Macroeconomics 1 - Week 2

Production and Growth

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Last lecture – the data of Macroeconomics

- GDP
  - The total market value of all final goods and services produced within a nation's boarder in a given time period.
  - 3 approaches to measure GDP:
    - Output approach – sum of final goods = sum of value added
    - Expenditure approach – $Y = C + I + G + NX$
    - Income approach – wages + profits + interest + rent

Last lecture – the data of Macroeconomics

- Nominal GDP
  - the production of goods and services in current prices
- Real GDP
  - the production of goods and services in constant prices
- GDP deflator

  = (Nominal GDP/Real GDP)*100
  - reflects only the prices of goods and services
- NDP (net domestic product)

  = GDP – depreciation of fixed capital
- GNP (gross national product)

  = GDP + incomes receivable from the rest of the world – incomes payable to the rest of the world

Last lecture – the data of Macroeconomics

- CPI
  - A measure of overall cost of goods and services bought by a typical consumer

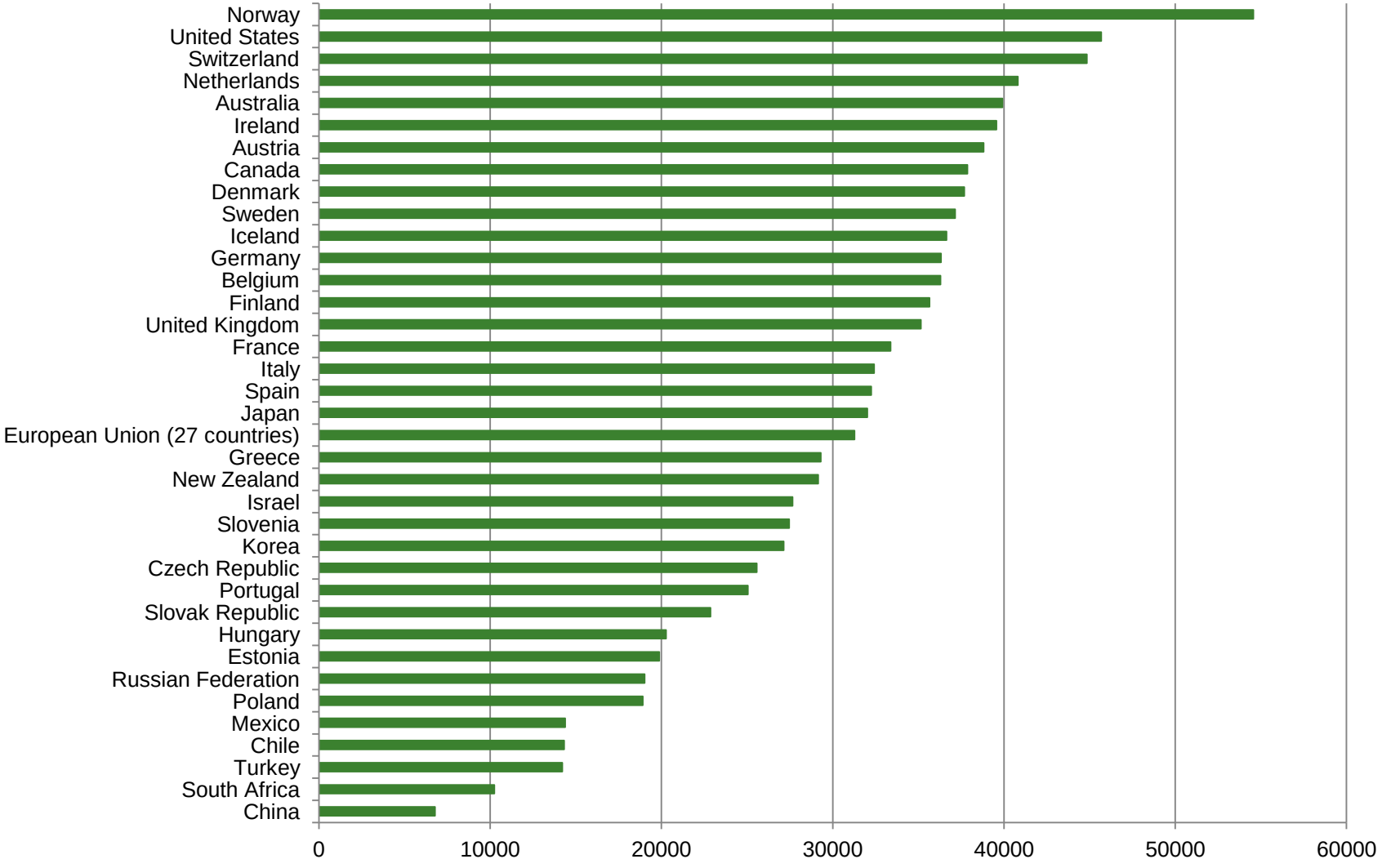
  = (price of basket $_{x}$ / price of basket $_{base}$)*100
- Inflation rate
  - Percentage change in the price level from the previous period
- GDP deflator vs. CPI
  - All goods vs. goods bought by consumer
  - Change in the price of the same goods vs. change in the price of goods in basket (changes in the basket)

