Social Infrastructure

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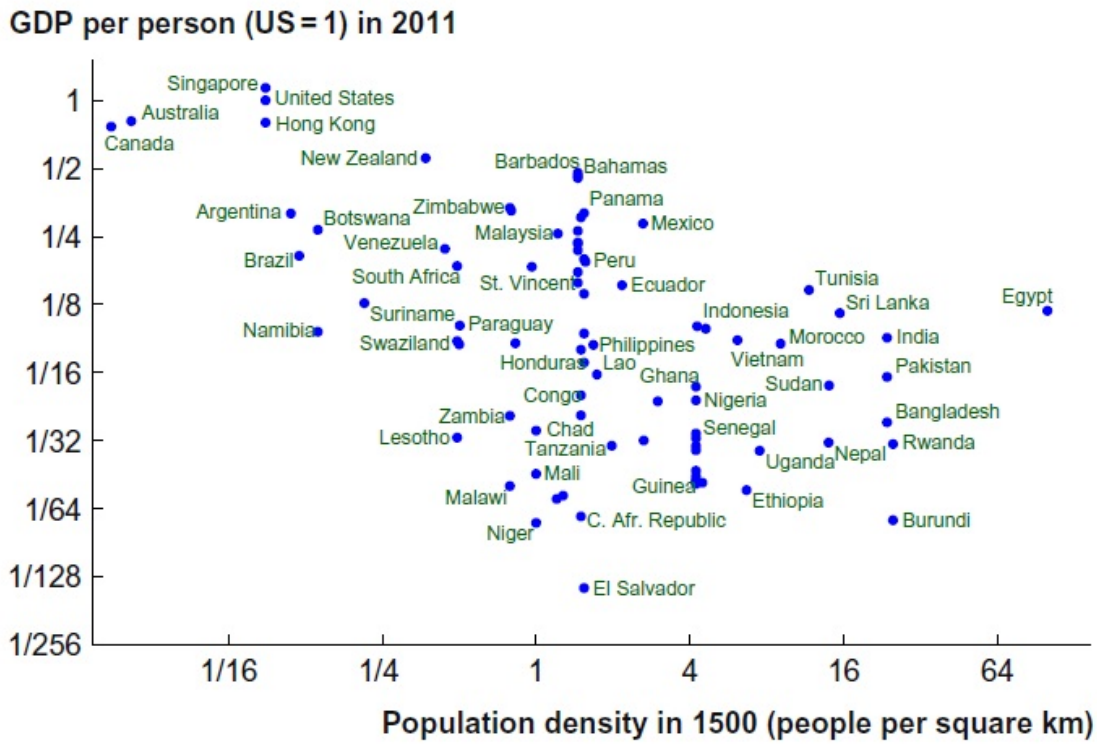
Growth Theory

Introduction

- Saving rates and investment in skills are key determinants of long run output per worker. Our models take these parameters as exogenous.
- Similarly, we still have an incomplete understanding about productivity differences across countries.
- Here, we will discuss which institutions may lead to differences across countries.
- Moreover, we are going to revisit the growth slowdown in developed countries around 1970.

Is it all pre-determined?



Source: Acemoglu et al. (2002)

You may be inclined to think that geography and culture explain a lot. However, the wealth of nations changes drastically over time. In fact, we observe a "Reversal of Fortune".

Is it all pre-determined? II

Left: picture at night from South and North Korea. Right: a slum in Caracas and the skyline of Dubai.

Moreover, in statistical analysis, culture and geography cannot explain major differences. Instead similar situated countries have very different income per person levels, i.e., institutions matter.

Investment decisions

An investment problem

Households will be willing to save until the marginal product of capital, its benefit, is equal to its costs, F_K:

$$MPK - \delta = F_K. \tag{1}$$

Similarly, households will be willing to invest into skills until the marginal product of human capital is equal to its costs:

$$MPH = F_H. \tag{2}$$

The costs of physical investment

Governments impose a variety of costs when firms engage in new investment:

- Permits needed to start the business.
- Bribes needed to receive permissions.
- The quality of capital markets determine the costs of loaning funds.

The World Bank's doing business indicator measures for different countries the costs of setting up a medium size firm, and the time it takes to receive all permits.

The benefits of physical investment

Returns will be high when

- business income taxes are low.
- labor cannot extract large rents or influence corporate policy.
- extortion by criminal organizations is minimal.
- markets are large. This may include export markets, i.e., the openness of an economy.

