



Economic Growth and Development

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Outline

- Economic Growth:
 - Why do the richest countries grow at 2% per year?

- Economic Development:
 - Why are some countries 50x richer than others?

Name that Country

- Life expectancy is less than 50 years
- 1 out every 10 infants dies before the age of one
- More than 90% of households have no electricity, refrigerator, telephone, or car
- Fewer than 10% of adults have completed high school.

What country is it?

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What country is it?

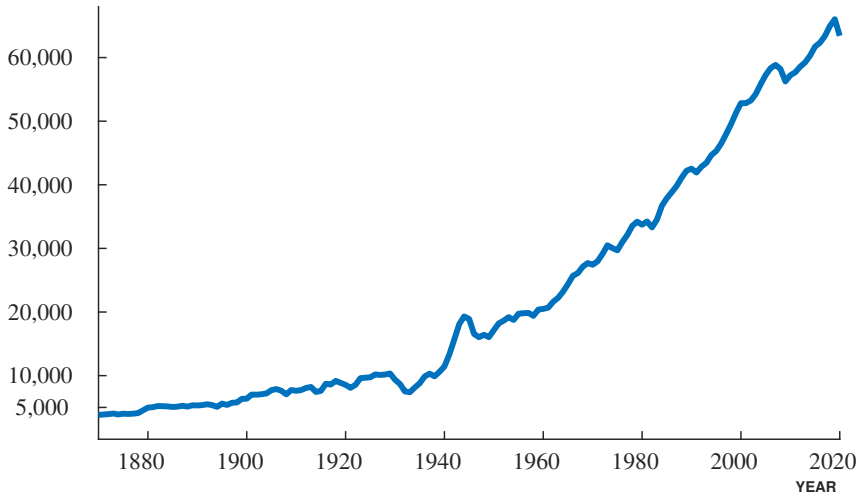
The United States circa 1890!

The Power of Economic Growth

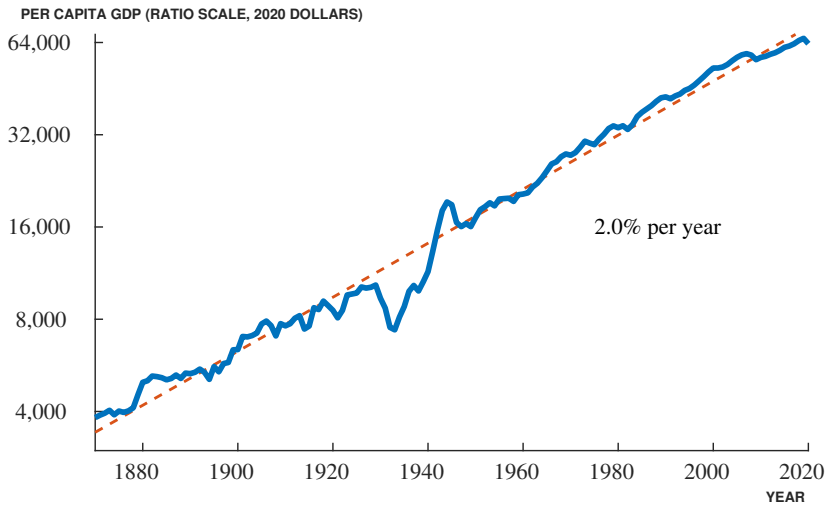
- In just a century, the U.S. is completely transformed
 - Almost all households have electricity, refrigerators, cell phones, and cars
 - Overwhelming majority graduates from high school, many college
 - New goods: air-conditioning, dishwashers, jet planes, skyscrapers, contraception, smartphones
- Health: Life expectancy in 1900 = 50 years, today 79 years
 - The richest person in the world in the mid 1800s — the great European financier Nathan Rothschild — died from an infection that \$10 of antibiotics would cure today.