Production and Growth

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

- Huge variation in the standards of living across countries

Comparison of GDP per capita in selected countries (2009)



Current USD in PPP exchange rate, Source: OECD

Production and Growth

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

- 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, i.e. it doubles every 35 years.

Production and Growth

- Variation in the standard of living
  - across countries, over time
- Moreover – differences in growth rates

- Huge growth in East Asian countries in last years (Singapore, South Korea, Taiwan)
  - About 7% per year (the average income doubles every 10 years)

- By contrast – stagnant average income for many years in some African countries

Production and Growth

- Countries experiencing rapid growth
  - Go from being among the poorest in the world to being among the richest

- Q: What policies should poor countries pursue to promote more rapid growth and join the developed world?

- Q: How can rich countries maintain their high standard of living?

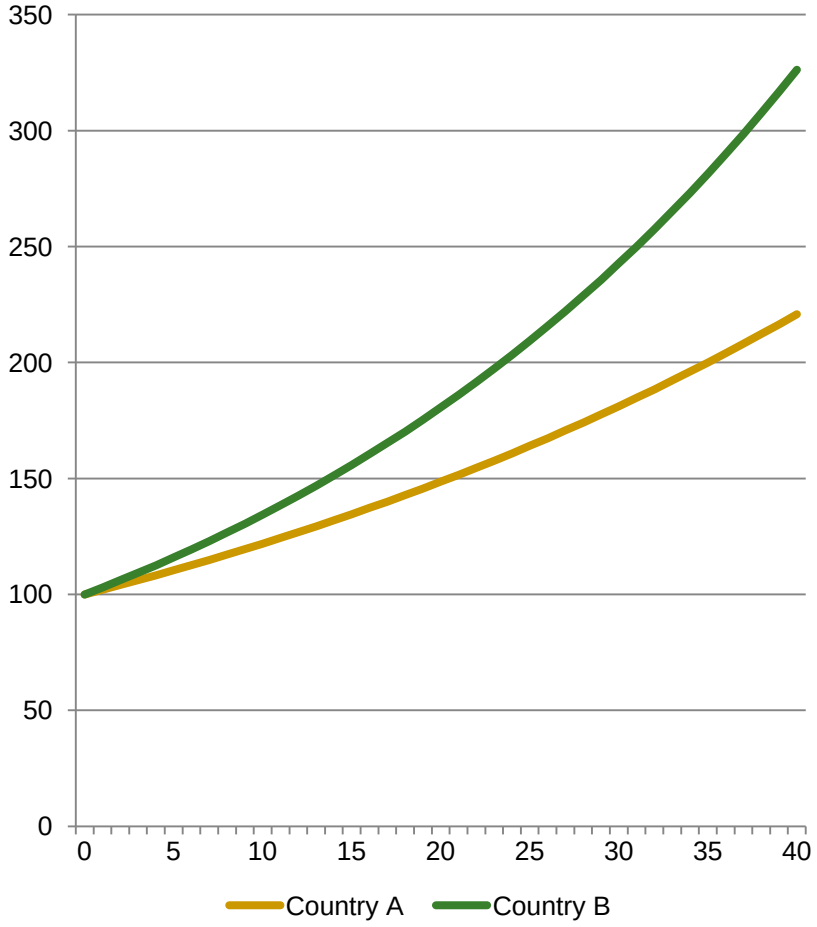
Outline

- In the last lecture
  - How we measure macroeconomic quantities and prices (total output, inflation)

