



Production and Growth

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Production and Growth

**A country's standard of living
depends on its ability to
produce goods and services.**

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Production and Growth

Within a country there are large changes in the standard of living over time.

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Production and Growth

In the United States over the past century, average income as measured by real GDP per person has grown by about 2 percent per year.

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Production and Growth

- ◆ **Productivity** refers to the amount of goods and services produced for each hour of a worker's time.
- ◆ A nation's standard of living is determined by the productivity of its workers.

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The Variety of Growth Experiences

Country	Period	Real GDP per Person at Beginning of Period	Real GDP per Person at End of Period	Growth Rate (per year)
Japan	1890-1997	\$1,196	\$23,400	2.82%
Brazil	1900-1990	619	6,240	2.41
Mexico	1900-1997	922	8,120	2.27
Germany	1870-1997	1,738	21,300	1.99
Canada	1870-1997	1,890	21,860	1.95
China	1900-1997	570	3,570	1.91
Argentina	1900-1997	1,824	9,950	1.76
United States	1870-1997	3,188	28,740	1.75
Indonesia	1900-1997	708	3,450	1.65
United Kingdom	1870-1997	3,826	20,520	1.33
India	1900-1997	537	1,950	1.34
Pakistan	1900-1997	587	1,590	1.03
Bangladesh	1900-1997	495	1,050	0.78

Economic Growth Around the World

Living standards, as measured by real GDP per person, vary significantly among nations.

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Economic Growth Around the World

The poorest countries have average levels of income that have not been seen in the United States for many decades.

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Compounding and the Rule of 70

- ◆ Annual growth rates that seem small become large when compounded for many years.
- ◆ **Compounding** refers to the accumulation of a growth rate over a period of time.

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Compounding and the Rule of 70

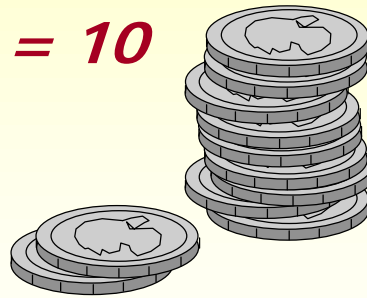
According to the **rule of 70**, if some variable grows at a rate of x percent per year, then that variable doubles in approximately $70/x$ years.

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An Example of the Rule of 70

- ◆ \$5,000 invested at 7 percent interest per year, will double in size in 10 years

$$70 / 7 = 10$$



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Why Productivity Is So Important

Productivity plays a key role in determining living standards for all nations in the world.

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Why Productivity Is So Important

Productivity refers to the quantity of goods and services that a worker can produce from each hour of work.

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Why Productivity Is So Important

To understand the large differences in living standards across countries. We must focus on the production of goods and services.

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How Productivity is Determined

- ◆ The inputs used to produce goods and services are called the **factors of production**.
- ◆ The factors of production directly determine productivity.

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The Factors of Production

- ◆ **Physical capital**
- ◆ **Human capital**
- ◆ **Natural resources**
- ◆ **Technological knowledge**

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The Factors of Production

- ◆ **Capital** is a produced factor of production.
- ◆ It is an input into the production process that in the past was an output from the production process.

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Physical Capital

- ◆ **Physical capital** is the stock of equipment and structures that are used to produce goods and services.
 - ◆ Tools used to build or repair automobiles.
 - ◆ Tools used to build furniture.
 - ◆ Office buildings, schools, etc.

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Human Capital

- ◆ **Human capital** is the economist's term for the knowledge and skills that workers acquire through education, training, and experience.
 - ◆ Like physical capital, human capital raises a nation's ability to produce goods and services.

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Natural Resources

- ◆ **Natural resources** are inputs used in production that are provided by nature, such as land, rivers, and mineral deposits.
 - ◆ Renewable resources include trees and forests.
 - ◆ Nonrenewable resources include petroleum and coal.

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Natural Resources

Natural resources can be important but are not necessary for an economy to be highly productive in producing goods and services.

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Technological Knowledge

- ◆ **Technological knowledge** is the understanding of the best ways to produce goods and services.
- ◆ **Human capital** refers to the resources expended transmitting this understanding to the labor force.

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The Production Function

Economists often use a production function to describe the relationship between the quantity of inputs used in production and the quantity of output from production.

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The Production Function

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

Y = quantity of output

A = available production technology

L = quantity of labor

K = quantity of physical capital

H = quantity of human capital

N = quantity of natural resources

$F()$ is a function that shows how the inputs are combined.

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The Production Function

- ◆ A production function has constant returns to scale if, for any positive number x ,

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

- ◆ That is, a doubling of all inputs causes the amount of output to double as well.

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The Production Function

- ◆ Production functions with constant returns to scale have an interesting implication.
- ◆ Setting $x = 1/L$,

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

Where:

Y/L = output per worker

K/L = physical capital per worker

H/L = human capital per worker

N/L = natural resources per worker

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The Production Function

The preceding equation says that productivity (Y/L) depends on physical capital per worker (K/L), human capital per worker (H/L), and natural resources per worker (N/L), as well as the state of technology, (A).