The costs of human capital investment

The costs of the education system can be thought of a form of cost into investing into skills:

- In the U.S. a Bachelor degree costs often more than 30,000 Dollar.
- Attending business, law, or medical school more than 100,000. In Europe, university education is almost free.

The benefits of human capital investment

The main benefit from human capital investment are the returns:

- The average physician in the U.S. earns \$316,000, \$57,000 in Spain, and \$12,000 in Mexico.
- Taxes on high-income people vary substantially across countries.
- In many developing countries, schooling has a very low quality and even after finishing compulsory schooling, students cannot read or write.

Economic stability

To make long-term investment decisions, firms and individuals require a stable economic environment. This is particularly so because investment decisions are often irreversible:

- Once a factory is build, it is difficult to move it to another place.
- Once people learn computer coding, the government outlawing computers will make these skills obsolete.
- Hence, private parties will only undertake them when they expect governments not to change course and extract the benefits in the future. Extreme examples are revolutions but also electoral changes in democratic governments can have these effects.

If individuals are afraid that future governments will expropriate the benefits of the investment, they will never undergo these.

Productivity differences

Productivity is key

	Apple (U.S.)	Foxconn (Taiwan)
Value added (billions)	163	20
Capital (billions)	46	14
Employment (millions)	0.16	1.30

- We know that physical capital investment rates by themselves cannot explain large cross-country differences in income per worker.
- We have already seen a model of skill development. However, is that all?
- In the end, we need to understand why Apple produces in the U.S. and Foxconn in Taiwan and China.

Long-term investment

- Firms like Apple may produce in the U.S. because their intangible capital investment is well-protected.
- Nobel price winner North (1990) points out that when property rights are clearly defined, people will invest in productive activities instead of predatory activities.
- Hence, an aggregate capital stock measure may not tell us all about its productivity.
- He also points out that such institutions are key to create trust and reduce transaction costs.
- Tabellini (2010) shows that trust, and other cultural variables, can explain some European differences in income per worker.

Innovation and property rights

- One particular form of long-term investment is innovation in new products, i.e., new technologies.
- In the Romer model, we have assumed that property rights are perfectly enforceable, i.e., the innovator could sell his/her patent, and the patent holder could exclusively sell the capital good.
- in fact, we had seen that such enforceability, leading to imperfect competition, is a necessary prerequisite to have any technological progress.
- In a country where successful innovations could be expropriated by force from other private persons or the government, nobody would be willing to engage in innovative activity.

The source of property rights

Property rights are defined by

- The legislator that passes laws.
- The executive that promulgates regulations.
- Courts that interpret these laws and regulations in case of any controversies between parties.

Interpretation by courts

Laws (and regulations) are often vague and require judgment, giving courts an important role in shaping institutions:

- In many European countries, dismissal is only possible (absent misbehavior) when the company has a *justified* business reason. These words, however, mean something very different in German and Italian courts.

- An example from the U.S.: Samsung Electronics Co. v. Apple Inc.: "If an infringed design patent only applies to a component of a product, should damages for the infringement be limited to the portion of the infringer's profits attributable to that component?"

Enforceability of rights

Even when the law is clearly established, it is of little use when rights cannot be rectified:

- The executive branch may be unwilling to enforce the law.
- In Spain, the median duration of a civil case is in excess of 3 years. In Italy, the median duration is even 8 years.
- A firm may decide not to enter into a contract as it becomes almost impossible to enforce it.
- The idea of well-defined and enforceable laws is sometimes called the rule of law.

Misallocation

A yet other aspect of the capital stock is its allocation. Hsieh and Klenow (2009) show that misacllocation of the capital stock has productivity effects. The idea is:

- Firms should employ capital and labor until marginal products are equalized across firms.
- More productive firms will be bigger but the marginal worker (unit of capital) is just a productive as in a less productive firm.
- If this is not the case, aggregate output can be increased by reallocating the factors of production.

Measuring misallocation

To measure misallocation, consider the following firm problem:

$$\max \left\{ \pi_i = P_i z_i K_i^{\alpha} L_i^{1-\alpha} - r(1+\tau_i^K) K_i - w(1+\tau_i^L) L_i \right\}, \tag{3}$$

where r is the aggregate interest rate, and w is the aggregate wage rate. τ_i are firm-specific price distortions. The optimal capital choice is:

