

Productivity and Growth

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Production and Growth

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

Production and Growth

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

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.

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.

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.

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.

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.

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



Why Productivity Is So Important

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

Why Productivity Is So Important

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

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.

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.

The Factors of Production

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

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.

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.

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.

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.

Natural Resources

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

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.

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.

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.

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.

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

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).

Economic Growth and Public Policy

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

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.

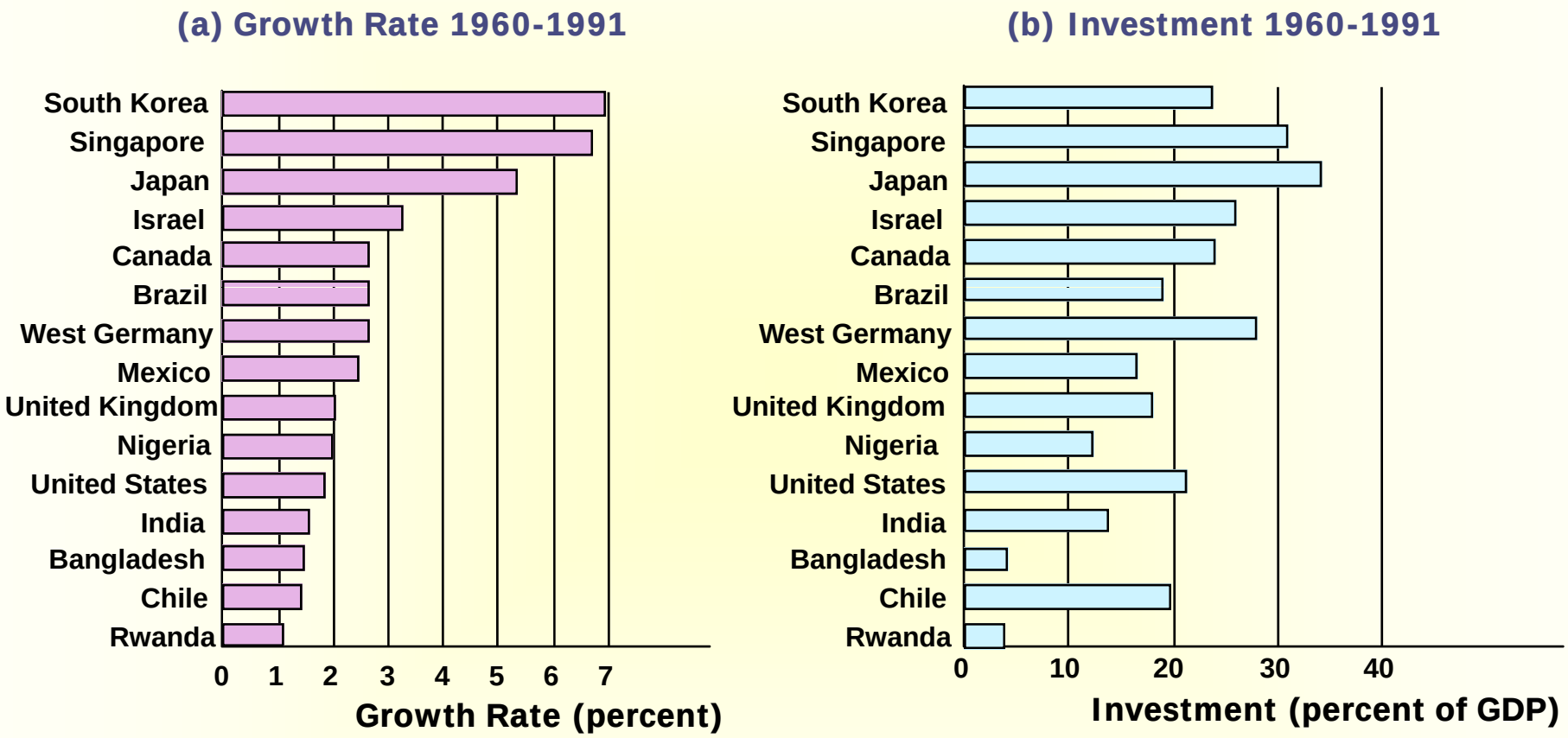
Government Policies That Raise Productivity and Living Standards

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

The Importance of Saving and Investment

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

Growth and Investment



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.