GDP per Person has Grown by a Factor of 15 since 1870

PER CAPITA GDP (2020 DOLLARS)



U.S. Long-Run Economic Growth



Rule of 70

- Simple rule for growth rates and “years to double”

$$\text{Years to Double} = \frac{70}{g}$$

- Or you can use to calculate the growth rate:

$$g = \frac{70}{\text{Years to Double}}$$

- Example:
 - $g = 2\% \Rightarrow \text{Years to Double} = 35$ (U.S.)
 - $g = 7\% \Rightarrow \text{Years to Double} = 10$ (China, India)
 - $\text{Years to Double} = 25 \Rightarrow g \approx 3\%$

The Theory of Economic Growth

- Where does long-run growth come from?
 - The discovery of new ideas and technologies!
- Ideas are special (Paul Romer, 2018 Nobel Laureate)
 - Standard goods: barrel of oil, hour of a surgeon's time
 - Ideas: calculus, HTML, chemical structure of a new drug

Ideas are infinitely usable

- Implication for economic growth:

Standard good: Income per person \propto Computers per person

Ideas: Income per person \propto Ideas (not per person!)

Each invention potentially makes everyone better off!

E.g. semiconductors, the WWW, mRNA vaccines

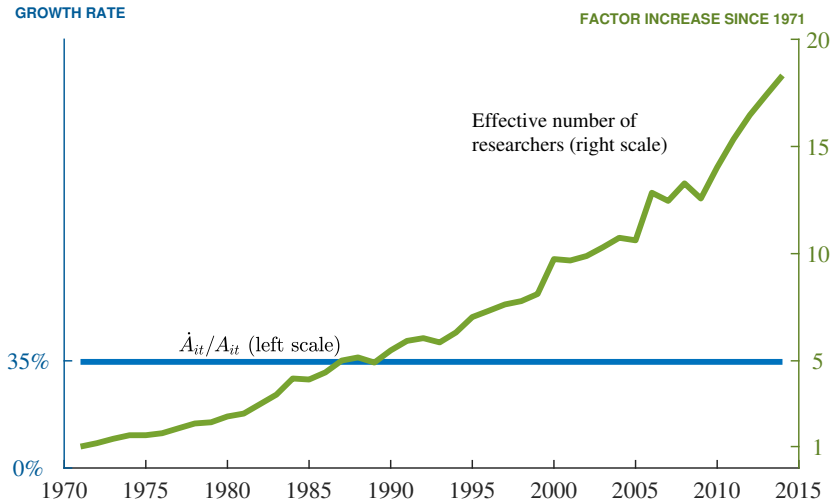
Framework for Understanding Frontier Growth

- Growth models often work like this:

$$\begin{array}{ccccc} \text{Economic} & & \text{Research} & & \text{Research} \\ \text{growth} & = & \text{productivity} & \times & \text{effort} \end{array}$$

- Let's look at some data to see what we can learn...

Moore's Law: Research Effort



Summary of Evidence

- Moore's Law
 - 18x harder today to generate the doubling of chip density
 - Have to **double research input every 10 years!**
- Qualitatively similar findings in rest of the economy
 - Agricultural innovation (yield per acre of corn and soybeans)
 - Medical innovations (new drugs or cancer mortality)
 - Publicly-traded firms
 - Aggregate economy

New ideas are getting harder to find!

Implications for Growth Theory

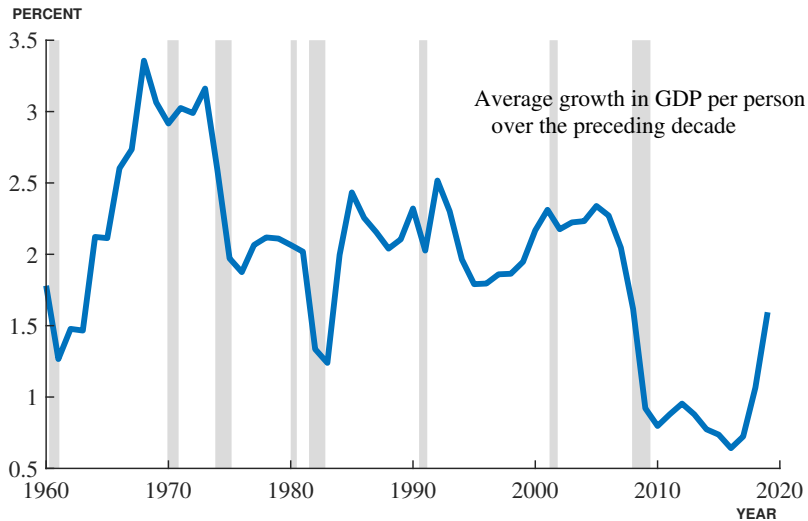
- Where does long-run growth come from?

