

N. GREGORY

MANKIW

PRINCIPLES OF

# ECONOMICS

*Eight Edition*

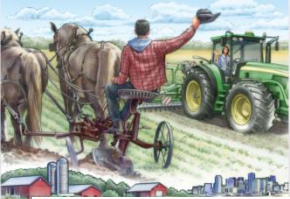


CHAPTER

25

## Production and Growth

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# Economic Growth around the World

- Real GDP per person
  - Living standard
  - Vary widely from country to country
- Growth rate
  - How rapidly real GDP per person grew in the typical year
- Because of differences in growth rates
  - Ranking of countries by income changes substantially over time

# Table 1 The Variety of Growth Experiences

| Country        | Period    | Real GDP per Person<br>at Beginning of<br>Period <sup>a</sup> | Real GDP per<br>Person at End of<br>Period <sup>a</sup> | Real GDP per<br>Person Growth<br>Rate (per year) |
|----------------|-----------|---|---|--|
| Brazil         | 1900-2014 | \$ 828  | \$15,590  | 2.61%  |
| Japan          | 1890-2014 | 1,600   | 37,920  | 2.59   |
| China          | 1900-2014 | 762   | 13,170  | 2.53   |
| Mexico         | 1900-2014 | 1,233   | 16,640  | 2.31   |
| Germany        | 1870-2014 | 2,324   | 46,850  | 2.11   |
| Indonesia      | 1900-2014 | 948   | 10,190  | 2.10   |
| Canada         | 1870-2014 | 2,527   | 43,360  | 1.99   |
| India          | 1900-2014 | 718   | 5,630   | 1.82   |
| United States  | 1870-2014 | 4,264   | 55,860  | 1.80   |
| Pakistan       | 1900-2014 | 785   | 5,090   | 1.65   |
| Argentina      | 1900-2014 | 2,440   | 12,510  | 1.44   |
| Bangladesh     | 1900-2014 | 663   | 3,330   | 1.43   |
| United Kingdom | 1870-2014 | 5,117   | 39,040  | 1.42   |

<sup>a</sup> Real GDP is measured in 2014 dollars.



# A picture is worth a thousand statistics



The United Kingdom is an advanced economy. In 2014, its income per person was \$39,040. A baby born in the United Kingdom can expect a relatively healthy childhood: Only 4 out of 1,000 children die before reaching age 5. Almost the entire population has access to modern sanitation facilities, such as a bathroom and sewer system, to safely remove human waste. Educational attainment is high: Among individuals of college age, 60 percent are enrolled in higher education.

# A picture is worth a thousand statistics, Part 1

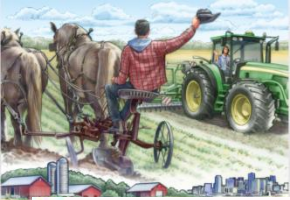


Mexico is a middle-income country. In 2014, its income per person was \$16,640. About 13 out of 1,000 children die before age 5. About 85 percent have access to modern sanitation. Among those of college age, 30 percent are enrolled.



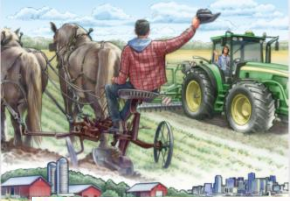


Mali is a poor country. In 2014, its income per person was only \$1,510. Life is often cut short: 115 out of 1,000 children die before age 5. Only 25 percent of the population has access to modern sanitation. And educational attainment in Mali is low: Among those of college age, only 7 percent are enrolled.



# Productivity, Part 1

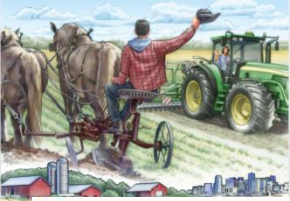
- Productivity
  - Quantity of goods and services
  - Produced from each unit of labor input
- Why productivity is so important
  - Key determinant of living standards
  - Growth in productivity is the key determinant of growth in living standards
  - An economy's income is the economy's output



# Productivity, Part 2

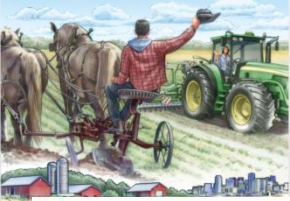
- Determinants of productivity
  - Physical capital per worker
  - Human capital per worker
  - Natural resources per worker
  - Technological knowledge