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.

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.

Investment from Abroad

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

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.**

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.

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.

Education

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

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.

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.

Free Trade

- **Some countries engage in . . .**

  . . . inward-orientated trade policies, avoiding interaction with other countries.

  . . . outward-orientated trade policies, encouraging interaction with other countries.

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.**

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.

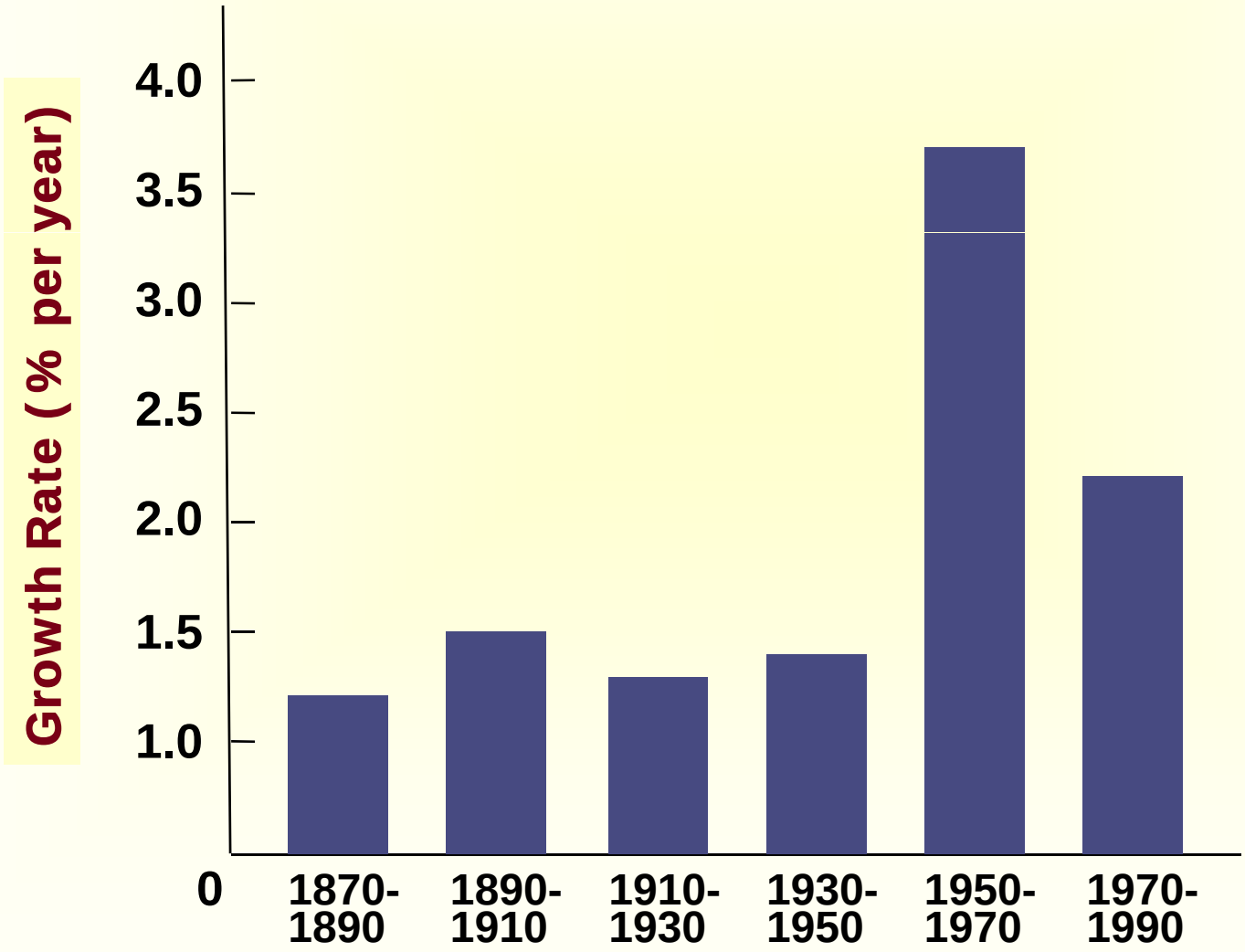
The Productivity Slowdown

- 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.