$$\begin{array}{ccccc} \text{Economic} & & \text{Research} & & \text{Research} \\ \text{growth} & = & \text{productivity} & \times & \text{effort} \\ 2\% & & \downarrow \text{ (falling) } & & \uparrow \text{ (rising) } \end{array}$$

- Ideas are getting harder and harder to find
- A “Red Queen” model of economic growth:

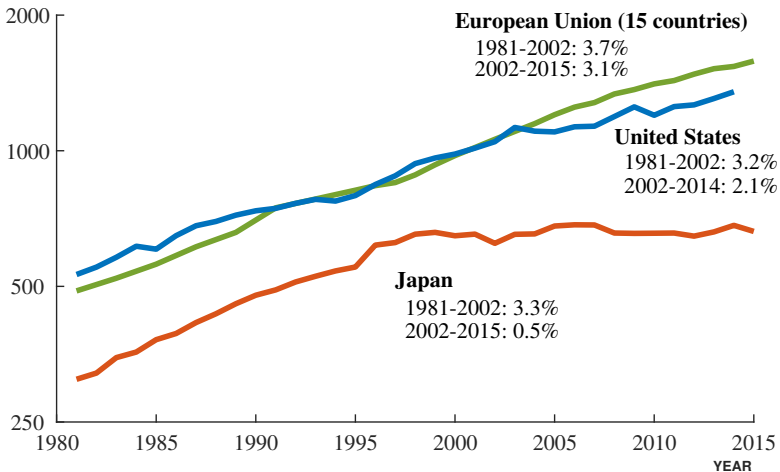
We have to run faster and faster just to maintain constant exponential growth at 2%

