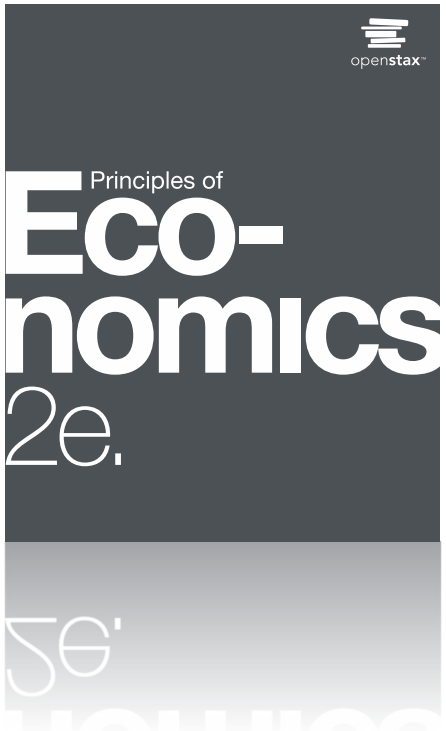
PRINCIPLES OF ECONOMICS 2e

Chapter 20 Economic Growth

PowerPoint Image Slideshow



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CH.20 OUTLINE

Preliminary: Estimated Calorie Needs

Gender	Age (years)	Sedentary[b]	Moderately Active[c]	Active[d]
Child	2-3	1,000	1,000-1,400	1,000-1,400
Female	4-8 9-13 14-18 19-30 31-50 51+	1,200 1,600 1,800 2,000 1,800 1,600	1,400-1,600 1,600-2,000 2,000 2,000-2,200 2,000 1,800	1,400-1,800 1,800-2,200 2,400 2,400 2,200 2,000-2,200
Male	4-8 9-13 14-18 19-30 31-50 51+	1,400 1,800 2,200 2,400 2,200 2,000	1,400-1,600 1,800-2,200 2,400-2,800 2,600-2,800 2,400-2,600 2,200-2,400	1,600-2,000 2,000-2,600 2,800-3,200 3,000 2,800-3,000 2,400-2,800

Source: WebMD

Humans need about 2,500 calories a day to maintain “energy balance”, depending on height, weight, and gender.

Daily Calorie Consumption by Country

Credit: modification of work by Lauren Manning/Flickr Creative Commons

- The average number of calories that people consume per day increased over time.
- Even more so has the amount of food calories that people are able to afford based on their working wages.
- Calorie consumption varies by nation.

20.1 The Relatively Recent Arrival of Economic Growth

- **Modern economic growth** - the period of rapid economic growth from 1870 onward.

- Rapid and sustained economic growth is a relatively recent experience for humanity.

- **Before the last two centuries, the average person's standard of living was very low and had not changed much for centuries.**

Industrial Revolution

- **Industrial Revolution:** the First Industrial Revolution in the late 17th and especially the early 18th century spread manufacture by power-driven machinery. Many economic and social changes resulted.
- **Technological Revolution:** the late 19th century into the early 20th century, also known as the Second Industrial Revolution, saw rapid scientific innovation, standardization, mass production and industrialization.

- These industrial revolutions led to increasing inequality among nations.
  - 1870: GDP of the top economies of the world was 2.4 times the GDP per capita of the world's poorest economies.
  - 1960: the top economies had 4.2 times the GDP per capita of the world's poorest economies.

