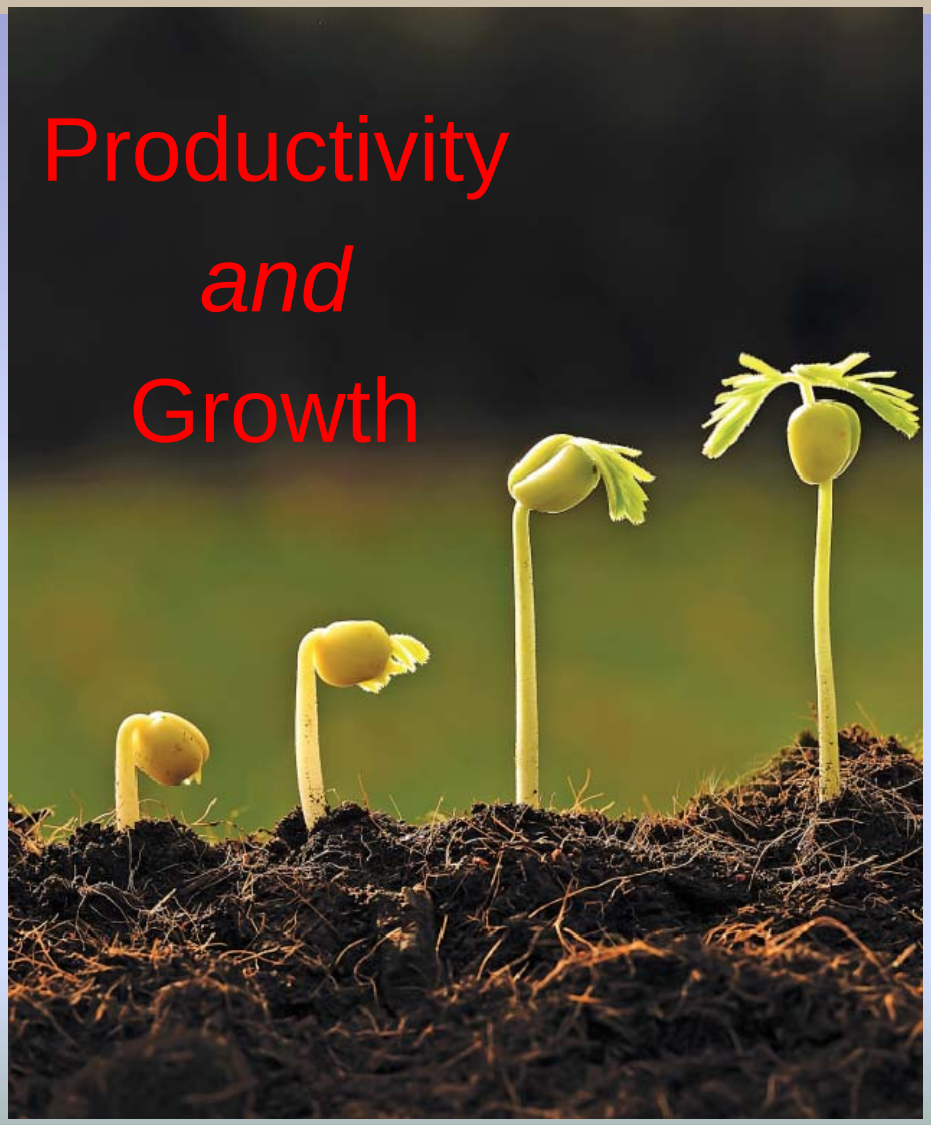
Chapter 8 ECON4

William A. McEachern



Theory of Productivity and Growth

- Increased standard of living
  - Increase in amount of resources
  - Increase in quality of resources
  - Better technology
  - Improvement in the rules of the game

Growth and PPF

- PPF, production possibilities frontier
  - Economy's production
  - Efficient use of resources
  - Assumptions
    - Fixed quantity of resources, technology, and rules of the game
    - Two categories of products
      - Consumer goods
      - Capital goods