Recent Growth in GDP per Person

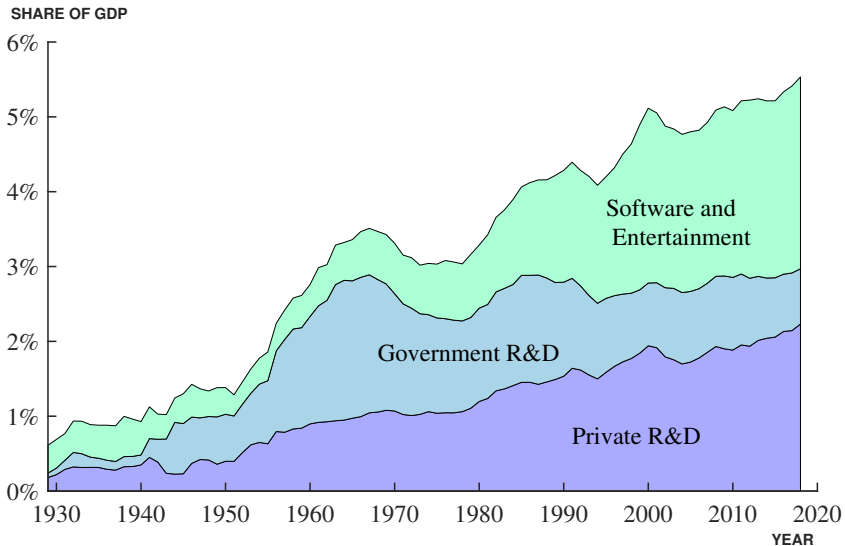


Research Employment in Select Economies

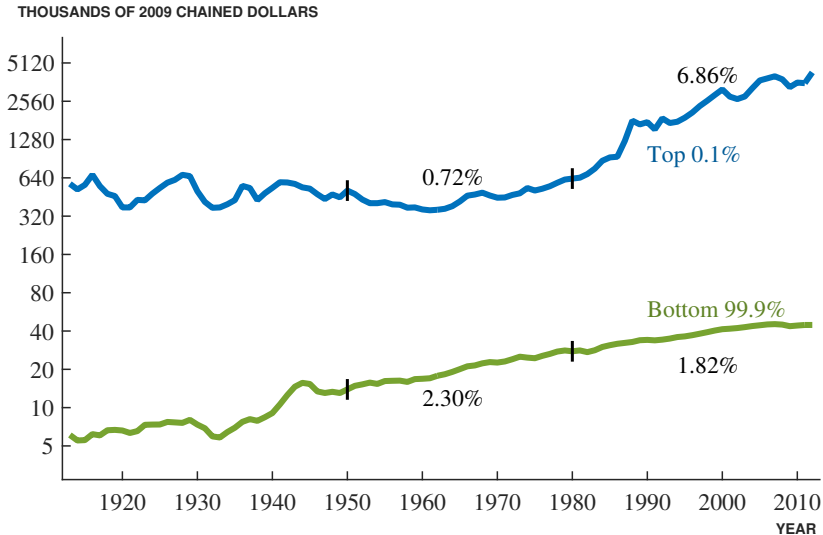
RESEARCH EMPLOYMENT (1000S, LOG SCALE)



U.S. R&D Spending Share



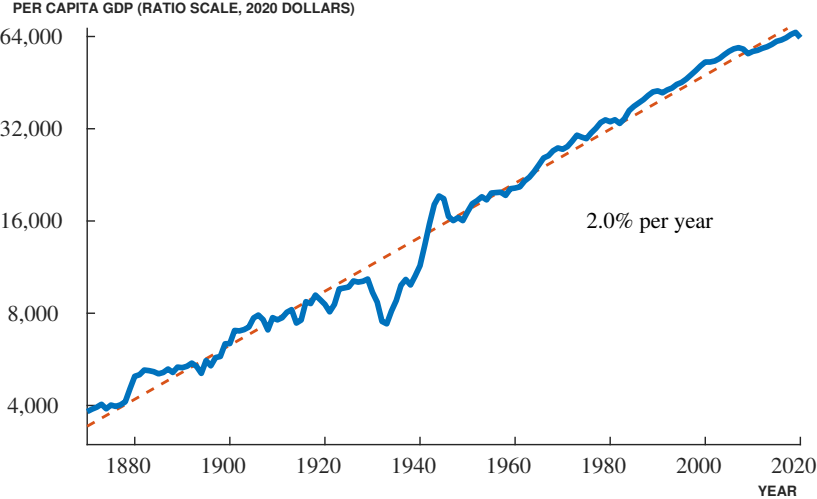
Average Income: Top 0.1% and Bottom 99.9%



The Future of U.S. Growth?

- Headwinds
 - Ideas are getting harder to find
 - Educational attainment is leveling out
 - Population growth slowing in advanced countries
- Tailwinds
 - China and India (each as populous as US/Japan/Europe)
 - How many future Thomas Edisons and Jennifer Doudnas are waiting to realize their potential?
- Uncertainties
 - The shape of the future idea production function?
 - To what extent can machines/AI substitute for labor/researchers?

You will likely be 3 times richer than your grandparents!