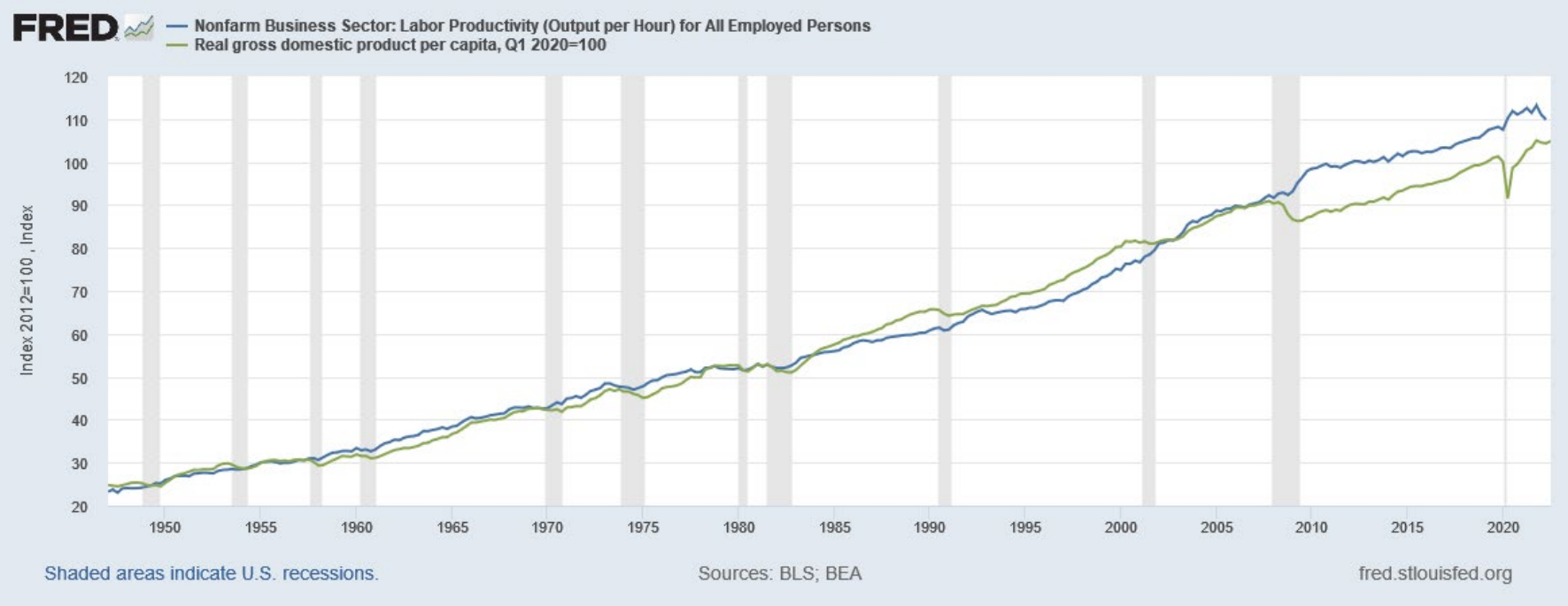
Rule of Law and Economic Growth

- Influence of two key factors on an economy's long-run economic growth:

- Adherence to **rule of law** -
  - The process of enacting laws that protect individual and entity rights to use their property as they see fit.
  - Laws must be clear, public, fair, and enforced, and applicable to all members of society.

- Protection of **contractual rights** -
  - The rights of individuals to enter into agreements with others regarding the use of their property
  - Providing recourse through the legal system in the event of noncompliance.

20.2 Labor Productivity and Economic Growth



Source: https://fred.stlouisfed.org/graph/?g=VsLQ

- **Labor productivity:** real output per worker or per hour worked.
  - Also called *worker* productivity.
- The average U.S. worker produced over twice as much per hour in 2015 than in 1975.
- Sustained economic growth reflects growth in labor productivity.

Determinants of Worker Productivity

- **Human capital:**
  - the accumulated knowledge (from education and experience), skills, and expertise of workers in an economy.

- **Physical capital:**
  - e.g., buildings, machine tools, infrastructure

- **Technological change:** invention and innovation.
  - **Invention** - advances in knowledge.
  - **Innovation** - putting advances in knowledge to use in a new product or service.

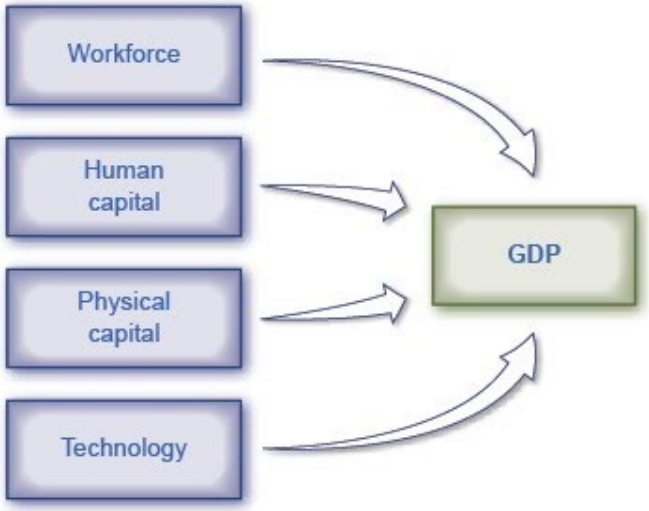
- **Economies of scale:** the cost advantages that industries obtain due to size.