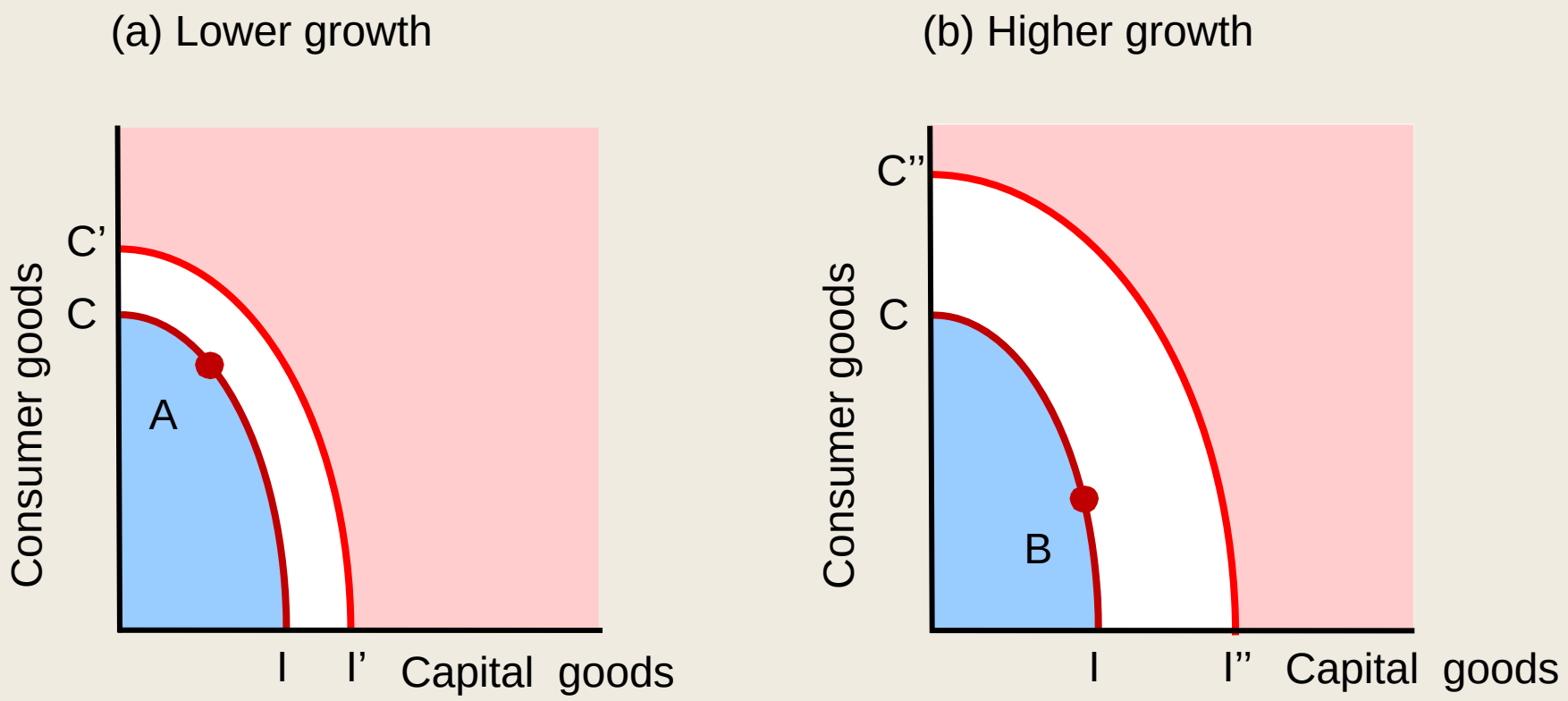
Growth and PPF

- PPF:
  - Inside: Inefficient
  - Outside: Unattainable
  - On the PPF: Efficient
  - Bowed out
    - Some resources are specialized
- Economic growth
  - Outward shift of PPF

Growth and PPF

- Economic growth
  - Greater availability of resources
  - Improvement in the quality of resources
  - Technological change that makes better use of resources
  - Improvements in the rules of the game that enhance production

Exhibit 1 Economic Growth Shown by Shifts Outward of the Production Possibilities Frontier



An economy that produces more capital goods will grow more, as reflected by a shift outward of the production possibilities frontier. More capital goods are produced in panel (b) than in panel (a), so the PPF shifts out more in panel (b).

What is Productivity?

- Production
  - Process that transform resources into goods and services
- Productivity
  - Efficient use of resources
  - Ratio of a specific measure of output to a specific measure of input
- Labor productivity
  - Output per unit of labor

Labor Productivity

- Labor
  - Most commonly used to measure productivity
  - 70% of production costs
  - Easily measured
  - Available statistics
- Labor productivity
  - Increases with human and physical capital per worker

Labor Productivity

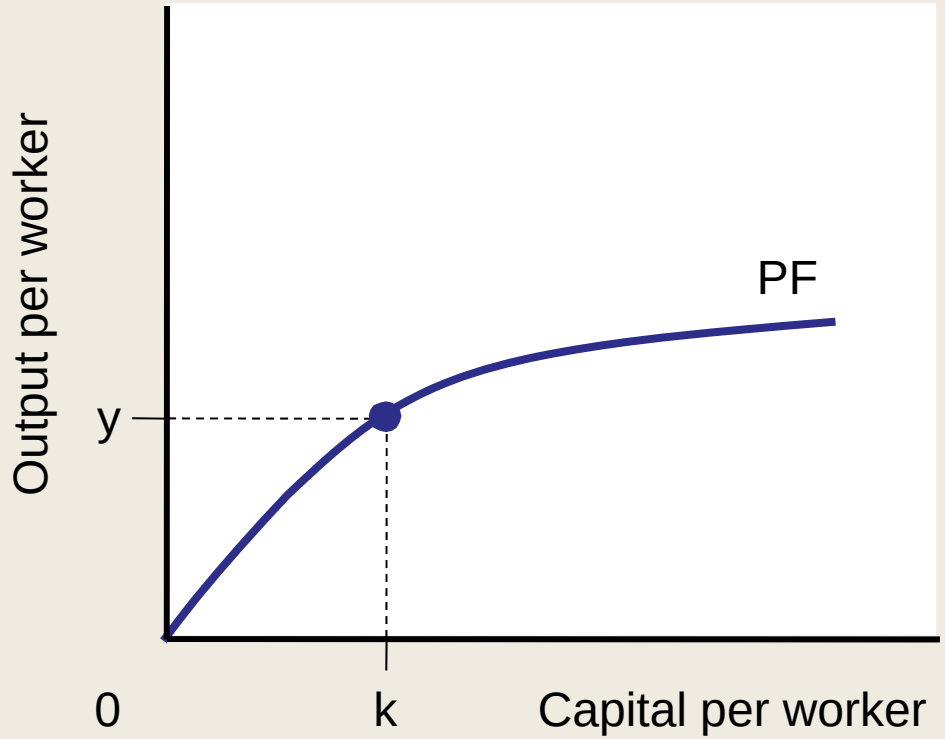
- Poorer countries
  - Labor is cheap, capital is dear
  - Producers substitute labor for capital
- Economy accumulates more capital per worker
  - Labor productivity increases
  - Standard of living grows

Per-Worker Production Function

- Per-worker production function, PF
  - Relationship between
    - Capital per worker
    - Output per worker
  - Upward sloping - diminishing slope
    - Diminishing marginal returns from capital
  - Increased productivity
    - More capital per worker - move along PF

