



Session 4:

Accounting for Growth

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Outline: Accounting for Growth

- Accounting for Growth using Production Functions
- Application: The U.S. Economy
- Application: Krugman's "The Myth of Asia's Miracle"
- Class Discussion: Why are some countries 50 times richer than others?
- Misallocation and TFP



Accounting for Growth Using Production Functions

Growth Accounting

- Consider our by-now familiar production function:

$$Y_t = A_t K_t^{1/3} L_t^{2/3}$$

(Notice, no longer treating A as fixed...)

- Applying our rules for growth rates (see pages 58–60):

$$g_{Yt} = g_{At} + \frac{1}{3} \times g_{Kt} + \frac{2}{3} \times g_{Lt}$$

- What is the economic interpretation of this equation?

Growth Accounting

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- Applying our rules for growth rates (see pages 58–60):

$$g_{Yt} = \underbrace{g_{At}}_{\text{TFP growth}} + \underbrace{\frac{1}{3} \times g_{Kt} + \frac{2}{3} \times g_{Lt}}_{\text{Input growth}}$$

- What is the economic interpretation of this equation?

The growth rate of output is the sum of TFP growth and input growth. Input growth is itself a weighted average of the growth rates of the inputs; weights are factor shares.

Growth Accounting (continued)

- One can apply this same logic to a production function that includes more inputs — such as education or different kinds of capital (e.g. structures versus computers)
- It is also usually helpful to do the accounting in “per person” terms (though not always).
- Recall $y_t = A_t k_t^{1/3}$, so

$$g_{yt} = g_{At} + \frac{1}{3} \times g_{kt}$$

- g_{At} is computed as the “residual” in growth accounting (just like in development accounting)



Application: The United States

Growth Accounting for the United States (BLS)

Period	Output per hour	TFP	Labor Comp- osition	K/L	IT Portion
1948–2018	2.35	1.24	0.22	0.89	0.24
1948–1973	3.28	2.12	0.18	0.98	0.08
1973–1995	1.54	0.50	0.25	0.80	0.32
1995–2003	3.25	1.61	0.27	1.38	0.53
2003–2018	1.52	0.65	0.23	0.64	0.23

Source: BLS Multifactor Productivity Trends
for the private business sector

Key Results of Growth Accounting

- Most of growth comes from growth in TFP!
 - Completely unmodeled in Solow (1956); a finding of Solow (1957)
 - What causes this TFP growth?
- A growth slowdown began in 1973 (compare before and after)
 - Most of the slowdown is in TFP...
- The new economy of the late 1990s saw a return to rapid growth
 - Faster input growth, especially IT in the 1990s
- A growth slowdown since 2003 in capital and TFP



Application:

“The Myth of Asia’s Miracle”

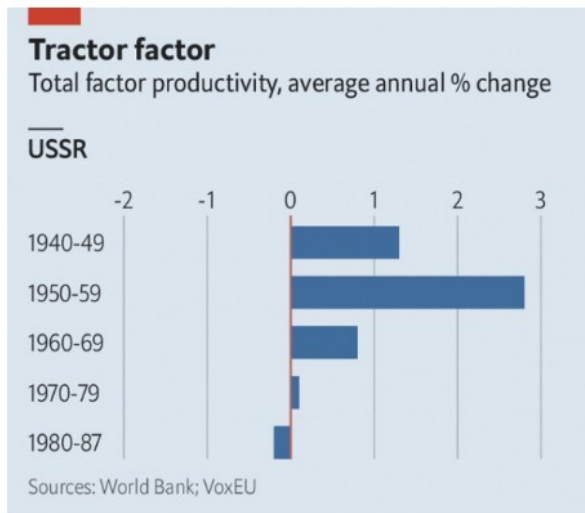
Reading: Krugman's "The Myth of Asia's Miracle"

- What is the one-paragraph summary of Krugman's thesis?