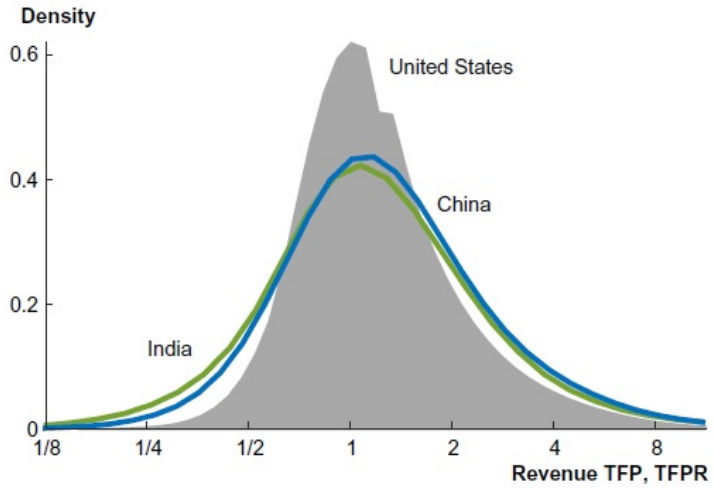
$$\alpha P_i z_i K_i^{\alpha-1} L_i^{1-\alpha} = r(1+\tau_i^K) \tag{4}$$

$$\alpha P_i Y_i = r(1+\tau_i^K) K_i \tag{5}$$

$$\frac{rK_i}{P_i Y_i} = \frac{\alpha}{(1+\tau_i^K)}. \tag{6}$$

And analogously for labor. The left-hand-side can be measured in balance-sheet data, and within narrow industries we would expect that α is constant. Hence, differences across firms must come from τ_i^K.

Misallocation in the U.S., China, and India



- Even in the U.S., we measure significant factor misallocation. This may be due to measurement error or true frictions.
- Misallocation is much larger in China and India. Reducing the level to the U.S. level would increase output in China and India by 40 and 50%, respectively.

Misallocation in Europe

(a) Average

	STD in revenue labor productivity	STD in revenue total factor productivity	OP covariance term
United States	0.58	0.39	0.51
United Kingdom	0.59	0.42	0.15
Germany	0.71	NA	0.28
France	0.53	0.23	0.24
Netherlands	0.55	0.15	0.30
Hungary	1.04	0.92	0.16
Romania	1.05	0.55	−0.03
Slovenia	0.80	0.22	0.04

(b) Change over time

	STD in revenue labor productivity	STD in revenue total factor productivity	OP covariance term
United States	0.02	0.00	0.09
United Kingdom	0.04	0.03	0.06
Germany	0.06	NA	0.14
France	NA	NA	NA
Netherlands	0.01	0.00	0.11
Hungary	−0.02	−0.03	0.18
Romania	0.03	−0.03	0.25
Slovenia	−0.06	−0.02	0.16

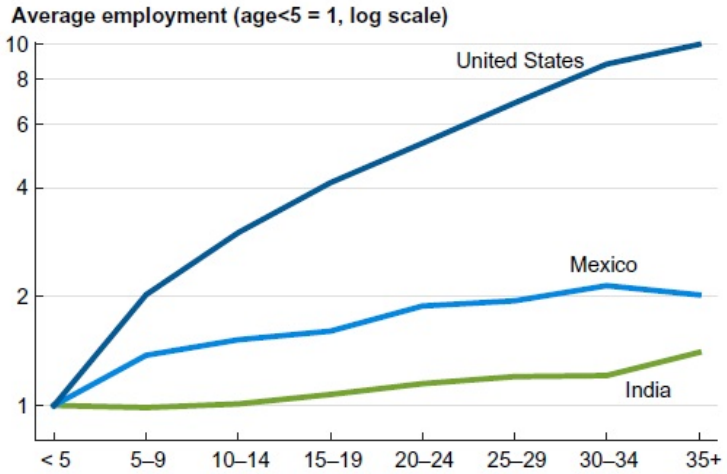
- Bartelsman et al. (2013) take a similar approach noting that, within-industries, more productive firms should be larger.
- The correlation between productivity and size is weaker in West Europe than the U.S.
- The correlation in Eastern Europe.
- The correlation has risen in Eastern Europe from the beginning to the end of the 90s.

A story behind misallocation

In China (and Eastern Europe), we have good anecdotal evidence for the institutions behind misallocation:

- Firms owned by the state face cheaper input factors than privately owned firms.
- Even among privately owned firms, fortunes depend heavily on how well one is connected to the local and federal government.

A story behind misallocation II



In follow-up work, Hsieh and Klenow (2014) show that plant's life cycle is an important contributor to less allocation of resources to the most productive plants. The idea is that in countries like Mexico and India, regulatory costs increase in plant size leading to productive plants choosing to stay smaller.