Exhibit 2

Per-Worker Production Function



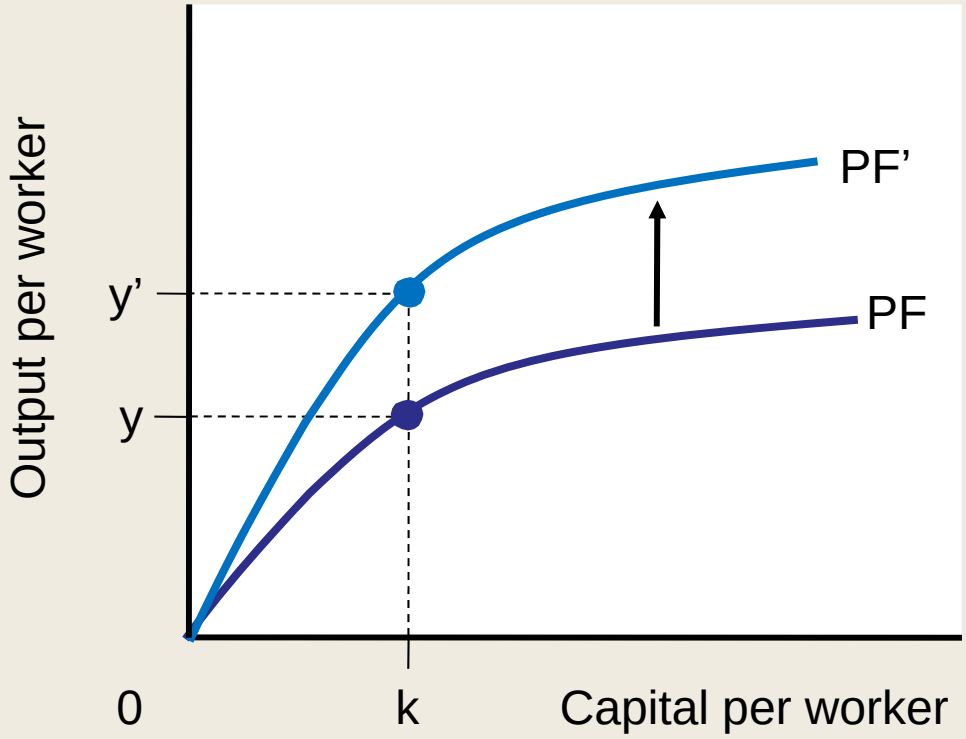
The per-worker production function, PF, shows a direct relationship between the amount of capital per worker, k, and the output per worker, y. The bowed shape of PF reflects the law of diminishing marginal returns from capital, which holds that as more capital is added to a given number of workers, output per worker increases but at a diminishing rate and eventually could turn negative.

Technological Change

- Technological change
  - Improves the quality of capital
  - Increased productivity
  - Upward rotation of PF
  - Higher standard of living

Exhibit 3

Impact of a Technological Breakthrough on the Per-Worker Production Function



A technological breakthrough increases output per worker at each level of capital per worker. Better technology makes workers more productive. This is shown by a rotation upward in the per-worker production function from PF to PF'. An improvement in the rules of the game would have a similar effect.

Rules of the Game

- Rules of the game
  - Formal and informal institutions that promote economic activity
    - Laws, customs, manners, conventions, other institutions
  - Stable political climate
    - Benefit productivity
    - Upward rotation of PF

Productivity & Growth in Practice

- Industrial market countries
  - Developed countries
  - The first to experience long-term economic growth during the 19th century
  - Highest standard of living
    - Abundant human and physical capital
  - 16% of world population
  - Produce 75% of world's output

Productivity & Growth in Practice

- Industrial market countries
  - Economically advanced capitalist countries of
    - Western Europe, North America, Australia, New Zealand, and Japan
  - Newly industrialized Asian economies
    - Taiwan, South Korea, Hong Kong, and Singapore

Productivity & Growth in Practice

- Developing countries
  - Poor countries
  - Lower standard of living
    - Less human and physical capital
    - Low labor productivity
  - 84% of world's population