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- What is the one-paragraph summary of Krugman's thesis?
 - No free lunch: willingness to postpone current consumption for future
 - Inevitably subject to diminishing returns → future slowdown
- Triumph of economics!
- What did you like about his style of argument? Dislike?
- What picture does Krugman paint of Soviet economic growth?
 - Y/N growth of about 3.2% per year (1950-1985, about 4% in 50-70)
 - But TFP growth of 0.7%. Capital mainly, also education, employment
 - No free lunch; slowdown: 75-85 = 1.5% and $\text{tfp} = -0.5\%$

TFP Growth in the USSR



The Economist

Source: The Economist, "The Lives of the Parties", December 15, 2018

Reading: Krugman (continued)

- What possible similarities can there be between the Soviet Union (heavy industry, pollution) and Singapore (model of efficiency, gleaming skyscrapers)?
 - Employment: 27% to 51%, education, I/Y from 10% to 40%
 - Remarkable fact: nearly zero TFP growth (Alwyn Young)
 - Singapore's economy has always been relatively efficient, just starved of capital and labor...
- What does Krugman say about Japan? Predictions for future in 1994?
- What parts of Krugman's essay do you find the least persuasive? (Oversold?)

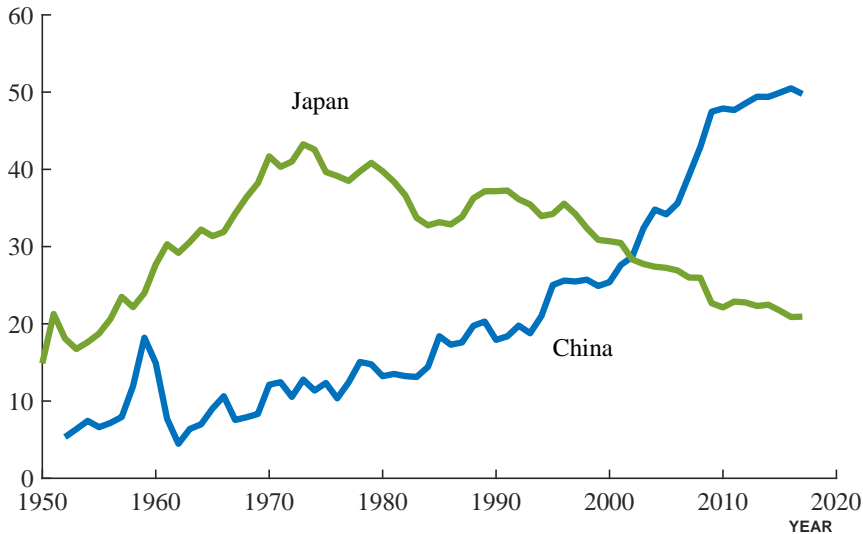
The Asian Miracle? Growth Rates, 1960 – 1990

Country	GDP per person	Young's (1995) TFP
Singapore	5.11	0.2
Hong Kong	5.49	2.3
Korea	5.37	1.7
Taiwan	5.30	2.1

- Why the difference?
 - Increased employment and hours worked per person
 - Increases in educational attainment
 - Increases in investment / capital-intensity
- TFP growth accounts for most growth in the U.S.
Input growth accounts for most growth in many fast-growing countries.