# Productivity, Part 3

- Physical capital
  - Stock of equipment and structures
  - Used to produce goods and services
- Human capital
  - Knowledge and skills that workers acquire through education, training, and experience



# Productivity, Part 4

- Natural resources
  - Inputs into the production of goods and services
  - Provided by nature, such as land, rivers, and mineral deposits
- Technological knowledge
  - Society's understanding of the best ways to produce goods and services



# Are natural resources a limit to growth?, Part 1



- **Argument**

- World's population is over 7 billion
- Natural resources — will eventually limit how much the world's economies can grow
  - Fixed supply of nonrenewable natural resources – will run out
  - Stop economic growth
  - Force living standards to fall

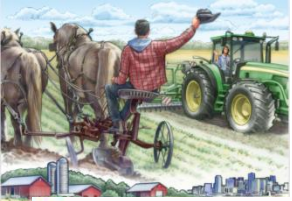




# Are natural resources a limit to growth?, Part 2

- Technological progress
  - Often yields ways to avoid these limits
    - Improved use of natural resources over time
    - Recycling
    - New materials
- Are these efforts enough to permit continued economic growth?

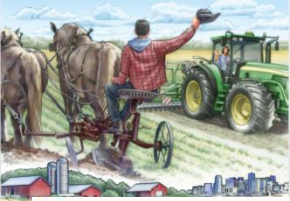
- **Prices of natural resources**
  - Scarcity — reflected in market prices
  - Natural resource prices
    - Substantial short-run fluctuations
    - Stable or falling — over long spans of time
  - Our ability to conserve these resources
    - Growing more rapidly than their supplies are dwindling



# Saving and Investment

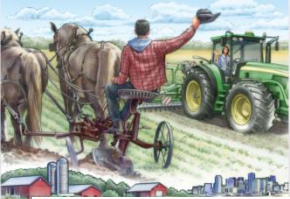
- Raise future productivity
  - Invest more current resources in the production of capital
  - Trade-off
    - Devote fewer resources to produce goods and services for current consumption





# Diminishing Returns, Part 1

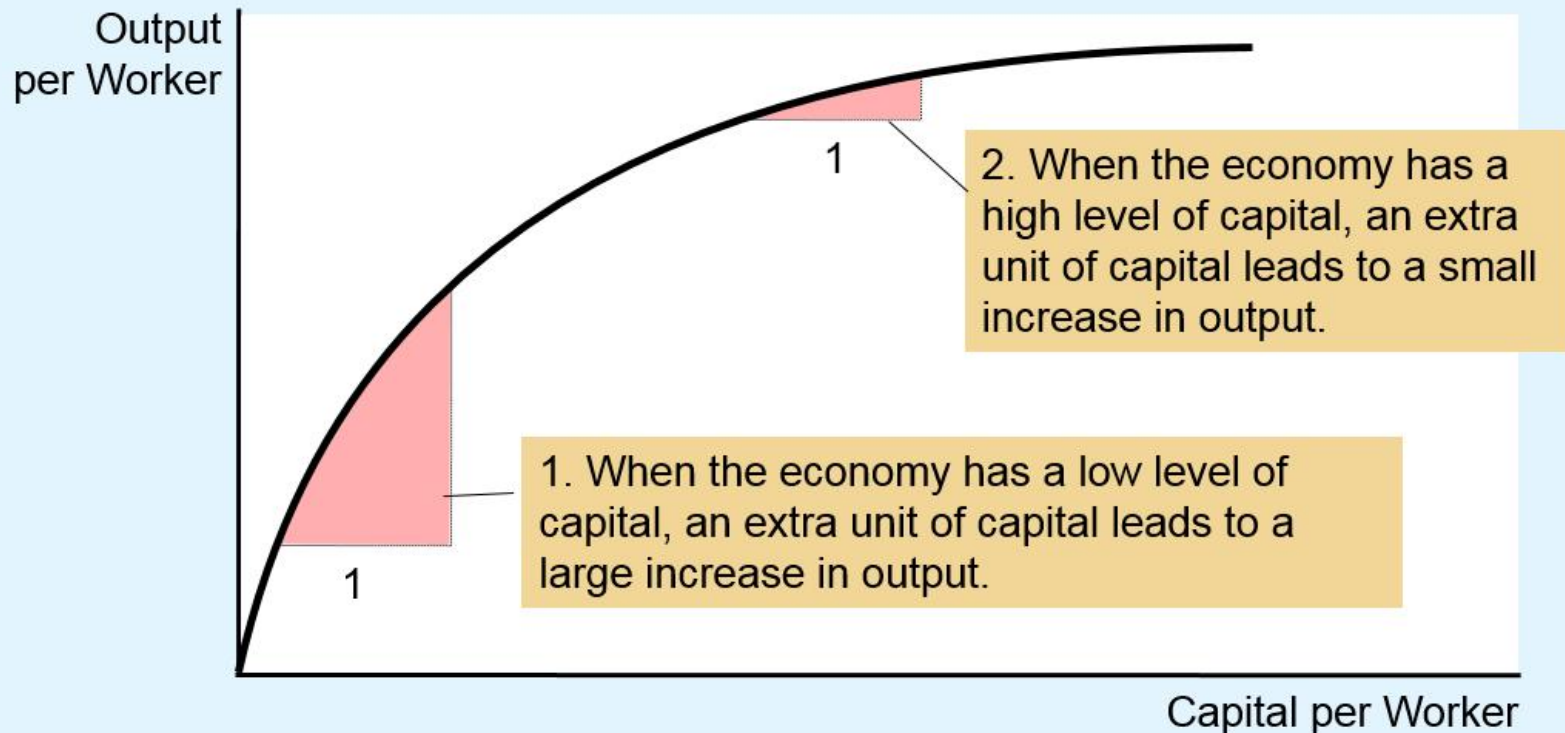
- Higher savings rate
  - Fewer resources – used to make consumption goods
  - More resources – to make capital goods
  - Capital stock increases
  - Rising productivity
  - More rapid growth in GDP