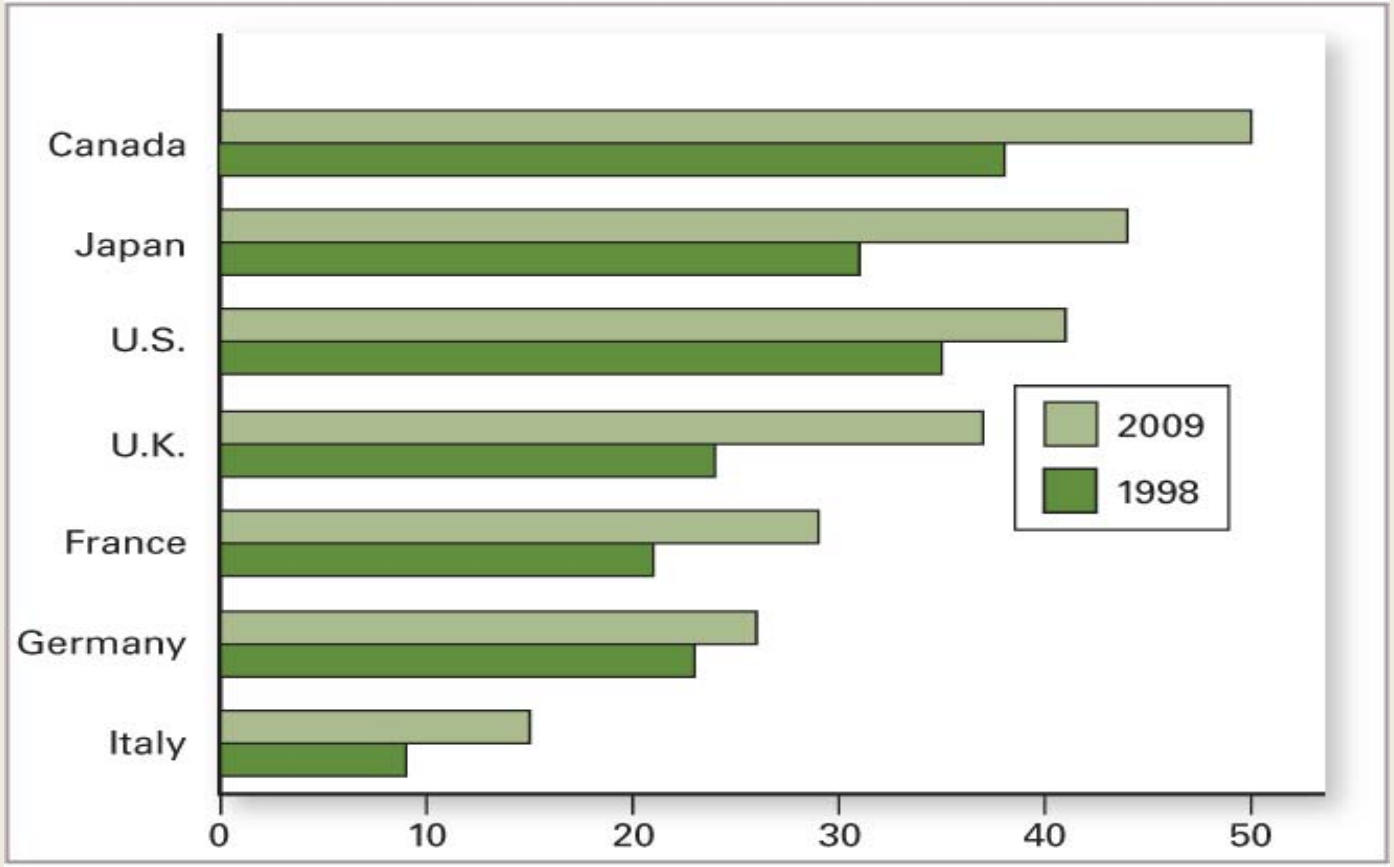
Education & Economic Development

- Education
  - Human capital
  - Higher productivity
- Industrial market economies
  - Higher education levels
- Developing countries
  - Lower education levels

Exhibit 4 Percent of Adult Population With at Least a Post-High School Degree: 1998 and 2009

Exhibit 4

Percent of Population Ages 25 to 64 with at Least a Post–High School Degree: 1998 and 2009



SOURCE: Based on figures in OECD, *Education at a Glance: 2011*, at http://www.oecd.org.

The share of the U.S. population ages 25 to 64 with at least a degree beyond high school increased from 35 percent in 1998 to 41 percent in 2009. The United States slipped from second among major industrial market economies in 1998 to third in 2009.

US Labor Productivity

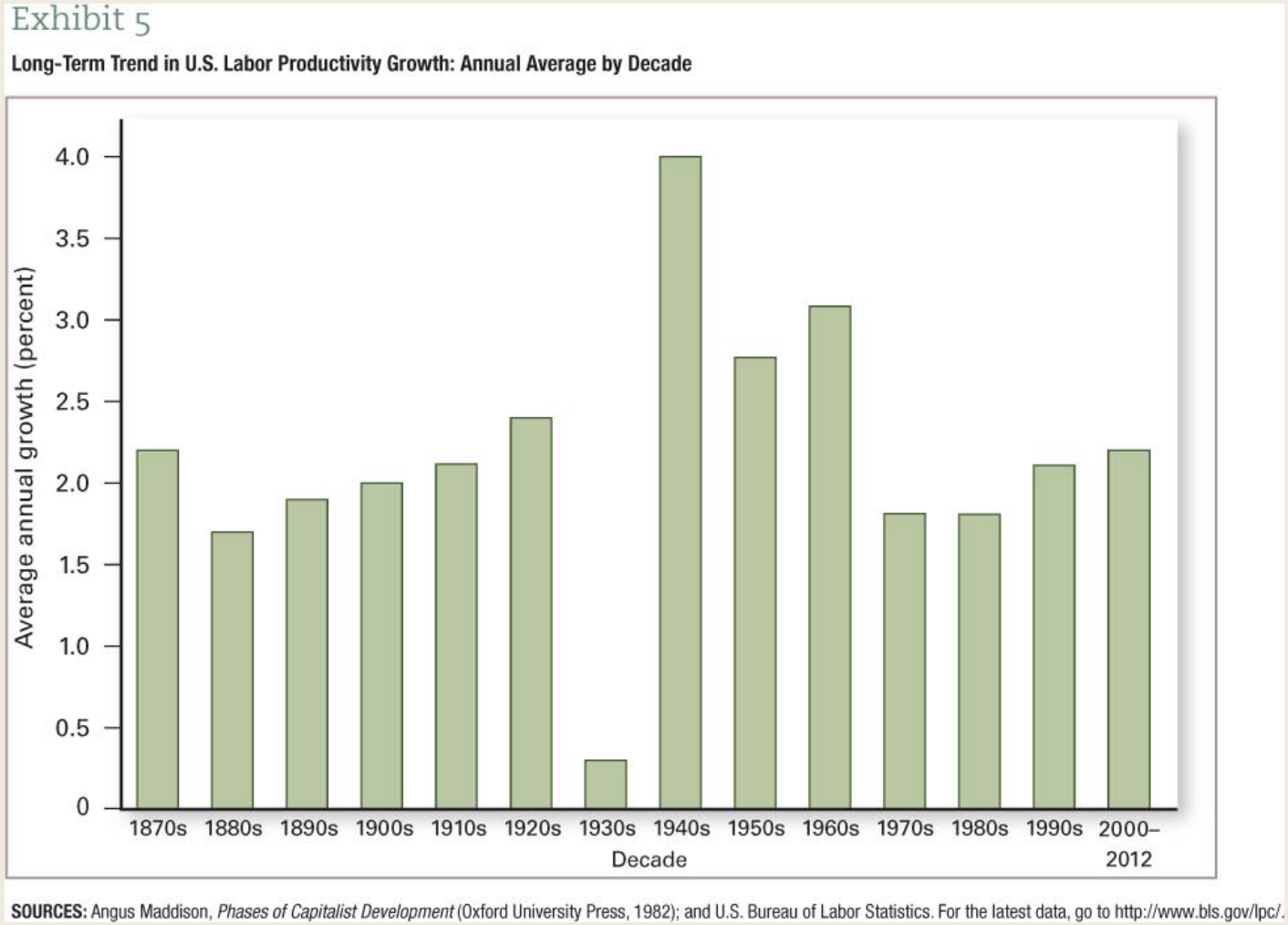
- Annual productivity growth
  - 2.1% per year, since 1870 (by 1,735%)
  - Over long periods
    - Small differences in productivity make huge differences in standard of living
- 1948-1973: Golden days
  - Productivity growth: 2.9% per year