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.

The Growth in Real GDP Per Person



Economic Miracles?: China and India

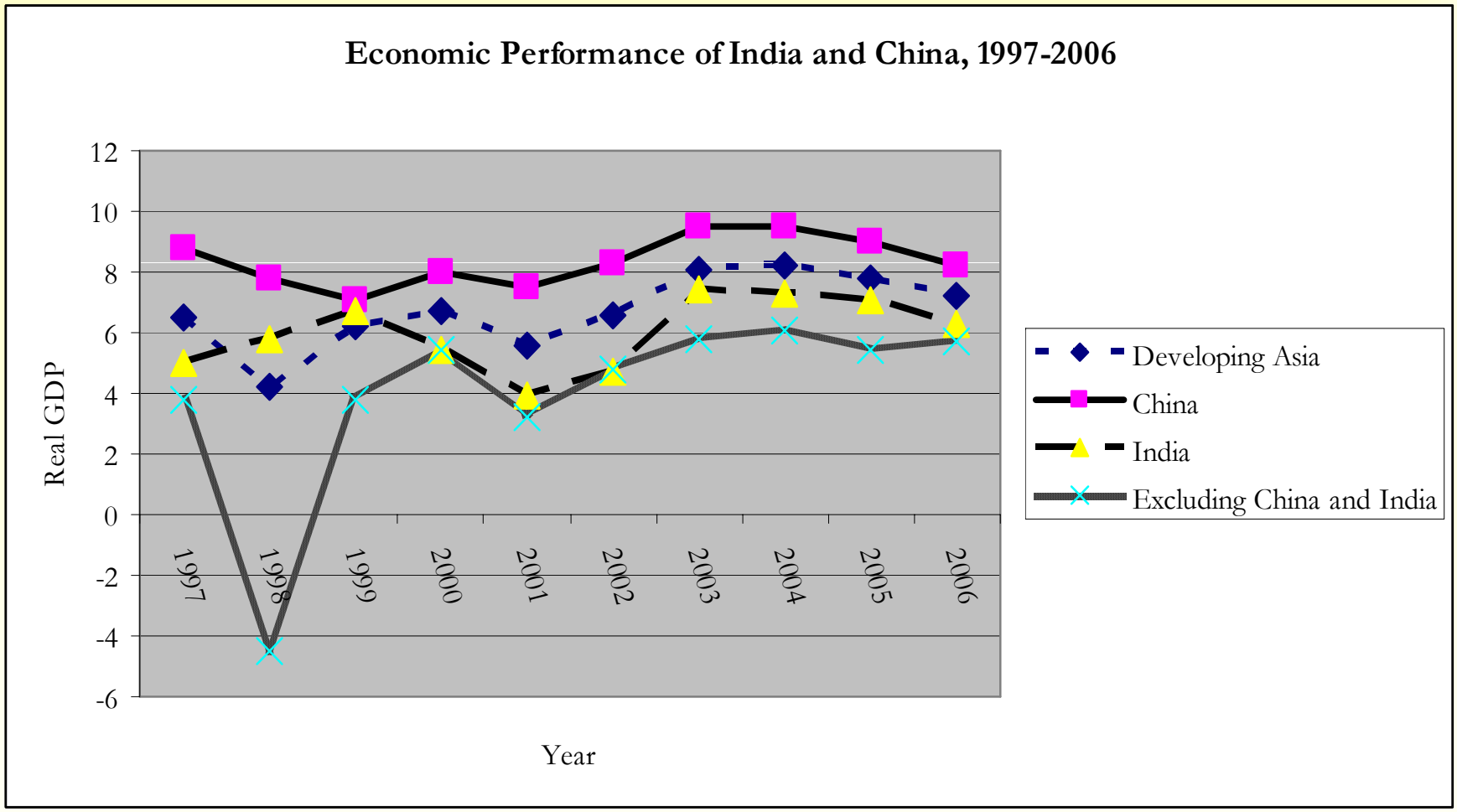
Growth of China and India

	Average Annual Growth Between 1975-2003	Average Annual Growth Between 1990-2003
China	**8.2%**	**8.5%**
India	**3.3%**	**4.0%**

Source: UNDP Human Development Report 2005, pp 267-268.