# Diminishing Returns, Part 2

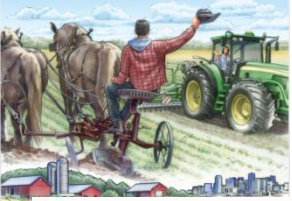
- Diminishing returns
  - Benefit from an extra unit of an input
  - Declines as the quantity of the input increases
- In the long run, higher savings rate
  - Higher level of productivity
  - Higher level of income
  - Not higher growth in productivity or income

# Figure 1 Illustrating the Production Function



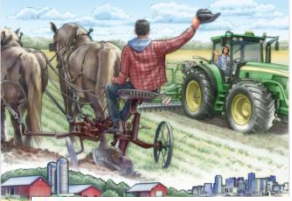
This figure shows how the amount of capital per worker influences the amount of output per worker. Other determinants of output, including human capital, natural resources, and technology, are held constant. The curve becomes flatter as the amount of capital increases because of diminishing returns to capital.





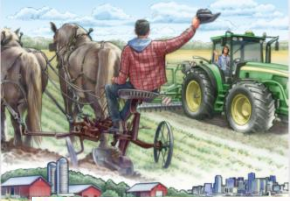
# Diminishing Returns, Part 3

- Catch-up effect
  - Countries that start off poor
  - Tend to grow more rapidly than countries that start off rich
- Poor countries
  - Low productivity
  - Even small amounts of capital investment
    - Increase workers' productivity substantially



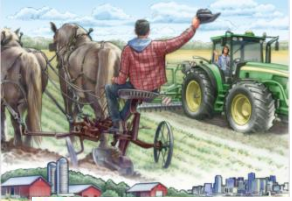
# Diminishing Returns, Part 4

- Rich countries
  - High productivity
  - Additional capital investment
    - Small effect on productivity
- Poor countries
  - Tend to grow faster than rich countries



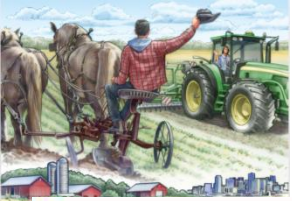
# Investment from Abroad, Part 1

- Investment from abroad
  - Another way for a country to invest in new capital
  - Foreign direct investment
    - Capital investment that is owned and operated by a foreign entity
  - Foreign portfolio investment
    - Investment financed with foreign money but operated by domestic residents