Sources of Economic Growth: The Aggregate Production Function

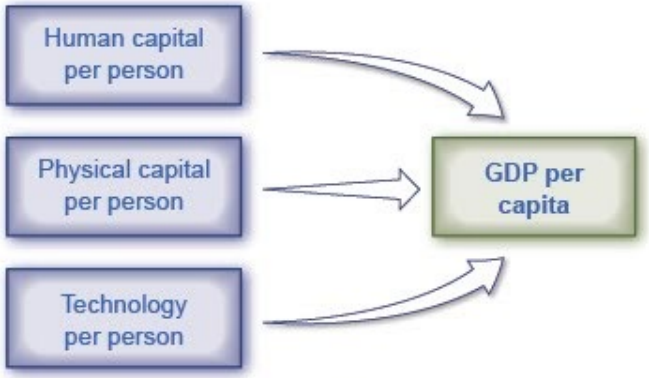
- **Microeconomic production function:**
  - how a *firm* turns economic inputs such as labor, machinery, and raw materials into outputs like goods and services.
  - describes a *firm's* (or an *industry's*) inputs and outputs.

- **Aggregate production function:**
  - how an economy as a whole turns economic inputs such as human capital, physical capital, and technology into output measured as GDP or GDP per capita.

Components of the Aggregate Production Function



(a) Aggregate production function with GDP as its output



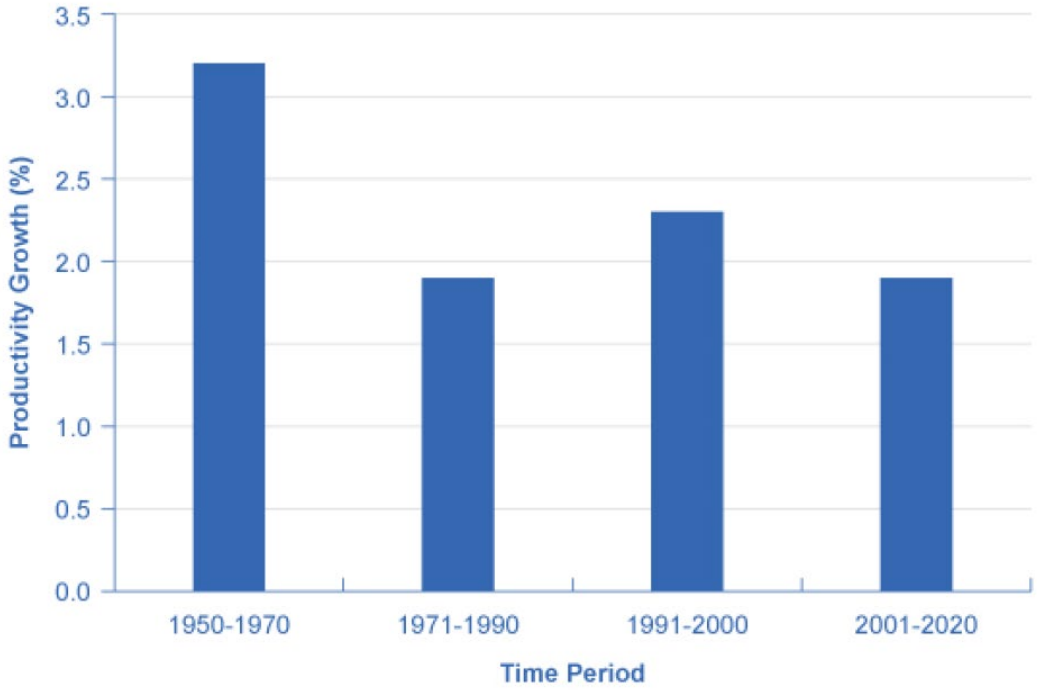
(b) Aggregate production function with GDP per capita as its output

- An aggregate production function shows what goes into producing the output for an overall economy.

  (a) This aggregate production function has GDP as its output.

  (a) This aggregate production function has GDP per capita as its output. Because we calculate it on a per-person basis, we already figure the labor input into the other factors and we do not need to list it separately.