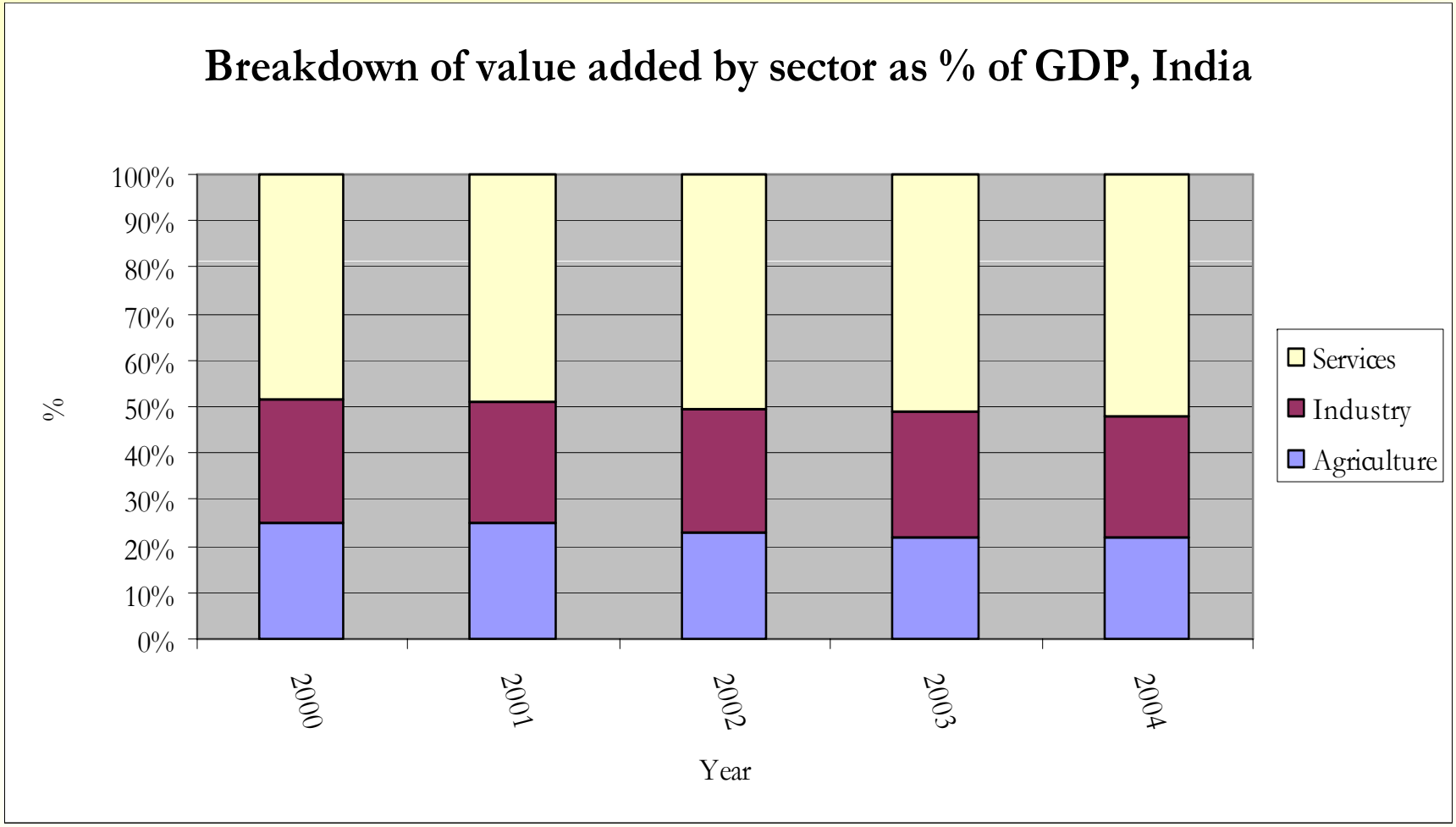
Economic Miracles?: China and India

Source: IMF



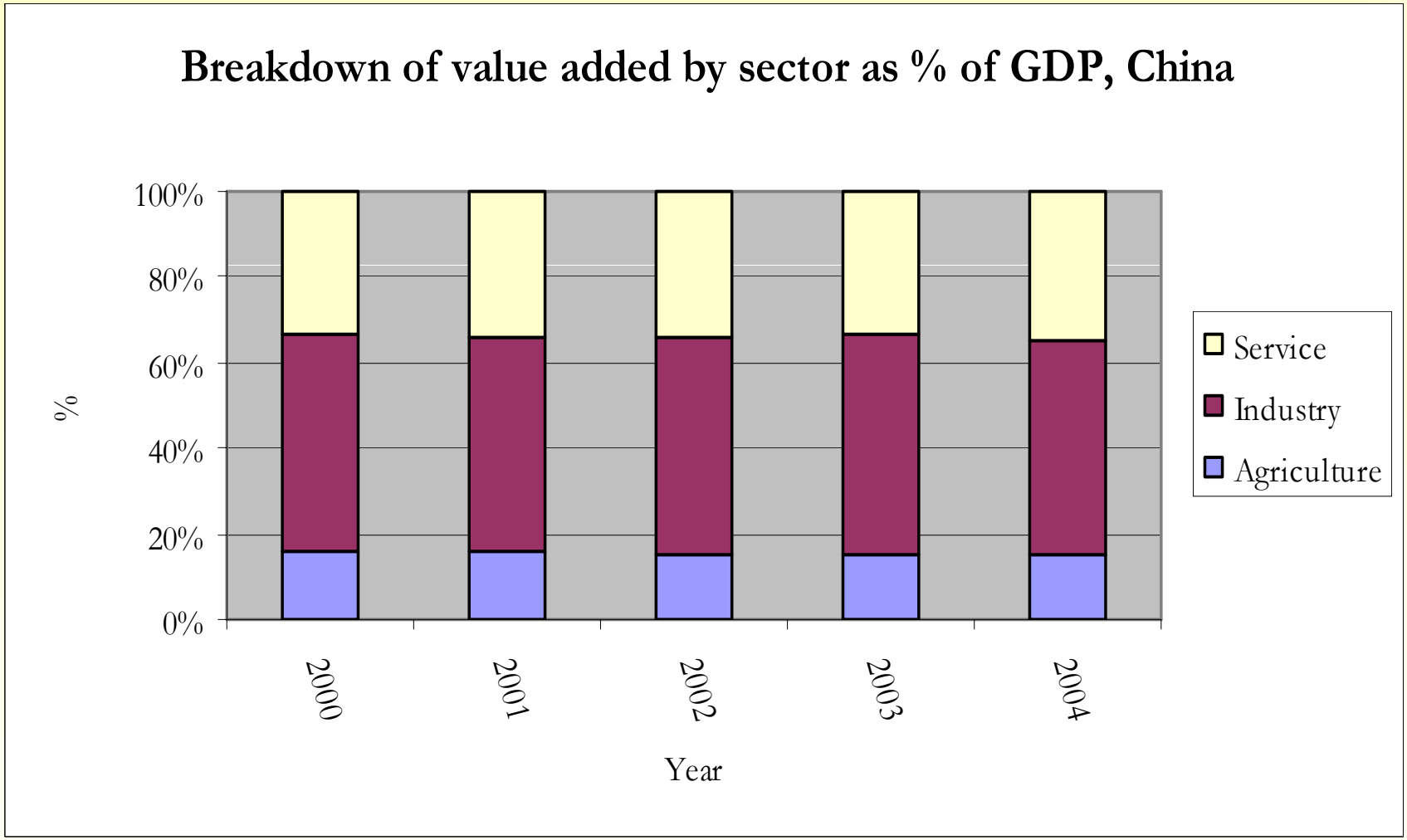
Economic Miracles?: China and India

Source: World Bank



Economic Miracles?: China and India

Source: World Bank



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.

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.

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.

General Questions

- Why some countries are rich and some countries are poor?
- What are the determinants of economic growth?
- What should the government do to promote economic growth?