Labor type misallocation

Hsieh et al. (2019) find that reducing talent misallocation in the U.S. from the 1960s level contributed 20 to 40% of output growth in the U.S.:

- The talents of women were mostly wasted in the 1960s.
- The talents of minorities were mostly wasted in the 1960s.
- In 1960, 94 percent of doctors and lawyers were white men. By 2010, the fraction was just 62 percent.

Measuring social infrastructure

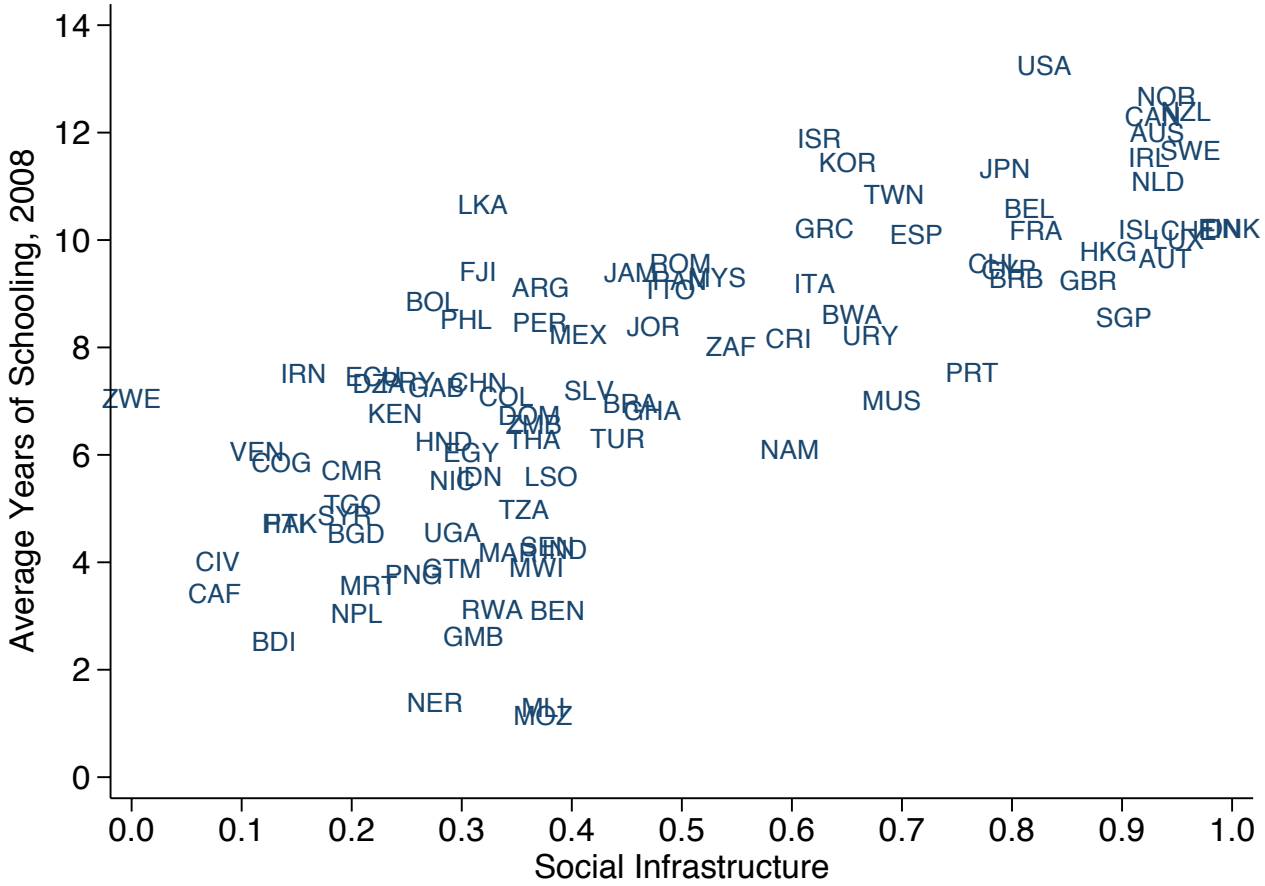
Measuring the different aspects of property rights and government efficency is difficult, and one has to decide how to weigh each component. The World Bank's Governance indicator project provides indexes of

- Rule of law
- Regulatory quality
- Accountability of politicians
- Political stability
- Government effectiveness
- Control of corruption

and we will take a simple average of these.