- Today
  - Study the forces that determine these variables, i.e. long-run determinants of the level and growth of GDP
  - 3 steps
    - international comparison in GDP per person
    - The role of productivity
    - Link btw. productivity and economic policies

Why is speed of growth important

Let's have 2 countries: Start at the same level of GDP, but country A grows by 2% each year and country B grows by 3% each year



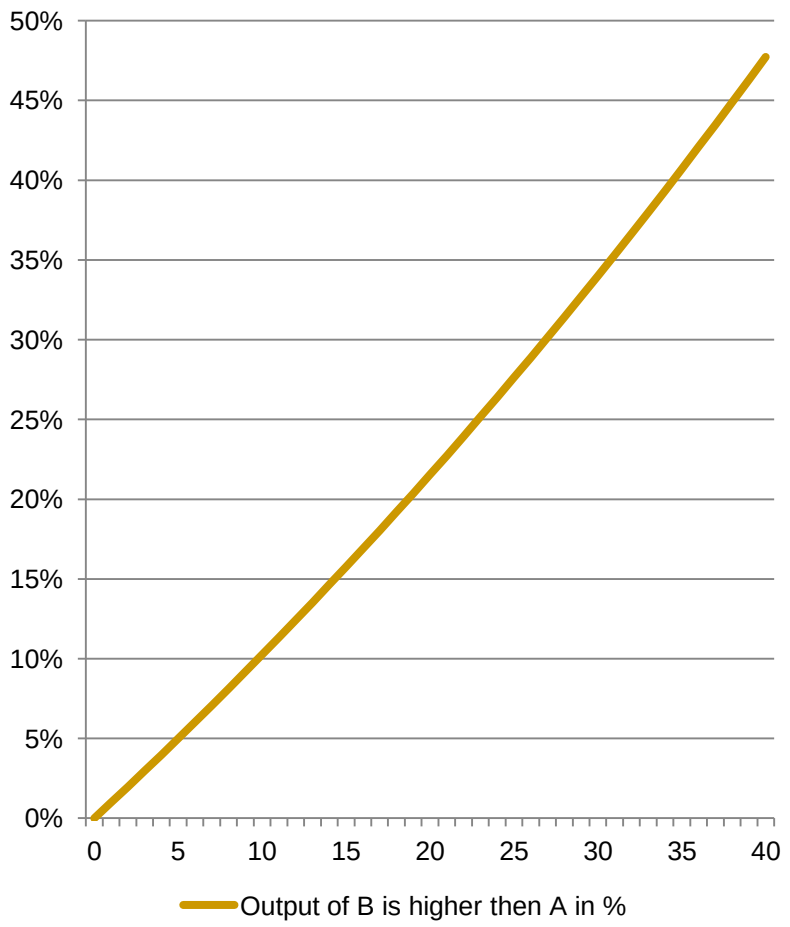


Table 1 The Variety of Growth Experiences

Country	Period	Real GDP per Person at Beginning of Period[a]	Real GDP per Person at End of Period[a]	Growth Rate (per year)
Japan	1890–2000	$1,256	$26,460	2.81%
Brazil	1900–2000	650	7,320	2.45
Mexico	1900–2000	968	8,810	2.23
Canada	1870–2000	1,984	27,330	2.04
Germany	1870–2000	1,825	25,010	2.03
China	1900–2000	598	3,940	1.90
Argentina	1900–2000	1,915	12,090	1.86
United States	1870–2000	3,347	34,260	1.81
India	1900–2000	564	2,390	1.45
Indonesia	1900–2000	743	2,840	1.35
United Kingdom	1870–2000	4,107	23,550	1.35
Pakistan	1900–2000	616	1,960	1.16
Bangladesh	1900–2000	520	1,650	1.16

[a]Real GDP is measured in 2000 dollars.