US Productivity Growth Since 1950



- U.S. growth in worker productivity was very high between 1947 and 1973.
- It then declined to lower levels in the later 1970s and the 1980s.
- The late 1990s and early 2000s saw productivity rebound, but then productivity sagged a bit between 2007 and 2019.
- Some think the productivity rebound of the late 1990s and early 2000s marks the start of a “new economy” built on higher productivity growth, but we cannot determine this until more time has passed. (Source: U.S. Department of Labor, Bureau of Labor Statistics.)

GDP and Compound Growth Rates

- **Compound growth rate** - the rate of growth when multiplied by a base that includes past GDP growth.

- Example: If South Korea had a GDP of $1.67 trillion with a growth rate of 2.8%, we can project future GDP's.
- https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG?locations=KR

Year	Starting GDP	Growth Rate 2%	Year-End Amount
1	$1.67 Trillion ×	(1+0.028)	$1.72 Trillion
2	$1.72 Trillion ×	(1+0.028)	$1.76 Trillion
3	$1.76 Trillion ×	(1+0.028)	$1.81 Trillion
4	$1.81 Trillion ×	(1+0.028)	$1.87 Trillion
5	$1.87 Trillion ×	(1+0.028)	$1.92 Trillion

To another decimal place, the last column is 1.717, 1.765, 1.814, 1.865, 1.917.

The Power of Sustained Economic Growth

- Nothing is more important for people's standard of living than sustained economic growth.
- When sustained and compounded, even small changes in the rate of growth make an enormous difference in the standard of living.

- How to calculate what GDP will be at the given growth rate in the future:
  - GDP at starting date × (1 + growth rate of GDP)$^{\text{years}}$ = GDP at end date

Growth Rate	Value of an original 100 in 10 Years	Value of an original 100 in 25 Years	Value of an original 100 in 50 Years
1%	110	128	164
3%	134	209	438
5%	163	339	1,147
8%	216	685	4,690

20.3 Components of Economic Growth

- **Physical capital:** the plant and equipment that firms use in production; this includes infrastructure.
  - **Infrastructure** - a component of physical capital such as roads and rail systems.
  - increase in the quantity and increase in the quality both matter

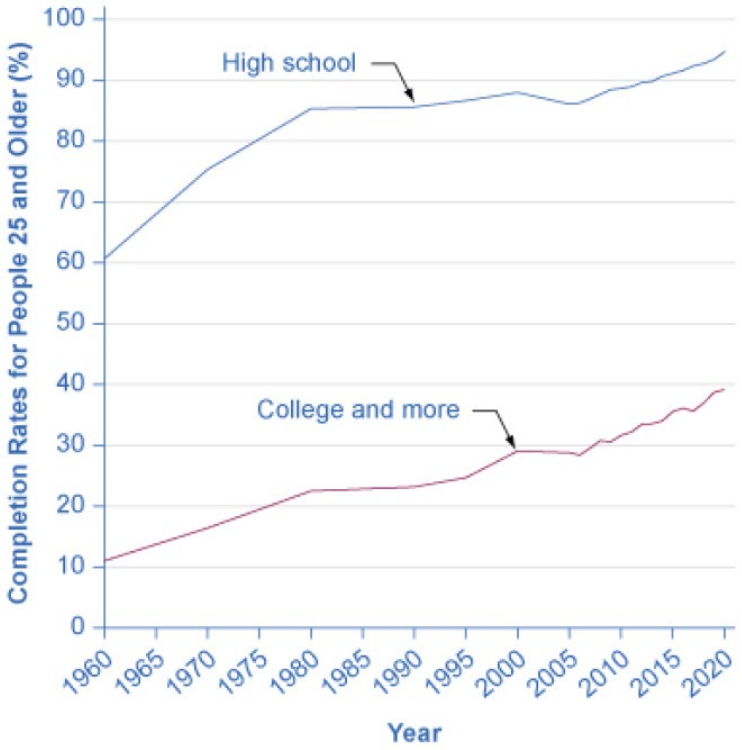
- **Human capital:**
  - education and training
  - social norms, institutions, and networks (social capital)

- **Technology:** all the ways in which existing inputs produce more or higher quality, as well as different and altogether new products.

Capital Deepening

- **Capital deepening:** increased capital per person.
  - human capital per worker
  - physical capital per worker.

