four determinants of productivity are: (1) physical capital, which is the stock of equipment and structures that are used to produce goods and services; (2) human capital, which consists of the knowledge and skills that workers acquire through education, training, and experience; (3) natural resources, which are inputs into production that are provided by nature; and (4) technological knowledge, which is society's understanding of the best ways to produce goods and services.
3. A college degree is a form of human capital. The skills learned in earning a college degree increase a worker's productivity.
4. Higher saving means fewer resources are devoted to consumption and more to producing capital goods. The rise in the capital stock leads to rising productivity and more rapid growth in GDP for a while. In the long run, the higher saving rate leads to a higher standard of living. A policymaker might be deterred from trying to raise the rate of saving because doing so requires that people reduce their consumption today and it can take a long time to get to a higher standard of living.
5. A higher rate of saving leads to a higher growth rate temporarily, not permanently. In the short run, increased saving leads to a larger capital stock and faster growth.

But as growth continues, diminishing returns to capital mean growth slows down and eventually settles down to its initial rate, though this may take several decades.

6. Removing a trade restriction, such as a tariff, would lead to more rapid economic growth because the removal of the trade restriction acts like an improvement in technology. Free trade allows all countries to consume more goods and services.
7. The higher the rate of population growth, the lower is the level of GDP per person because there's less capital per person, hence lower productivity.
8. The U.S. government tries to encourage advances in technological knowledge by providing research grants through the National Science Foundation and the National Institute of Health, with tax breaks for firms engaging in research and development, and through the patent system.

Quick Check Multiple Choice

1. b
2. c
3. d
4. c
5. d
6. a

Problems and Applications

1. The facts that countries import many goods and services yet must produce a large quantity of goods and services themselves to enjoy a high standard of living are reconciled by noting that there are substantial gains from trade. To be able to afford to purchase goods from other countries, an economy must generate income. By producing many goods and services, then trading them for goods and services produced in other countries, a nation maximizes its standard of living.
2.
 - a. More investment would lead to faster economic growth in the short run.
 - b. The change would benefit many people in society who would have higher incomes as the result of faster economic growth. However, there might be a transition period in which workers and owners in consumption-good industries would get lower incomes, and workers and owners in investment-good industries would get higher incomes. In addition, some group would have to reduce their spending for some time so that investment could rise.
3.
 - a. Private consumption spending includes buying food and buying clothes; private investment spending includes people buying houses and firms buying computers. Many other examples are possible. Education can be considered as both consumption and investment.
 - b. Government consumption spending includes paying workers to administer government programs; government investment spending includes buying

military equipment and building roads. Many other examples are possible.

4. The opportunity cost of investing in capital is the loss of consumption that results from redirecting resources toward investment. Over-investment in capital is possible because of diminishing marginal returns. A country can "over-invest" in capital if people would prefer to have higher consumption spending and less future growth. The opportunity cost of investing in human capital is also the loss of consumption that is needed to provide the resources for investment. A country could "over-invest" in human capital if people were too highly educated for the jobs they could get³for example, if the best job a Ph.D. in philosophy could find is managing a restaurant.
5.
 - a. The United States benefited from the Chinese and Japanese investment because it made our capital stock larger, increasing our economic growth.
 - b. It would have been better for Americans to make the investments because then they would have received all of the returns on the investments, instead of the returns going to China and Japan.
6. Greater educational opportunities for women could lead to faster economic growth in these developing countries because increased human capital would increase productivity and there would be external effects from greater knowledge in the country. Second, increased educational opportunities for young women may lower the population growth rate because such opportunities raise the opportunity cost of having a child.

7.
 - a. Individuals with higher incomes have better access to clean water, medical care, and good nutrition.
 - b. Healthier individuals are likely to be more productive.
 - c. Understanding the direction of causation will help policymakers place proper emphasis on the programs that will achieve both greater health and higher incomes.
8. Peace would promote economic growth because it is an indication that property rights will be respected in the future. Armed conflict and the threat of a revolutionary government reduce domestic residents' incentive to save, invest, and start new businesses. Moreover, foreigners have less incentive to invest in the country.

Easy taxes would promote economic growth because they result in citizens and businesses retaining a greater share of the income they earn and, thus, being able to save and invest a greater portion of that income.

A tolerable administration of justice would promote economic growth because it would ensure the maintenance of property rights, which encourages domestic saving and investment from abroad.