# Investment from Abroad, Part 2

- Benefits from investment
  - Some flow back to the foreign capital owners
  - Increase the economy's stock of capital
  - Higher productivity
  - Higher wages
  - State-of-the-art technologies

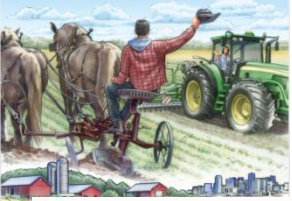


# Investment from Abroad, Part 3

- World Bank

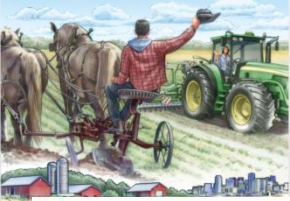
- Encourages flow of capital to poor countries
- Funds from world's advanced countries
- Makes loans to less developed countries
  - Roads, sewer systems, schools, other types of capital
- Advice about how the funds might best be used





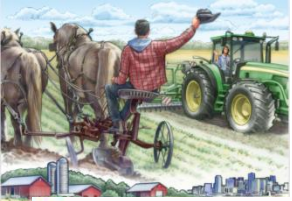
# Investment from Abroad, Part 4

- World Bank and the International Monetary Fund
  - Set up after World War II
  - Economic distress leads to:
    - Political turmoil, international tensions, and military conflict
  - Every country has an interest in promoting economic prosperity around the world



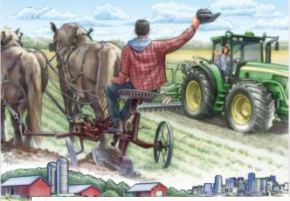
# Education

- Education
  - Investment in human capital
  - Gap between wages of educated and uneducated workers
  - Opportunity cost: wages forgone
  - Conveys positive externalities
  - Public education – large subsidies to human-capital investment
- Problem for poor countries: Brain drain



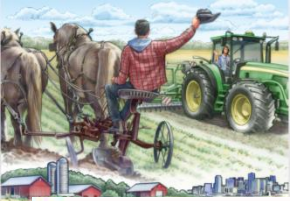
# Health and Nutrition, Part 1

- Human capital
  - Education
  - Expenditures that lead to a healthier population
- Healthier workers
  - More productive
- Wages
  - Reflect a worker's productivity



# Health and Nutrition, Part 2

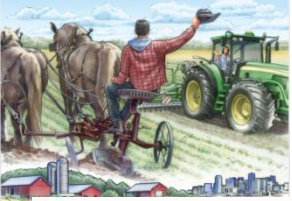
- Right investments in the health of the population
  - Increase productivity
  - Raise living standards
- Historical trends: long-run economic growth
  - Improved health – from better nutrition
  - Taller workers – higher wages – better productivity



# Health and Nutrition, Part 3

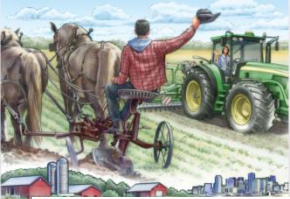
- Vicious circle in poor countries
  - Poor countries are poor
    - Because their populations are not healthy
  - Populations are not healthy
    - Because they are poor and cannot afford better healthcare and nutrition





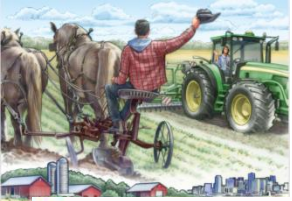
# Health and Nutrition, Part 4

- Virtuous circle
  - Policies that lead to more rapid economic growth
  - Would naturally improve health outcomes
  - Which in turn would further promote economic growth



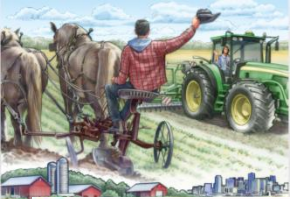
# Property Rights, Political Stability, Part 1

- To foster economic growth
  - Protect property rights
    - Ability of people to exercise authority over the resources they own
    - Courts – enforce property rights
  - Promote political stability
- Property rights
  - Prerequisite for the price system to work



# Property Rights, Political Stability, Part 2

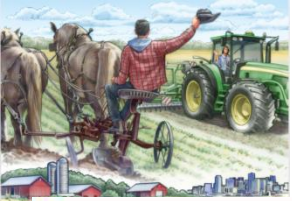
- Lack of property rights
  - Major problem
  - Contracts are hard to enforce
  - Fraud goes unpunished
  - Corruption
    - Impedes the coordinating power of markets
    - Discourages domestic saving
    - Discourages investment from abroad