Weekly consumption of people from all around the world

↑ Chad: $1.23 ↓ Bhutan: $5

↑ US: $159 ↓ Germany:$500

PRODUCTIVITY: ITS ROLE AND DETERMINANTS

- Why do countries vary extensively in living standards?
- Because of productivity
  - What productivity is
  - What factors determines productivity

- Productivity plays a key role in determining living standards for all nations in the world.
  - Single person in economy – more productive = higher consumption and more free time (standards of living)
  - Whole country – GDP measure of total income and at the same time total expenditure

PRODUCTIVITY: ITS ROLE AND DETERMINANTS

- *Productivity* refers to the amount of goods and services that a worker can produce from each hour of work.
- A nation's standards of living is determined by the productivity of its workers

- American workers are more productive than workers in India
- Japanese workers have experienced more rapid growth in productivity than Chinese workers

PRODUCTIVITY: ITS ROLE AND DETERMINANTS

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

- Why are some countries so much better at producing goods and services than others?
  - Determinants of productivity

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.

How Productivity Is Determined

- The Factors of Production
  - Physical capital
  - Human capital
  - Natural resources
  - Technological knowledge

How Productivity Is Determined

- *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.
  - 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.

How Productivity Is Determined

- *Human Capital*
  - 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.

How Productivity Is Determined

- *Natural Resources*
  - 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.
  - can be important but are not necessary for an economy to be highly productive in producing goods and services.
  - E.g. some countries in the Middle East (Kuwait, Saudi Arabia - oil)

How Productivity Is Determined

- *Technological Knowledge*
  - society's understanding of the best ways to produce goods and services.
  - Common knowledge vs. proprietary technology (patents)
  - Difference btw. technological knowledge and human capital
    - Human capital refers to the resources expended transmitting this understanding to the labor force.

FYI: 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.

FYI: 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.

FYI: 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.

FYI: 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

FYI: 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).

Europe vs. US

$$GDP = \underbrace{\frac{GDP}{Hours}}_{\text{productivity}} \times \left[\frac{Hours}{Employment} \times \underbrace{\frac{Employment}{WorkingAgePop}}_{\text{labour utilisation}} \times \frac{WorkingAgePop}{Population} \right] \times Population$$

1993-2003, Average Annual Growth Rates[1]	Euroland	US
GDP growth *equals changes in*	2.1	3.0
Population	0.5	1.2
plus Productivity (GDP/hour)	1.8	1.6
plus Labour utilisation	-0.1	0.1
of which Average hours worked	-0.5	-0.1
Employment rate	0.5	0.2
Working-age population	-0.1	0.0

[1] Data may not sum to totals due to rounding

Source: Daly, K. (2004). Has Euroland performed that badly? *The Business Economist 35*, 17-31.

ECONOMIC GROWTH AND PUBLIC POLICY

- What can government policy do to raise productivity and living standards?

ECONOMIC GROWTH AND PUBLIC POLICY

- 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.
  - Promote free trade.
  - 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.

- TRADE-OFF – because of scarce resources
  - Devoting more resources to producing capital requires devoting fewer resources to producing goods and services for current consumption
  - For society to invest more in in capital, it must consume less and save more of its current income

Diminishing Returns and the Catch-Up Effect

- Suppose government policy – to raise the nation's saving rate (% of GDP devoted to saving rather than consumption)

- What happens?

  ↑ savings => ↓ resources to produce consumption goods and ↑ resources to produce capital goods