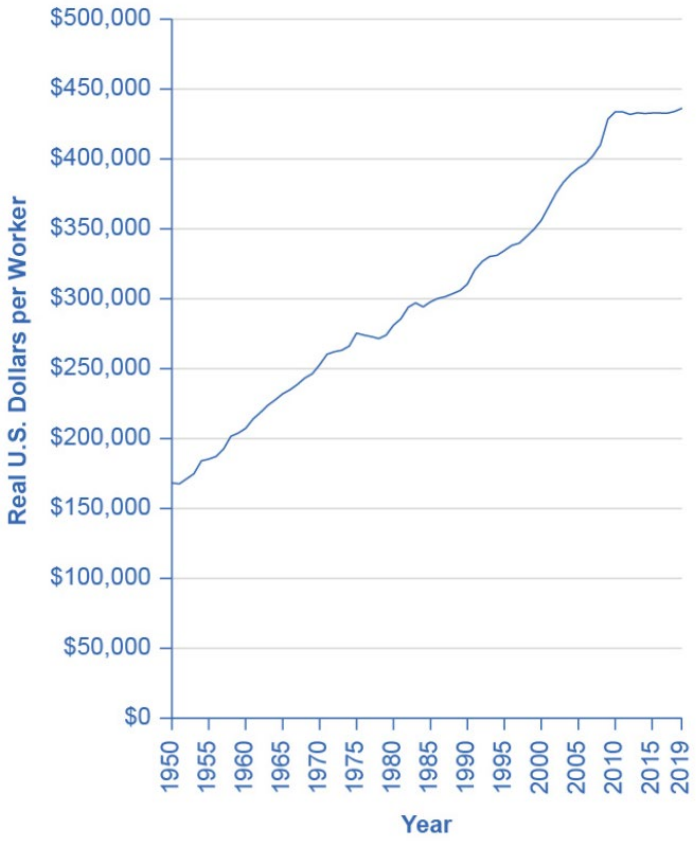
Human Capital Deepening in the U.S.



Source: US Department of Education, National Center for Education Statistics

- Rising levels of education for persons 25 and older *deepen* human capital in the U.S. economy.
    - Today, under one-third of U.S. adults have completed a four-year college degree.
- There is clearly room for additional deepening of human capital to occur.

Physical Capital Deepening in the US



(Source: Center for International Comparisons of Production, Income and Prices, University of Pennsylvania)

- Physical capital **deepening**: plant and equipment **per worker** in the U.S. economy has risen over the decades.
    - The increase leveled off in the 1970s and 1980s, which were also times of slower-than-usual growth in worker productivity.

Growth Accounting Studies

- Growth accounting studies determine how much physical and human capital deepening and technology have contributed to growth.
  - *Technology* is typically the most important contributor to economic growth.
  - Growth in human capital and physical capital explains only half or less of economic growth.
- Interactions: The three factors of human capital, physical capital, and technology must all be present to succeed.

A Healthy Climate for Economic Growth

- Markets that allow personal and business rewards and incentives for increasing human and physical capital encourage overall macroeconomic growth.
- Externalities and Public Goods
  - Times when markets fail to allocate capital or technology in a manner that provides the greatest benefit for society as a whole.
- Some areas in which governments around the world have chosen to invest in to facilitate capital deepening and technology:
  - Education
  - Savings and Investment
  - Infrastructure
  - **Special Economic Zones** - area of a country, usually with access to a port where, among other benefits, the government does not tax trade.
  - Basic Scientific Research