US Labor Productivity

- 1974-1982: Slowdown to 1%
  - Oil pieces jumped (1973-1974, 1979-1980)
    - Inflation, stagflation, three recessions
  - Legislation
    - Protect the environment
    - Improve workplace safety
- 1983: rebound
  - Information revolution

Exhibit 5

Long-Term Trend in U.S. Labor Productivity Growth: Annual Average by Decade



Annual productivity growth, measured as the growth in real output per work hour, is averaged by decade. For the entire period since 1870, labor productivity grew an average of 2.1 percent per year. Note the big dip during the Great Depression of the 1930s and the big bounce back during World War II. Productivity growth slowed during the 1970s and 1980s but recovered during the 1990s and 2000s.

Exhibit 6

U.S. Labor Productivity Growth Slowed During 1974 to 1982 and Then Rebounded to 2005, Then Slowed Again

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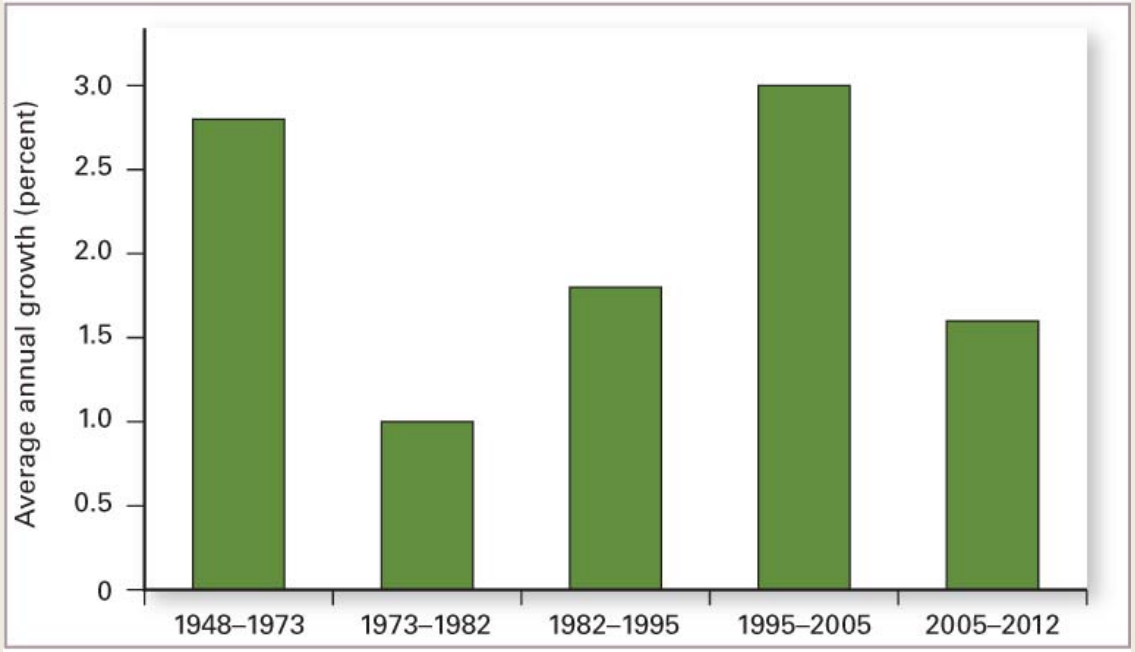

SOURCE: Averages based on annual estimates from the U.S. Bureau of Labor Statistics.
For the latest data go to http://www.bls.gov/lpc/home.htm.

The growth in labor productivity declined from an average of 2.9 percent per year between 1948 and 1973 to only 1.0 percent between 1974 and 1982. A jump in the price of oil contributed to three recessions during that stretch, and new environmental and workplace regulations, though necessary and beneficial, slowed down productivity growth temporarily. The information revolution powered by the computer chip and the Internet has boosted productivity in recent years.

Output per Capita

- Standard of living
  - Output per capita
  - Real GDP divided by population
- The U.S.
  - General upward trend
  - During recessions
    - Decrease in productivity