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Economic Growth and Public Policy

Governments can do many things to raise productivity and living standards.

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Government Policies That Raise Productivity and Living Standards

- ◆ **Encourage saving and investment.**
- ◆ **Encourage investment from abroad**
- ◆ **Encourage education and training.**
- ◆ **Establish secure property rights and maintain political stability.**

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Government Policies That Raise Productivity and Living Standards

- ◆ **Promote free trade.**
- ◆ **Control population growth.**
- ◆ **Promote research and development.**

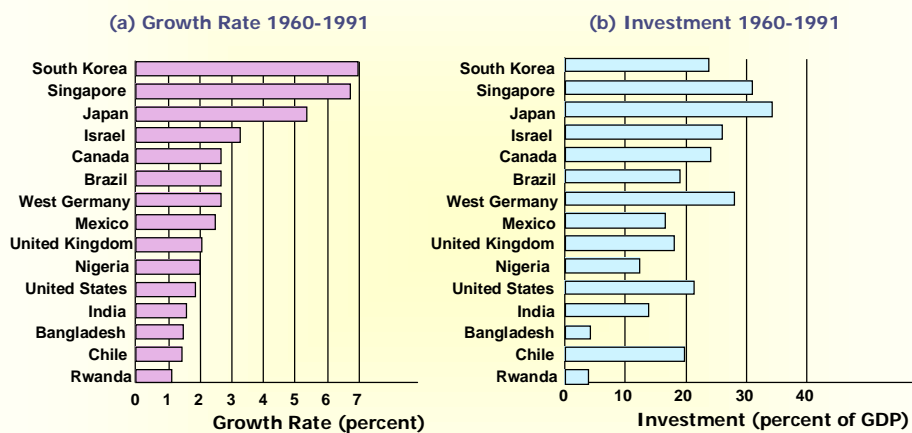
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The Importance of Saving and Investment

One way to raise future productivity is to invest more current resources in the production of capital.

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Growth and Investment



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The Importance of Saving and Investment

- ◆ **As the stock of capital rises, the extra output produced from an additional unit of capital falls; this property is called diminishing returns.**
- ◆ **Because of diminishing returns, an increase in the saving rate leads to higher growth only for a while.**

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The Importance of Saving and Investment

In the long run, the higher saving rate leads to a higher level of productivity and income, but *not* to higher growth in these areas.

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The Importance of Saving and Investment

The **catch-up effect** refers to the condition that, other things being equal, it is easier for a country to grow fast if it starts out relatively poor.

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Investment from Abroad

Governments can increase capital accumulation and long-term economic growth by encouraging investment from foreign sources.

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Investment from Abroad

Investment from abroad takes several forms:

- ◆ **Foreign Direct Investment**

- ◆ Capital investment owned and operated by a foreign entity.

- ◆ **Foreign Portfolio Investment**

- ◆ Investments financed with foreign money but operated by domestic residents.

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Education

- ◆ **For a country's long-run growth, education is at least as important as investment in physical capital.**

- ◆ **In the United States, each year of schooling raises a person's wage on average by about 10 percent.**
- ◆ **Thus, one way the government can enhance the standard of living is to provide schools and encourage the population to take advantage of them.**

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Education

An educated person might generate new ideas about how best to produce goods and services, which in turn, might enter society's pool of knowledge and provide an **external benefit** to others.

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Education

One problem facing some poor countries is the **brain drain**--the emigration of many of the most highly educated workers to rich countries.

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Property Rights and Political Stability

- ◆ ***Property rights* refer to the ability of people to exercise authority over the resources they own.**
- ◆ **An economy-wide respect for property rights is an important prerequisite for the price system to work.**
- ◆ **It is necessary for investors to feel that their investments are secure.**

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Free Trade

- ◆ **Trade is, in some ways, a type of technology.**
- ◆ **A country that eliminates trade restrictions will experience the same kind of economic growth that would occur after a major technological advance.**

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Free Trade

- ◆ Some countries engage in . . .
 - . . . **inward-orientated** trade policies, avoiding interaction with other countries.
 - . . . **outward-orientated** trade policies, encouraging interaction with other countries.

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Control of Population Growth

- ◆ Population is a key determinant of a country's labor force.
 - ◆ Large populations tend to produce greater total GDP.
 - ◆ However, **GDP per person** is a better measure of economic well-being, and high population growth reduces GDP per person.