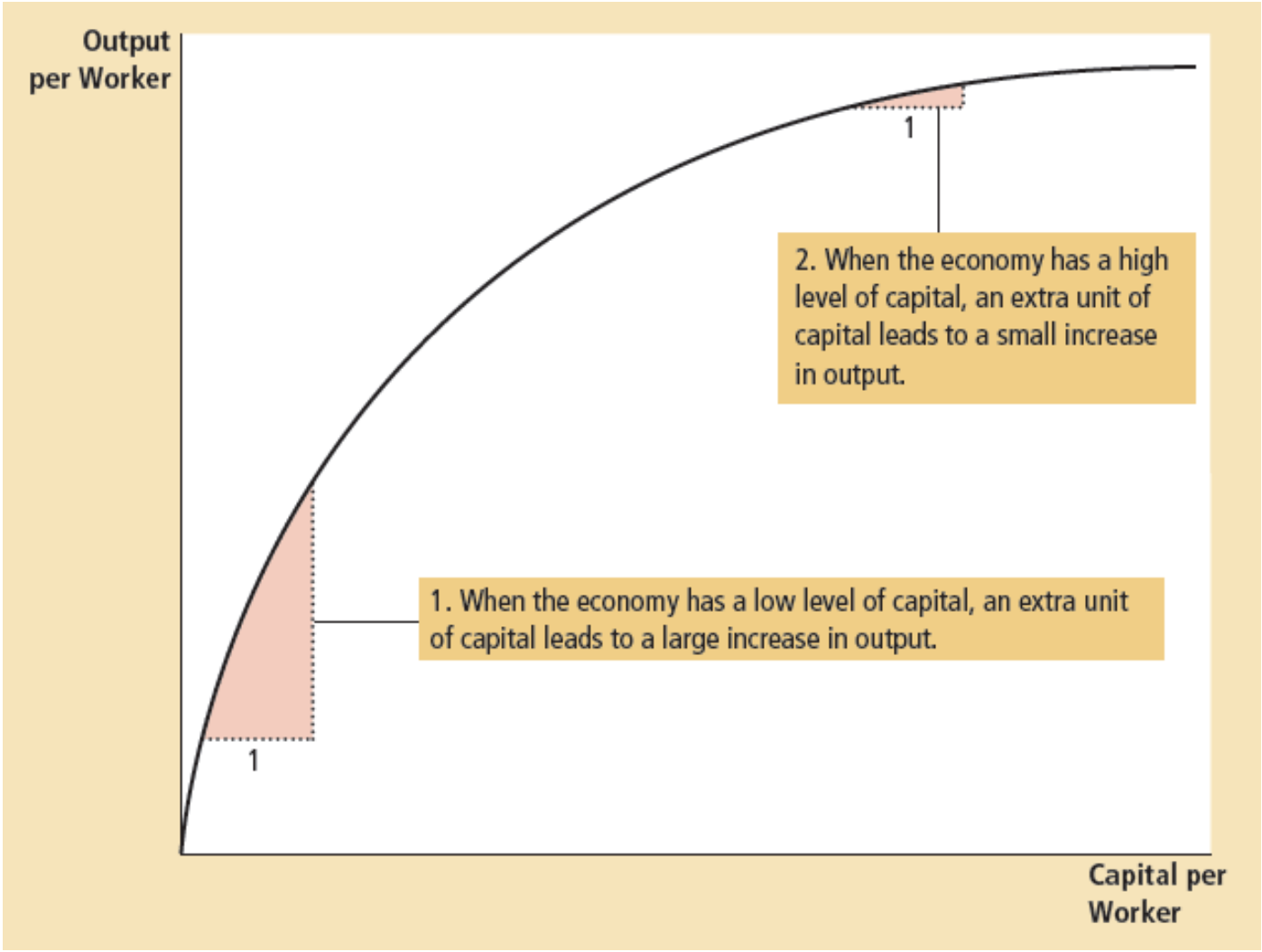
  ↑ capital stock => ↑ productivity => ↑ growth in GDP

- How long does this higher rate of growth last?

Diminishing Returns and the Catch-Up Effect

- Capital is subject to *diminishing returns*
  - As the stock of capital rises, the extra output produced from an additional unit of capital falls.