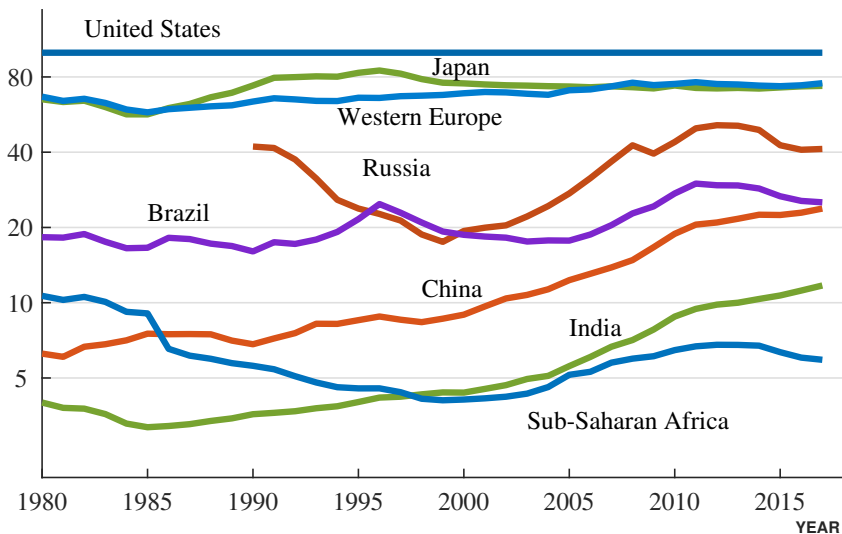




Economic Development

Growth around the World since 1980

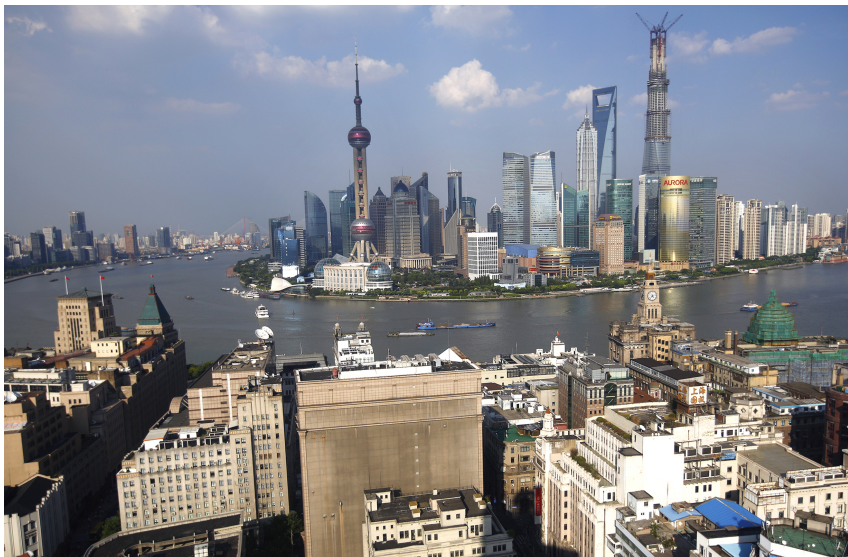
GDP PER PERSON (US=100)



Shanghai 1987



Shanghai 2013



Why are some countries so much richer than others?

- Through the lens of a production function
 - Inputs versus productivity?
- Why do some countries have more inputs? Why more efficient?
 - Rules, institutions
- How do we understand “catch-up” growth?

The Cobb-Douglas Production Function

- The most common production function in all of economics:

$$Y = \bar{A}K^{1/3}L^{2/3}$$

- Why constant returns to scale?
 - The standard replication argument...
 - Implies $y = \bar{A}k^{1/3}$ where $y \equiv Y/L$ and $k \equiv K/L$
- Why the exponents of 1/3 and 2/3?
 - The “labor share” of GDP...

The Importance of Capital versus TFP

- Which is more important in explaining income differences across countries?
- Compare the five richest and five poorest economies:

$$\underbrace{\frac{y_{rich}}{y_{poor}}}_{70} = \underbrace{\frac{\bar{A}_{rich}}{\bar{A}_{poor}}}_{14} \cdot \underbrace{\left(\frac{k_{rich}}{k_{poor}}\right)^{1/3}}_5$$

- TFP is about three times as important as capital.
 - So TFP accounts for 3/4 of cross-country income differences and capital accounts for 1/4.

Poor countries are poor partly because of few inputs but also b/c of inefficiency in using those inputs.



Why???

Why fewer inputs and why less efficiency?

What is this?



North versus South Korea: Institutions Matter!



Institutions, Property Rights, and Rule of Law

- Mancur Olson's "natural experiments"
 - North vs. South Korea, East vs. West Germany, Rio Grande, China vs. Hong Kong, China since 1978
- Adopting bad policies can **reduce** incomes substantially
 - China's **Great Leap Forward** (1960) – 30 million people died
 - Venezuela today – GDP has fallen by 60% since 2013
- But **which** institutions and policies?
 - Some governments "get it wrong" on purpose, because that maximizes their own rewards.

Misallocation and TFP

- Why do differences in institutions show up in TFP?