# Property Rights, Political Stability, Part 3

- Political instability

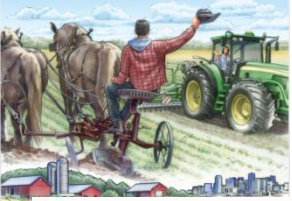
- A threat to property rights
- Revolutions and coups
- Revolutionary government might confiscate the capital of some businesses
- Domestic residents – less incentive to save, invest, and start new businesses
- Foreigners – less incentive to invest



# Free Trade, Part 1

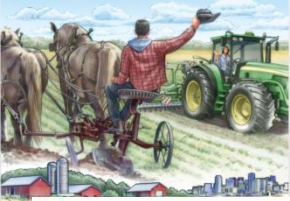
- Inward-oriented policies
  - Avoid interaction with the rest of the world
  - Infant-industry argument
    - Tariffs
    - Other trade restrictions
  - Adverse effect on economic growth





# Free Trade, Part 2

- Outward-oriented policies
  - Integrate into the world economy
  - International trade in goods and services
  - Economic growth
- Amount of trade – determined by
  - Government policy
  - Geography
    - Easier to trade for countries with natural seaports



# Research and Development

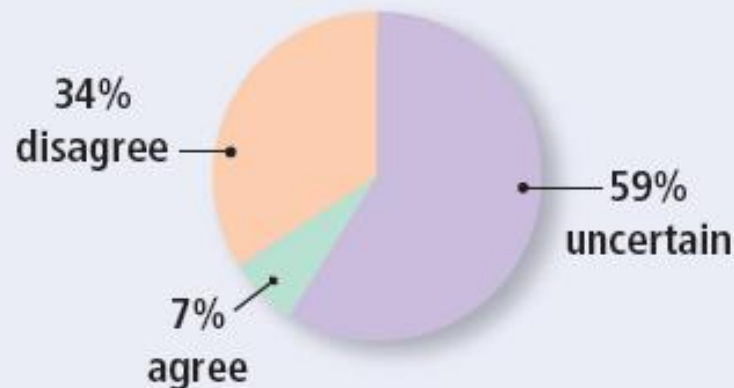
- Knowledge – public good
  - Government – encourages research and development
    - Farming methods
    - Aerospace research (Air Force; NASA)
    - Research grants
      - National Science Foundation
      - National Institutes of Health
    - Tax breaks
    - Patent system

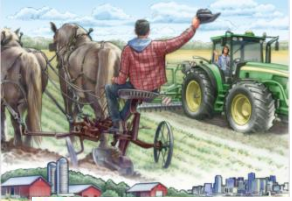
# ASK THE EXPERTS

## Innovation and Growth

*“Future innovations worldwide will not be transformational enough to promote sustained per-capita economic growth rates in the United States and western Europe over the next century as high as those over the past 150 years.”*

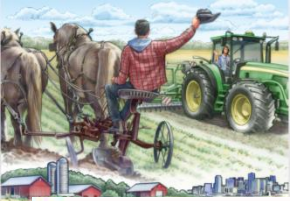
What do economists say?





# Population Growth, Part 1

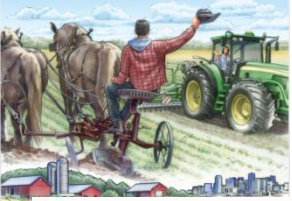
- Large population
  - More workers to produce goods and services
    - Larger total output of goods and services
  - More consumers
- Stretching natural resources
  - Malthus: an ever-increasing population
    - Strain society's ability to provide for itself
    - Mankind – doomed to forever live in poverty



# Population Growth, Part 2

- Diluting the capital stock
  - High population growth
    - Spread the capital stock more thinly
    - Lower productivity per worker
    - Lower GDP per worker
- Reducing the rate of population growth
  - Government regulation
  - Increased awareness of birth control
  - Equal opportunities for women





# Population Growth, Part 3

- Promoting technological progress
  - World population growth
    - Engine for technological progress and economic prosperity
    - More people = More scientists, more inventors, more engineers