20.4 Economic Convergence

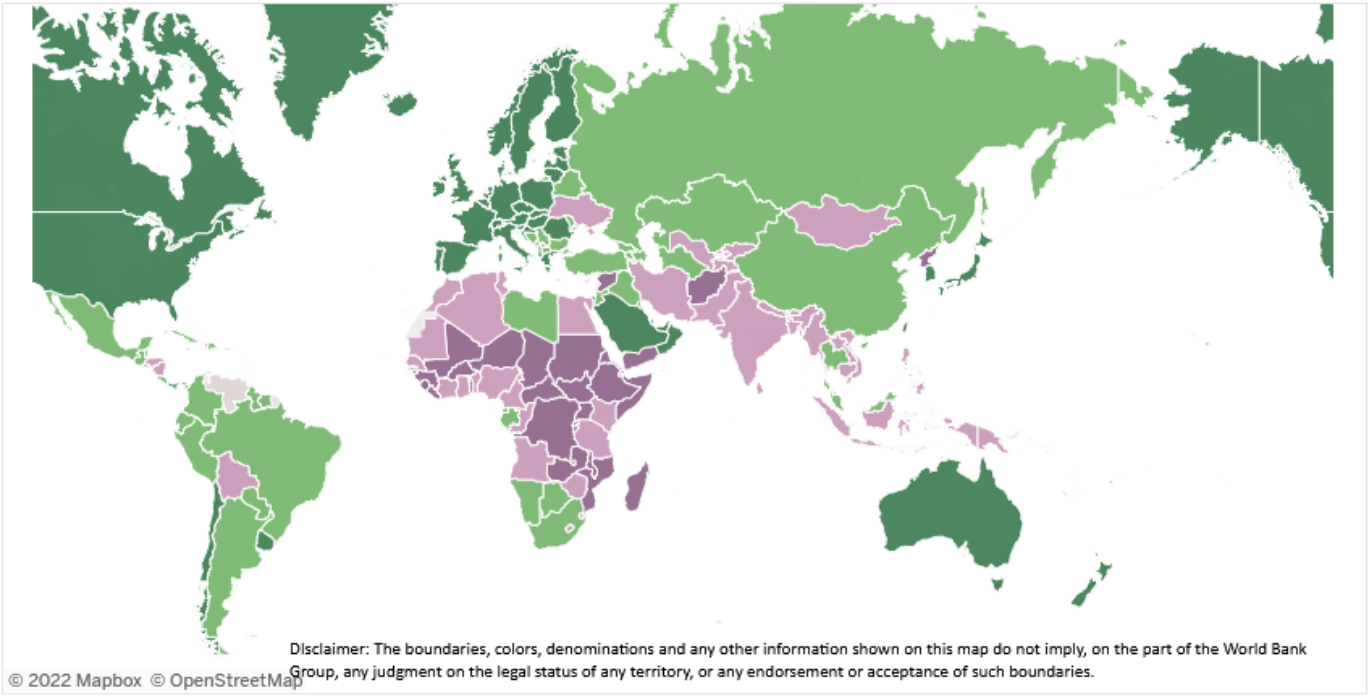
- **Convergence:** when economies with low per capita incomes grow faster than economies with high per capita incomes.
- Low-income countries do have GDP growth that is faster than that of the high-income countries (on average).
- BUT: middle-income countries often have GDP growth that is faster than that of the low-income countries (on average).

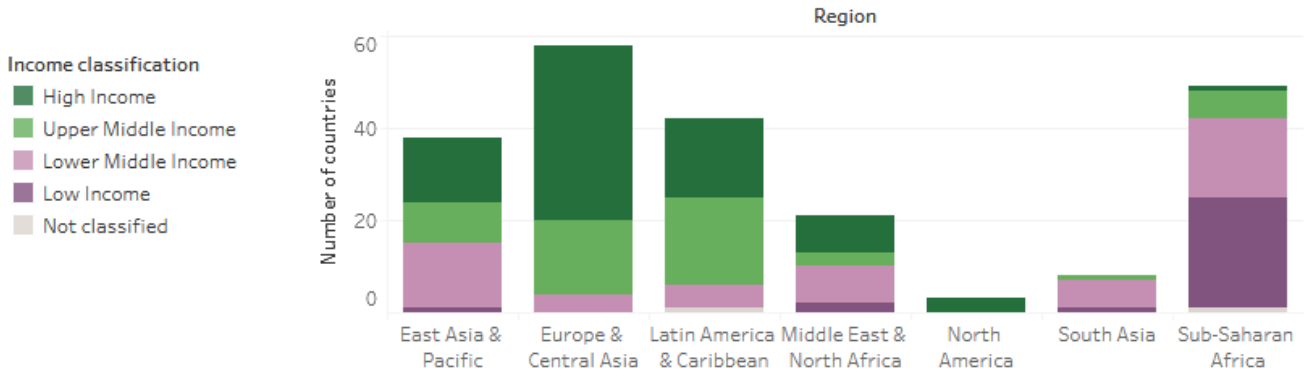
Average Growth Rates by Region and Period (%/yr)

Region \ Years	1990–2000	2000–2008	2010–2019
High income	2.7	2.3	1.7
Low income	3.8	5.6	4.5
Middle income	4.7	6.1	4.