Exhibit 7

U.S. Real GDP per Capita has Nearly Tripled Since 1962

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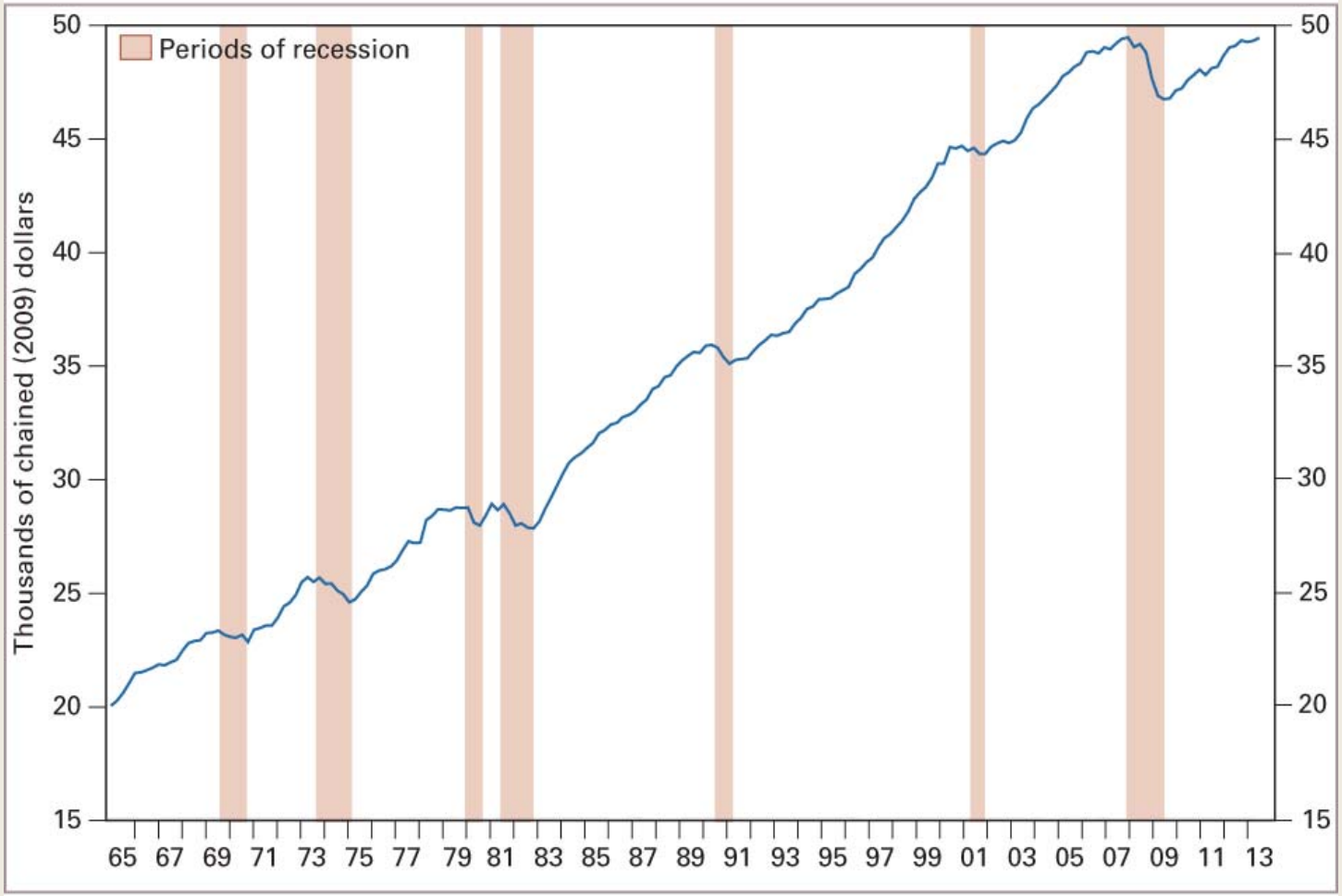


SOURCES: *Survey of Current Business*, 93 (August 2013): D-61. For the latest data, go to http://www.bea.gov/scb/index.htm. Select the most recent month, go to the "National Data" section toward the end of the page, and then select "Charts."

Despite eight recessions since 1959, real GDP per capita has nearly tripled. Periods of recession are indicated by the pink shaded bars.

International Comparisons

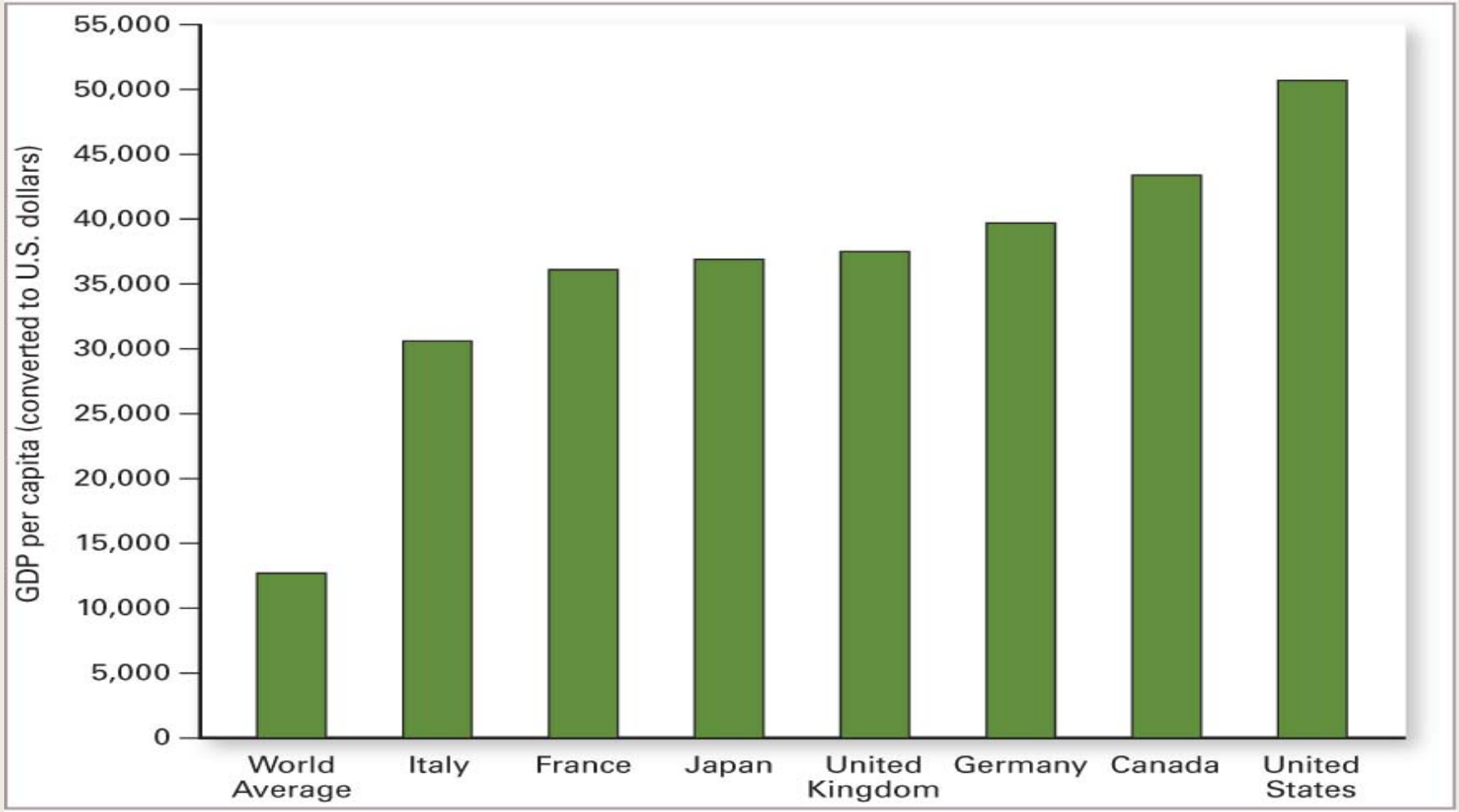
- U.S., level of output per capita
  - The highest: $46,400 per capita, 2009
  - 21% more than Canada
- U.S., growth in output per capita
  - The third: 1.8% per year