Diminishing returns and the catch-up effect



Diminishing Returns and the Catch-Up Effect

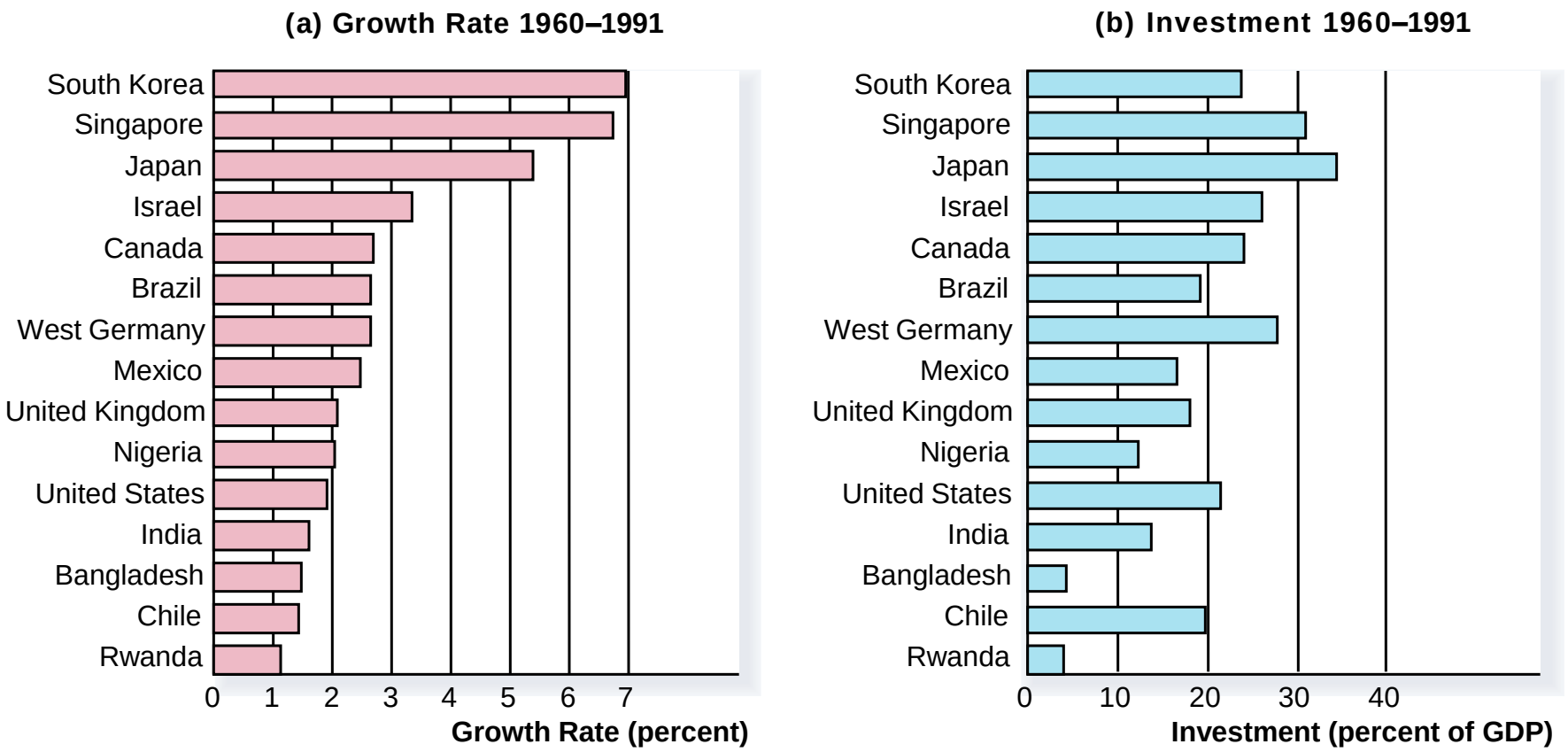
- Because of diminishing returns, an increase in the saving rate leads to higher growth only for a while.

- 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.

Diminishing Returns and the Catch-Up Effect

- The *catch-up effect* refers to the property whereby countries that start off poor tend to grow more rapidly than countries that start off rich.

Figure 1 Growth and Investment



Investment from Abroad

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

- 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.

Investment from Abroad

- Some of the benefits from this investment flow back to the foreign owners (through profit)
  - Still it increases the economy's stock of capital
  - For poor countries – one way to learn the state-of-the art technologies developed and used in richer countries
- Tools to encourage investment from abroad
  - Removing restrictions for foreign ownership of domestic capital

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

- Human capital mediate positive *externalities*
  - An educated person might generate new ideas about how best to produce goods and services
  - this in turn, might enter society's pool of knowledge and provide an external benefit to others
  - The return to schooling can be even greater for society than the return for the individual
  - E.g. public education

Education

- In less developed countries, where human capital is especially scarce
  - the gap between wages of educated and uneducated workers is even larger
  - Children often drop out of school at early age – because of *opportunity costs* (their help is needed to help support the family)

- 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.
  - It is necessary for investors to feel that their investments are secure.
  - Courts serve an important role – they enforce property rights

- Political instability – if revolutionary government might confiscate the capital of some businesses
  - Domestic residents have less incentives to save, invest, and start new businesses
  - Foreigners have less incentives to invest in the country