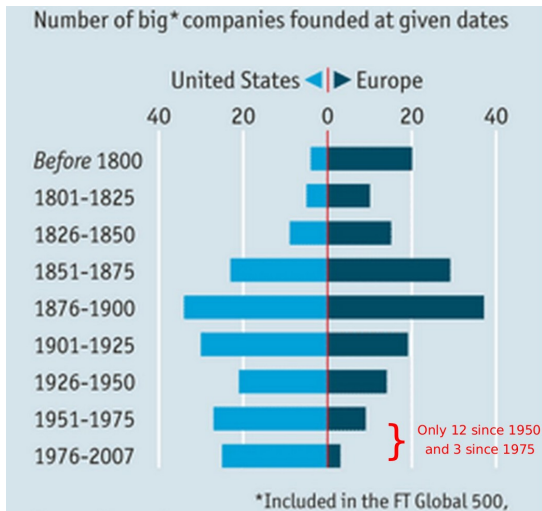
Misallocation and TFP

- Why do differences in institutions show up in TFP?
- Suppose economy = two firms making textiles
 - (a) Not very productive, but owned by the Prime Minister's sister
 - (b) A small, dynamic startup — much more productive

Good connections and bad property rights \Rightarrow the less productive firm is “favored” by loans, subsidies, etc.

- **TFP = how efficiently resources are allocated**
 - All inputs to low productivity firm \Rightarrow low TFP
 - Inputs allocated efficiently (e.g. markets/competition) \Rightarrow high TFP

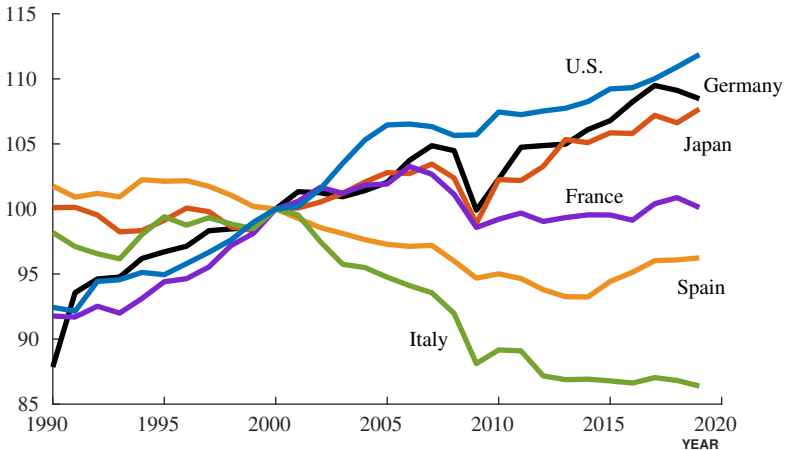
FT Global 500 Startups in US vs Europe (creative destruction)



Source: <http://www.economist.com/node/21559618>

TFP in Advanced Economies

TOTAL FACTOR PRODUCTIVITY (2000=100)



Misallocation in the United States

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- Sandra Day O'Connor, Supreme Court Justice (1981–2006)
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- Consider white men in U.S. business:
 - 1960: **94%** of doctors, lawyers, and managers
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 - 1960: **94%** of doctors, lawyers, and managers
 - 2010: **60%** of doctors, lawyers, and managers
- Over the past 50 years, the U.S. allocation of talent has improved! Accounts for
 - **40%** of growth in GDP per person, and
 - **20%** of growth in GDP per worker