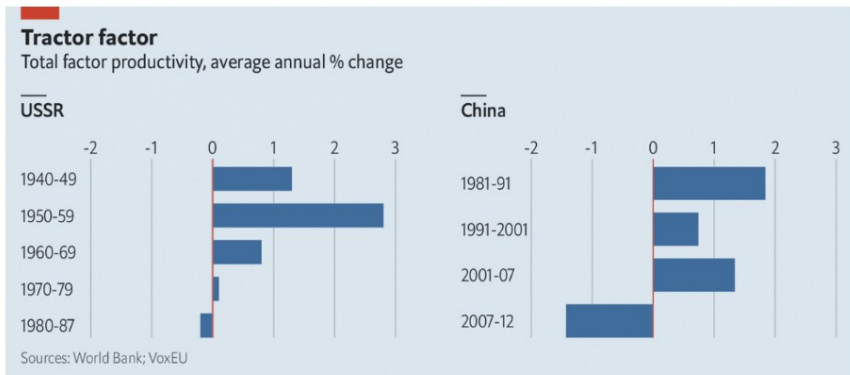
The Investment Rate in Japan and China

PERCENT OF GDP



Source: Penn World Tables 9.1

TFP Growth in the China

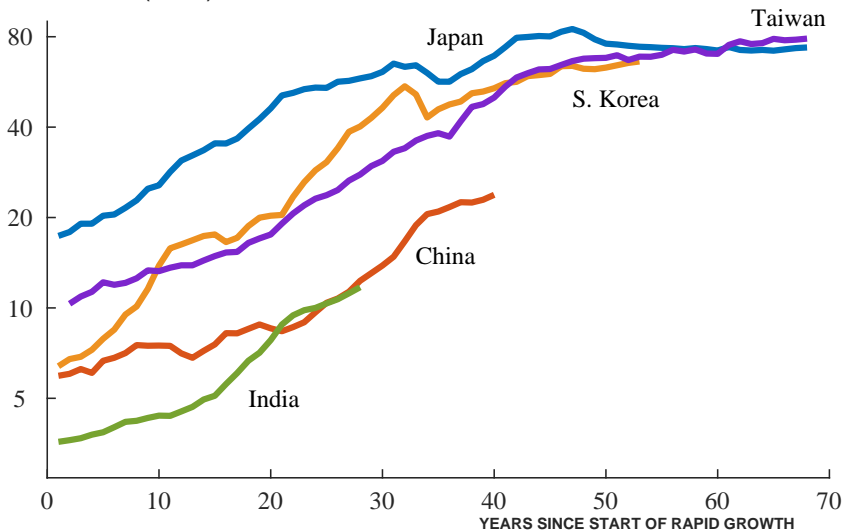


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The Dynamics of Catch-Up Growth

GDP PER PERSON (US=100)





Class Discussion:

Why are some countries
50 times richer than others?

Discussion

- How does the production approach (so far) answer this question?
- What are the strengths and weaknesses of this answer?
- **Why** do some countries have such low levels of capital and TFP?

Discussion

- How does the production approach (so far) answer this question?
- What are the strengths and weaknesses of this answer?
- Why do some countries have such low levels of capital and TFP?
 - Omitted inputs: Human capital (education), infrastructure, natural resources, technology
 - Institutions / property rights
 - Misallocation and TFP
 - China vs. Russia (Gradualism vs. Big Bang reform)

What is this?



North versus South Korea: Institutions Matter!



North versus South Korea: Institutions Matter!



China post 1978: Gradual shift from communist allocations to market allocations

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
 - Institutions clearly are first order!
- But **which** institutions?
 - Acemoglu and Robinson (2012): *Why Nations Fail*
[Thomas Friedman summary essay in NYT](#)
 - Inclusive vs Extractive institutions
 - "Reversal of fortune" in the Americas
 - Political foundations for economic institutions

Some governments "get it wrong" on purpose, because that maximizes their own rewards.
 - China?

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.

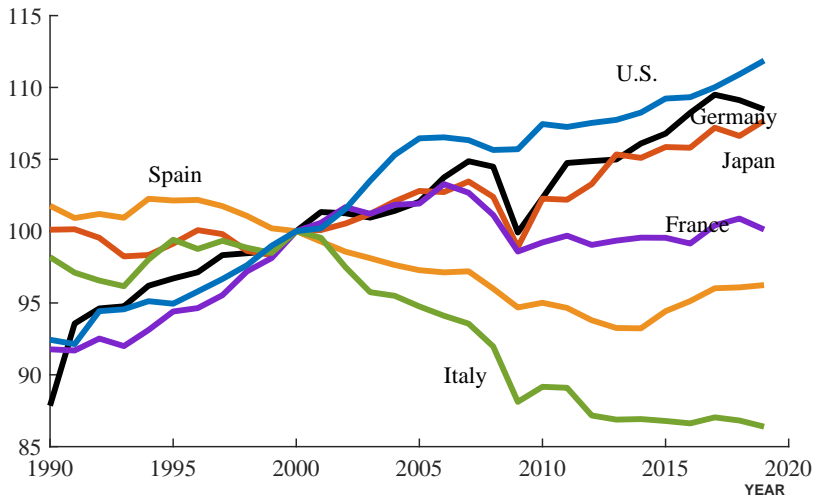
- **TFP = how efficiently resources are used**
 - All inputs allocated to low productivity firm \Rightarrow low TFP
 - Inputs allocated efficiently (e.g. markets/competition) \Rightarrow high TFP

Negative TFP growth in China after 2007?