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Research and Development

- ◆ **The advance of technological knowledge has led to higher standards of living.**
 - ◆ **Most technological advance comes from private research by firms and individual inventors.**
 - ◆ **Government can encourage the development of new technologies through research grants, tax breaks, and the patent system.**

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The Productivity Slowdown

- ◆ **From 1959 to 1973 productivity grew at a rate of 3.2 percent per year.**
- ◆ **From 1973 to 1998 productivity grew by only 1.3 percent per year.**
- ◆ **The slowdown in economic growth has been one of the most important problems facing economic policymakers.**

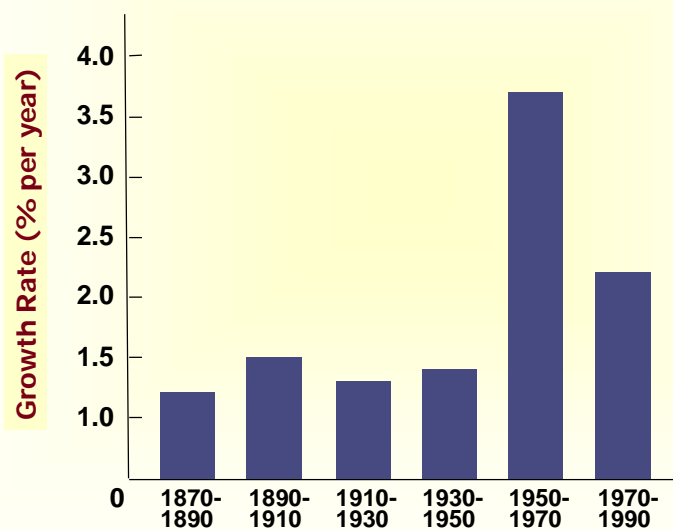
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The Productivity Slowdown

- ◆ The slowdown in productivity growth is a worldwide phenomenon.
- ◆ The slowdown cannot be traced to those factors of production that are most easily measured – technology may be the key.

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The Growth in Real GDP Per Person



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Summary

- ◆ **Economic prosperity, as measured by real GDP per person, varies substantially around the world.**
- ◆ **The average income of the world's richest countries is more than ten times that in the world's poorest countries.**
- ◆ **The standard of living in an economy depends on the economy's ability to produce goods and services.**

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Summary

- ◆ **Productivity depends on the amounts of physical capital, human capital, natural resources, and technological knowledge available to workers.**
- ◆ **Government policies can influence the economy's growth rate in many different ways.**

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Summary

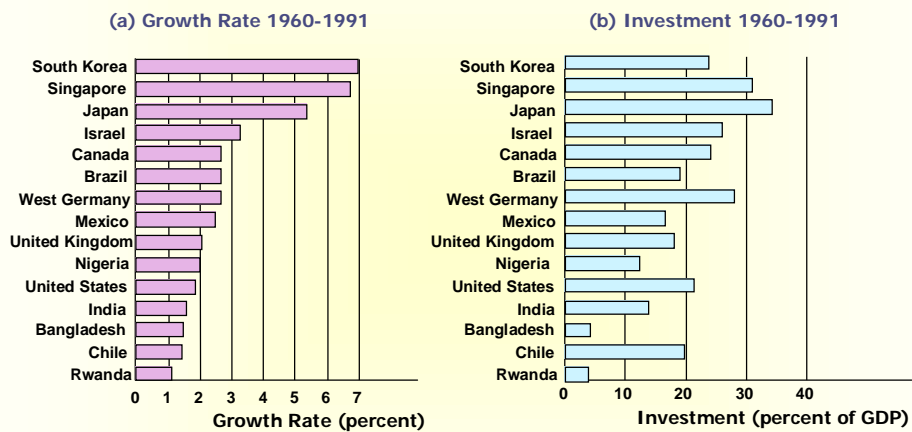
- ◆ **The accumulation of capital is subject to diminishing returns.**
- ◆ **Because of diminishing returns, higher saving leads to a higher growth for a period of time, but growth will eventually slow down.**
- ◆ **Also because of diminishing returns, the return to capital is especially high in poor countries.**

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Graphical Review

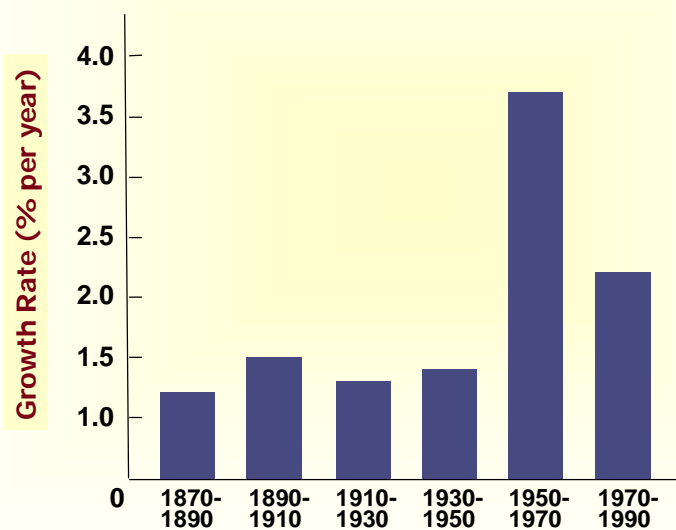
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The Growth in Real GDP Per Person



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