Exhibit 8

U.S. GDP per Capita in 2012 was Highest of Major Economies

Exhibit 8

U.S. GDP Per Capita Highest of Major Economies and Four Times the World Average



SOURCE: Based on 2012 dollar estimates from the OECD at http://www.oecd.org/home/; and *The World Factbook 2013:* at https://www.cia. gov/library/publications /the-world-factbook/index.html. Estimates have been adjusted across countries using the purchasing power of the local currency in 2012.

Exhibit 9

U.S. Real GDP per Capita Outgrew Most Other Major Economies Between 1990 and 2010

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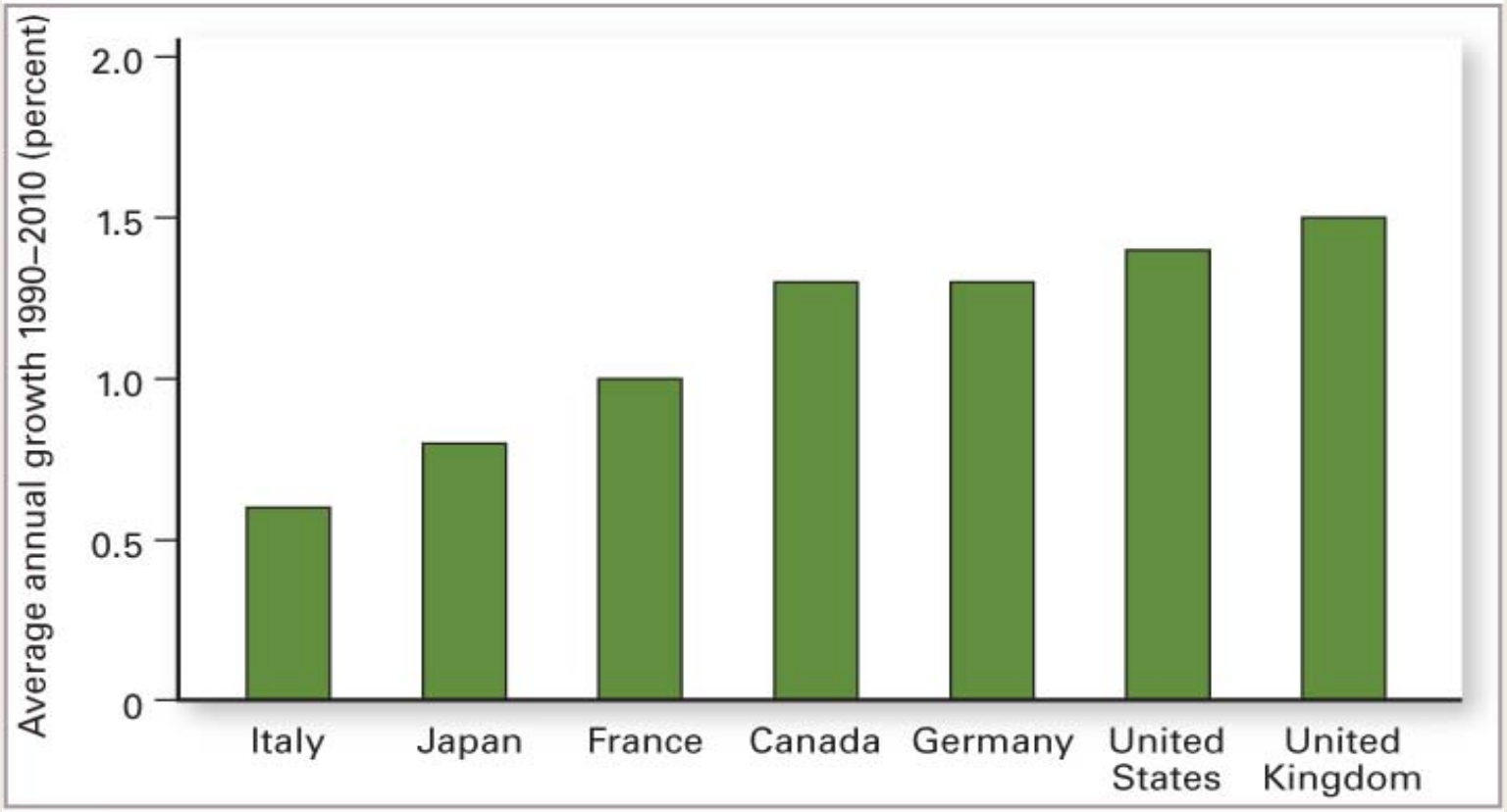


SOURCE: Based on annual figures from 1990 to 2010 from the U.S. Bureau of Labor Statistics at http:// www.bls.gov/fls/#productivity. Figures were converted into U.S. dollars based on the purchasing power of local currency. For the latest data, go to http://www.stats.bls.gov/fls/.