Free Trade

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

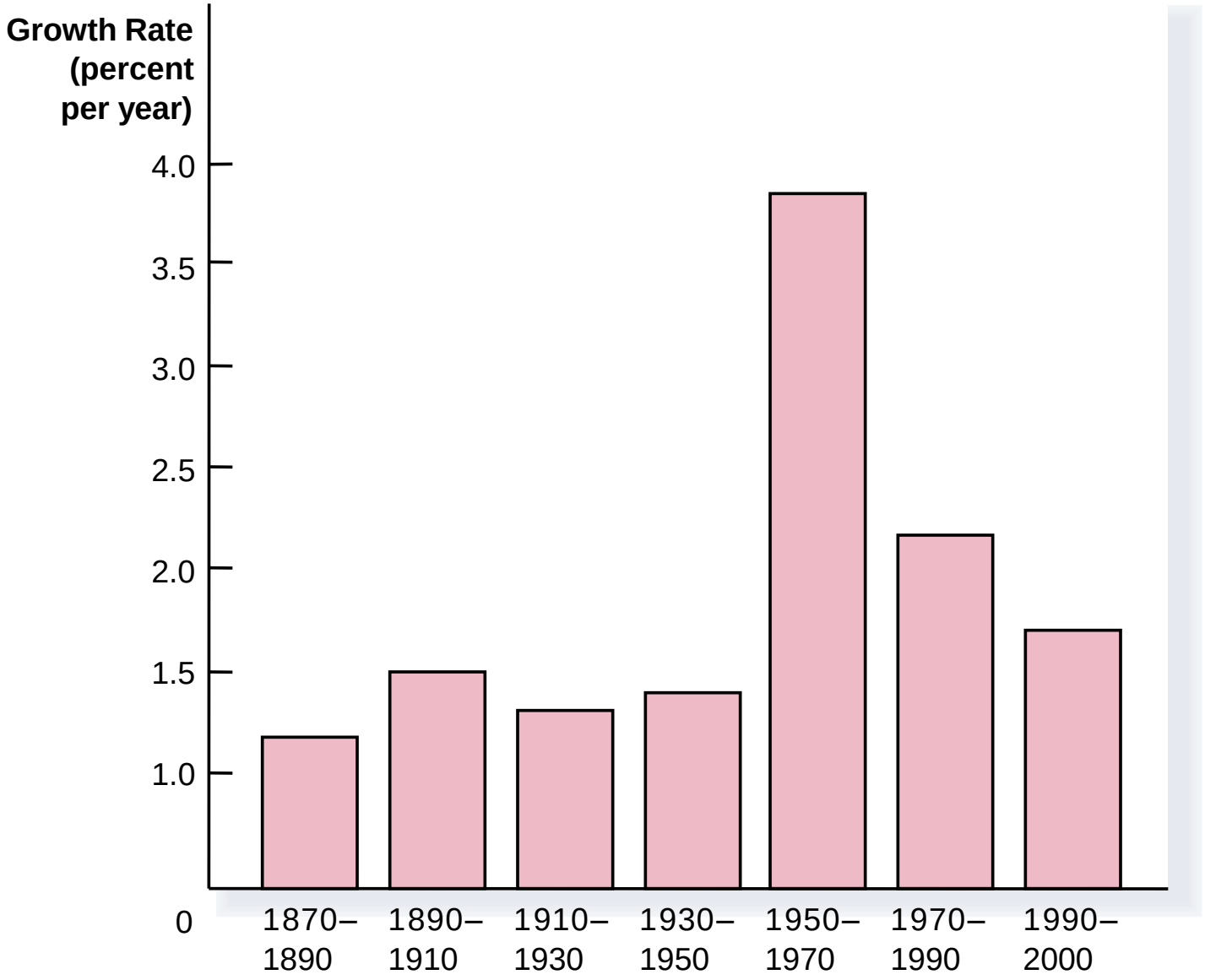
Free Trade

- 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.

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.

Figure 2 The Growth in Real GDP Per Person



CASE STUDY: The Productivity Slowdown and Speedup

- The causes of the changes in productivity growth are elusive.
- The slowdown cannot be traced to the factors of production that are most easily measured.
- Many economists attribute the slowdown and speedup in economic growth to changes in technology and the creation of new ideas.

Population Growth

- Economists and other social scientists have long debated how population growth affects a society
  - The most direct effect – the size of the labor force
  - At the same time – more people to consume goods and services

Population Growth

- Population growth interacts with other factors of production:
  - Stretching natural resources
  - Diluting the capital stock
  - Promoting technological progress

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.