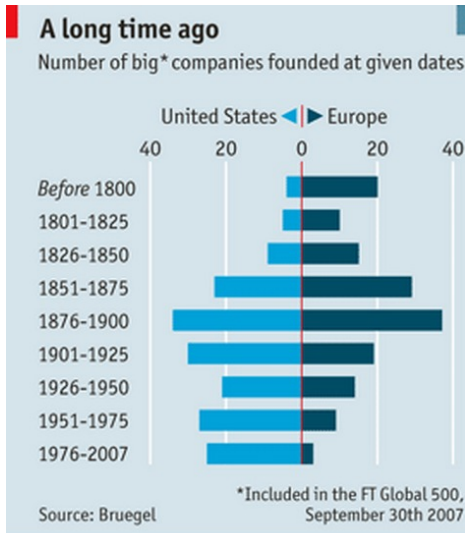
Negative TFP growth in Italy and Spain since 2000?

TFP in Advanced Economies

TOTAL FACTOR PRODUCTIVITY (2000=100)



Fortune 500 Startups in US vs Europe (creative destruction)



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

Misallocation in the United States

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 - 1960: **94%** of doctors, lawyers, and managers
 - 2010: **60%** of doctors, lawyers, and managers

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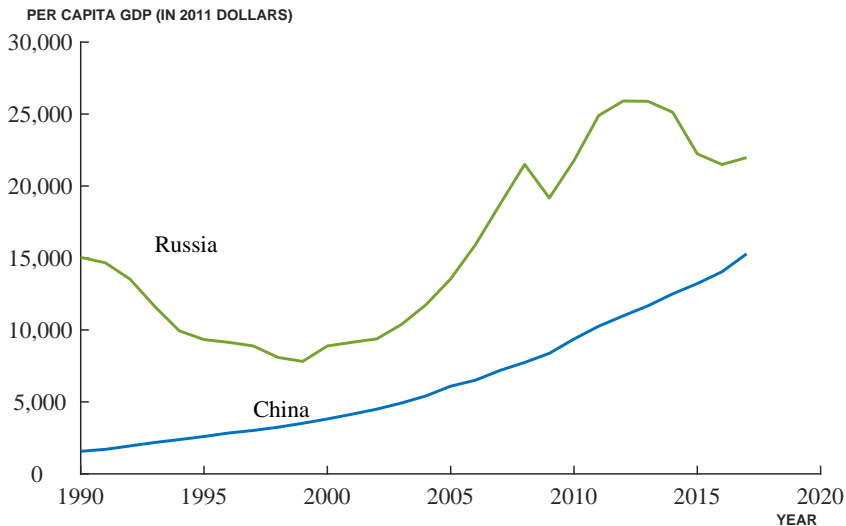
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- Consider white men in U.S. business:
 - 1960: **94%** of doctors, lawyers, and managers
 - 2010: **60%** of doctors, lawyers, and managers
- Over the past 50 years, the U.S. allocation of talent has improved!
Accounts for
 - **40%** of growth in GDP per person, and
 - **20%** of growth in GDP per worker

Source: Hsieh, Hurst, Jones, and Klenow (2019)

Reading: Paul Romer — For Richer, For Poorer

- According to Romer, why do Africans so often lack access to electricity and lighting?
- What is his proposal for solving this problem? Why?
- What are the most significant problems to putting this proposal into action?
- What do you think of this idea?

Per Capita GDP in China and Russia, 1990–2017



Questions for Review

- What is growth accounting?
- Explain the intuition underlying the key equation of growth accounting.
- At what rate has TFP grown in the U.S. during the last decade or so?
How does this compare to the past? What fraction of growth in output per hour is due to TFP growth?
- What do we mean by the “TFP growth slowdown” and the “new economy”?
- What does Krugman mean by his title, “The Myth of Asia’s Miracle”? Is he right?
- How can the misallocation of resources reduce TFP?
- Why are some countries 50 times richer than others?
- What are charter cities?