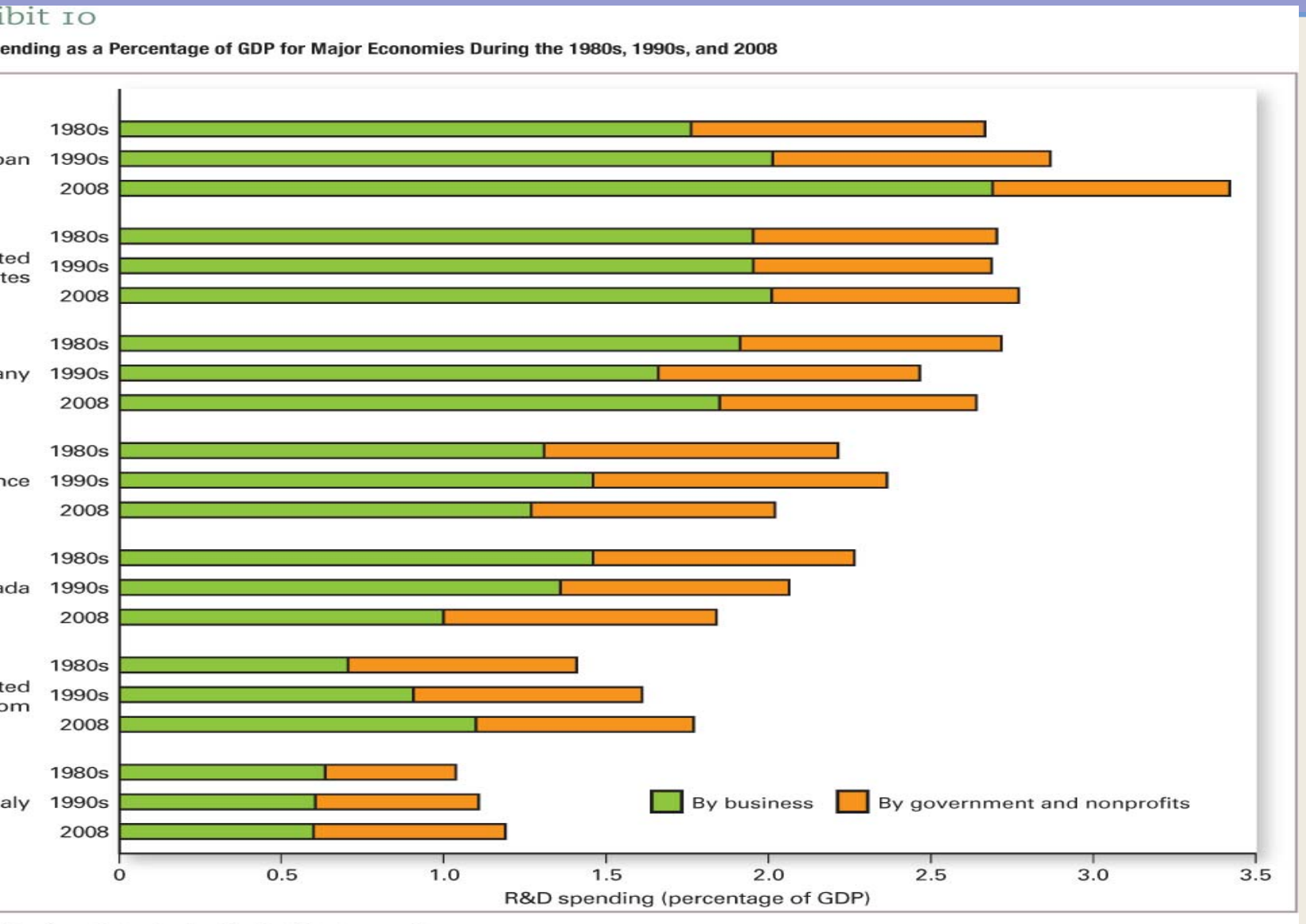
Other Issues

- Does technological change lead to unemployment?
  - Job dislocations, displaced workers
  - More affordable products, higher demand
    - Increased employment and production
  - No statistical evidence

Research and Development

- Basic research
  - General search for knowledge
  - First step for technological advancement
  - Yields a higher return to society
- Applied research
  - Answer particular questions
  - Develop specific products

ibit 10 R&D Spending as a Percentage of GDP for Major Economies During the 1980s, 1990s, and 2008



Industrial Policy

- Industrial policy
  - Government
    - Use taxes, subsidies, regulations, coordination
    - Nurture technologies
    - Protect domestic industries
  - Concerns
    - Government’s efficiency
    - Giveaway programs

Do Economies Converge?

- Convergence theory
  - Developing countries
    - Can grow faster than advanced ones
    - Should eventually close the gap
- Explanations
  - Adopt existing technologies
  - Invest in human resources

Do Economies Converge?

Evidence

- Some poor countries are closing the gap
  - Hong Kong, Singapore, South Korea, and Taiwan
  - Adopting the latest technology
  - Investing in human resources
- Others
  - Slow growth
  - Lower relative standard of living
  - Trapped

Do Economies Converge?

Explanations

- High birthrates
- Difference in human capital
- Unstable economic environment
- No institutions
- Bad infrastructures
- Civil war