

# 24

## PRODUCTION AND GROWTH

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### **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.

### **KEY POINTS:**

1. 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.
2. 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.
3. Government policies can influence the economy's growth rate in many ways: encouraging saving and investment, encouraging investment from abroad, fostering education, maintaining property rights and political stability, allowing free trade, controlling population growth, and promoting the research and development of new technologies.
4. 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. Because of diminishing returns, higher saving leads to higher growth for a period of time, but growth eventually slows down as the economy approaches a higher level of capital, productivity, and income. 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.

### **CHAPTER OUTLINE:**

- I. Economic Growth Around the World

**Table 24-1**

- A. Table 24-1 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, 2.8 percent 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 and Canada (two former colonies of the United Kingdom).
- B. *FYI: The Magic of Compounding and the Rule of 70*
1. Compounding refers to the accumulation of a growth rate over a period of time.
  2. Example: Jerry and Elaine both graduate from college at the age of 22 and take jobs earning \$30,000 per year.
    - a. Jerry lives in an economy where incomes grow at 1 percent per year.
    - b. Elaine lives in an economy where incomes grow at 3 percent per year.
    - c. Forty years later (when both are 62) Jerry will be earning \$45,000 and Elaine will be earning \$98,000.
  3. The Rule of 70 can help us understand the effects of compounding:
 

Rule of 70: If a variable grows at  $X\%$  per year, then that variable will double in approximately  $70 / X$  years.

## 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 amount of goods and services produced for each hour of a worker's time**.
  - 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
    - a. Definition of **Physical Capital: the stock of equipment and structures that are used to produce goods and services**.
    - b. Example: Crusoe will catch more fish if he has more fishing poles.
  - 2. Human Capital
    - 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 taught the best fishing techniques.
  - 3. Natural Resources
    - a. Definition of **Natural Resources: the inputs into the production of goods and services 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.
    - c. *Case Study: Are Natural Resources a Limit to Growth?* 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.
  - 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 figured out the best places on the island to fish.
- 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:

$$Y = A F(L, K, H, N)$$

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  $F(\cdot)$  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:

$$xY = A F(xL, xK, xH, xN)$$

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:

$$Y/L = A F(1, K/L, H/L, N/L)$$

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 ( $N/L$ ).

### III. Economic Growth and Public Policy

#### A. The Importance of Saving and Investment

1. Because capital is a produced factor of production, a country 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.

**Figure 24-1**

3. Figure 24-1 shows economic growth rates and investment amounts of 15 countries for 1960 to 1991.
  - a. Countries that devote a large share of GDP to investment tend to have high growth rates.

- b. Of course, from the data given it is difficult to determine cause and effect.

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 from an additional unit of capital will fall.
  - b. 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.
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. This helps explain why (referring to Figure 24-1) South Korea had a growth rate more than three times larger than the United States even though both countries devoted a similar share of GDP to investment.

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.
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.

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. 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.
- F. Free Trade
1. Some countries have tried to achieve faster economic growth by avoiding transacting with the rest of the world.
  2. However, we know that 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.
- G. The Control of Population Growth
1. High population growth reduces GDP per person.
  2. Rapid growth in the number of workers forces other inputs to be spread more thinly between the workers (especially capital).
  3. Countries with high population growth rates also have a large number of school-age children, putting strains on the educational system.
  4. Some countries have already instituted measures to reduce population growth rates.

5. Policies that foster equal treatment for women should raise economic opportunities for women leading to lower rates of population.

6. *FYI: Thomas Malthus on Population Growth*

- a. Malthus 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.

- 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. The U.S. government promotes the creation of new technological information by providing research grants and providing tax incentives for firms engaged in research.
3. The patent system also encourages research by granting an inventor the exclusive right to produce the product for a specified number of years.

- I. *Case Study: The Productivity Slowdown*

1. From 1959 to 1973, output per hour worked grew at a rate of 3.2 percent per year. From 1973 to 1998, productivity grew by only 1.3 percent per year.

**Figure 24-2**

2. This slowdown in productivity is one of the largest problems facing policy makers today.
3. This slowdown has been worldwide.
4. It does not appear that this slowdown can be blamed on decreases in physical capital or human capital.
5. Many economists believe that this slowdown has occurred as a result of a drop in the amount of technological innovation.

- J. *In the News: The Sachs Solution to the African Problem*

1. This is an article that economist Jeffrey Sachs wrote for *The Economist*.
2. Sachs points out that four factors can account for Africa's low growth rates:
  - a. Trade barriers
  - b. Excessive tax rates

- c. Low savings rates
- d. Adverse geographic and resource structural conditions  
(especially the high incidence of inaccessibility to the sea)