Source: http://databank.worldbank.org/data/views/variableSelection/selectvariables.aspx?source=world-development-indicators#c_u
Classification leves: https://blogs.worldbank.org/opendata/new-world-bank-country-classifications-income-level-2021-2022

Country Income Classifications





Source: https://blogs.worldbank.org/opendata/new-world-bank-country-classifications-income-level-2022-2023

Arguments Favoring Convergence

- Low-income countries might have an advantage in achieving greater worker productivity and economic growth in the future.
  - Diminishing marginal returns: low-income economies could converge to the levels that the high-income countries achieve.
  - Low-income countries may find it easier to improve their technologies than high-income countries, by applying technology that has already been invented.
    - "catching up"
    - Economist Alexander Gerschenkron names this "the advantages of backwardness".
  - Low-income countries can observe and learn from the experience of countries that have grown more quickly.

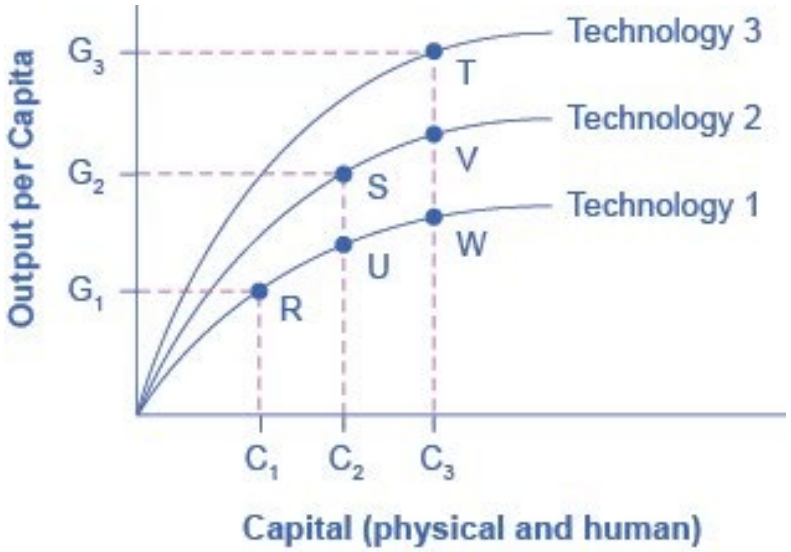
Arguments That Convergence Is Neither Inevitable nor Likely

- New technology may **overcome** the diminishing marginal returns of capital deepening.

- Technological improvements may not run into diminishing returns over time.
  - We can apply widely the ideas of new technology at a marginal cost that is very low or even zero.

- When it comes to adapting and using new technology, a society's performance is not necessarily guaranteed.
  - Low-income countries may have opportunities to copy and adapt technology, **but …**
  - if they lack the appropriate supportive economic infrastructure and institutions, new technologies may not have relevance.

Capital Deepening and New Technology



- Capital deepening, while remaining at a given technology level faces diminishing marginal returns (e.g., moving from point R to point W).
- But suppose that as capital deepens, technology also improves (e.g., the economy moves from R to S).
- Similarly, if capital deepens more and technology increases from Technology 2 to Technology 3, then the economy moves from S to T.
- With improvements in technology, there is no longer any reason that economic growth must necessarily slow down.

The Slowness of Convergence

- Economic convergence between high-income countries and the rest of the world seems possible, but it will proceed slowly.
- High-income countries have been building up their advantage in standard of living over **decades** or even **centuries**.

- Example:
  - A high-income country with a GDP per capita now of $40,000, with a 2% annual growth rate,
    - after 30 years, GDP is $72,450. (= $40,000(1 + 0.02)^30)
  - While in a poor country with a GDP per capita now of $4,000, with a 7% annual growth rate,
    - after 30 years, GDP is $30,450. (= $4,000(1 + 0.07)^30).
  - Convergence is occurring:
    - The rich country was 10 times as wealthy as the poor one, and now it is only about 2.4 times as wealthy.
    - BUT: Even after 30 consecutive years of very rapid growth, people in the low-income country are still likely to feel quite poor compared to people in the rich country.

END