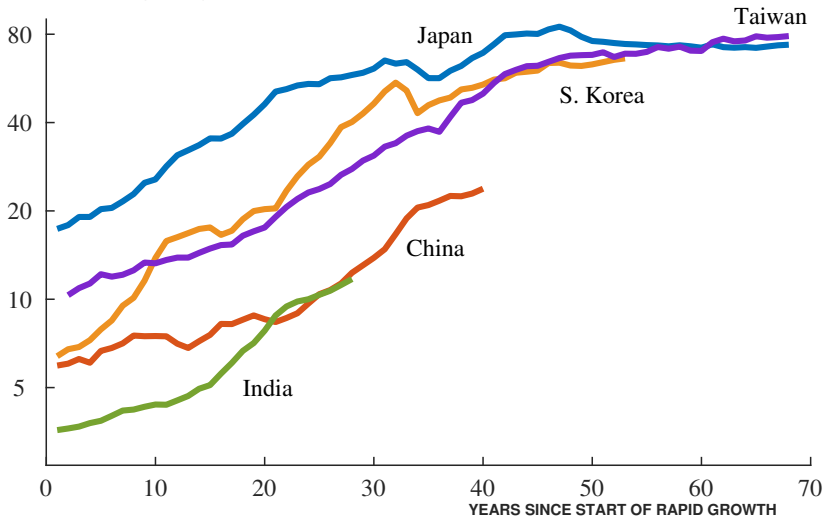


Catch-Up Dynamics

Why are India and China growing at 7% per year?

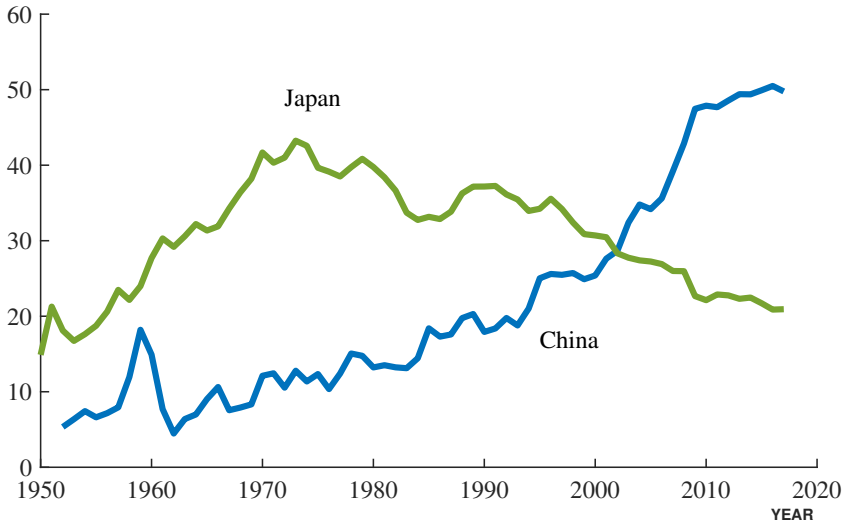
The Dynamics of Catch-Up Growth

GDP PER PERSON (US=100)



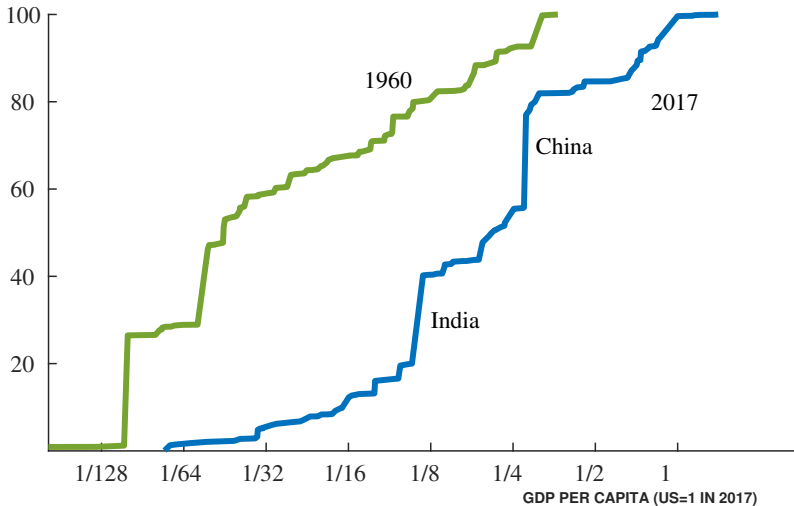
Investment in Physical Capital

PERCENT OF GDP



The Distribution of World Population by Income

SHARE OF WORLD POPULATION (PERCENT)



1960: 2 out of 3 people lived on less than \$7 per day.

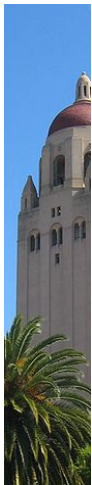
2017: Only 1 out of 12!

Nobel Prize, 2019: RCTs in Development

- Abhijit Banerjee, Esther Duflo, and Michael Kremer
 - Break the “big” development problem down into many smaller problems
 - Study these problems using **randomized controlled trials** (RCTs), like in medicine
- Example: Which interventions improve education?
 - Giving schools free textbooks and flipcharts (**no**)
 - De-worming medicines for students (**mixed**)
 - Monitoring that teachers actually show up (**yes**)
- Stanford faculty Pascaline Dupas, Kate Casey, Arun Chandresekhar, Melanie Morten and others

Conclusion

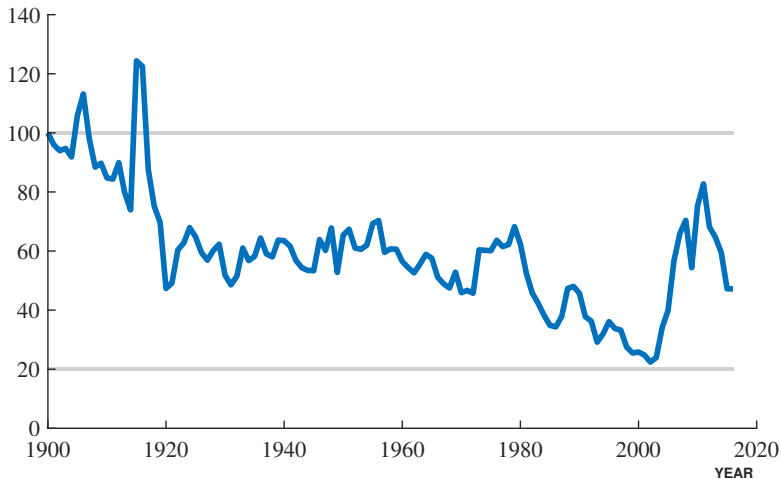
- Differences in rates of economic growth matter more than almost anything else in the long run
 - Responsible for enormous improvements in living standards
 - Around the world and in the U.S.
- Institutions, property rights, and ideas matter
 - Incentives to create and use ideas
 - Allocating inputs to their most productive uses



Extra slides

Commodity Prices over the Long Run

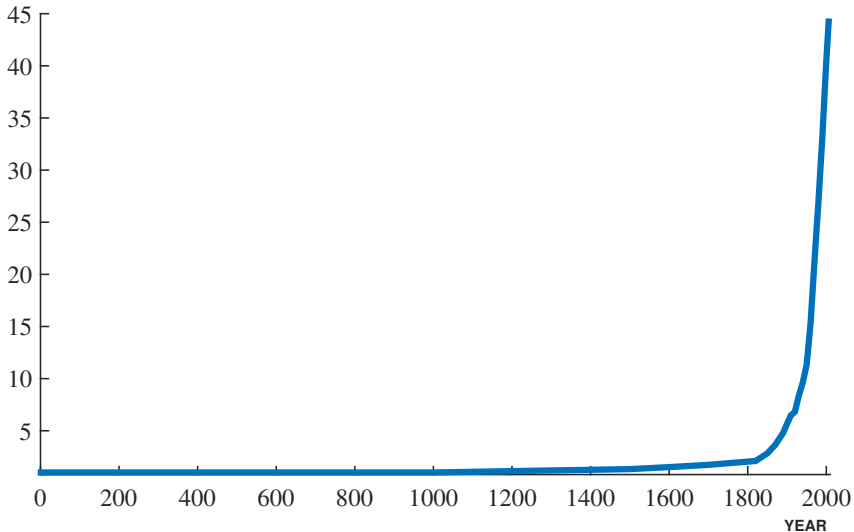
EQUALLY-WEIGHTED PRICE INDEX (INITIAL VALUE IS 100)



Source: www.globalfinancialdata.com.

What is graphed here?

INDEX (1.0 IN INITIAL YEAR)



World Growth over the Very Long Run

INDEX (1.0 IN INITIAL YEAR)