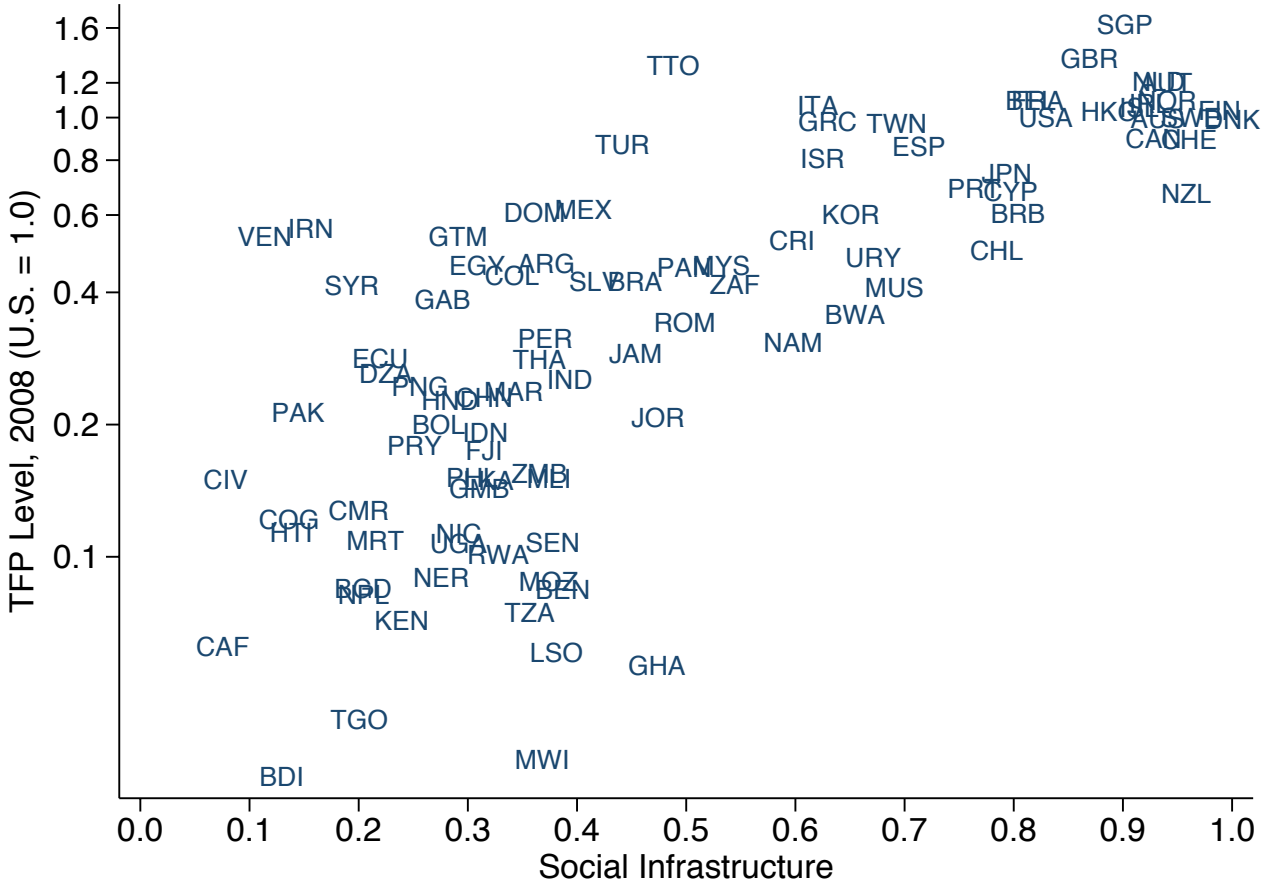
Social infrastructure is positively related to...

education



Social infrastructure is positively related to...

productivity



Can we establish causality?

A question of causality

These are just correlations, and we might suffer from reverse causality: Richer countries can afford to invest more into a social infrastructure.

To tell in which direction causality flows, we need exogenous variation in the data.

Can we get exogenous variation from European settlers?

- When many settlers come, they have an incentive to bring good institutions with them.
- Problem: More settlers may go to places with higher economic prospects.

Exogenous variation from diseases

Nobel-price winning economists suggest as solution in Acemoglu et al. (2001) to use cross-country variation in the probability of sickness for European settlers:

- In regions where settling was difficult because of sickness, Europeans created extractive states.
- In regions where sickness was less an issue, Europeans settled and brought institutions from Europe with them.
- These institutional differences persist until today! (minute 21)

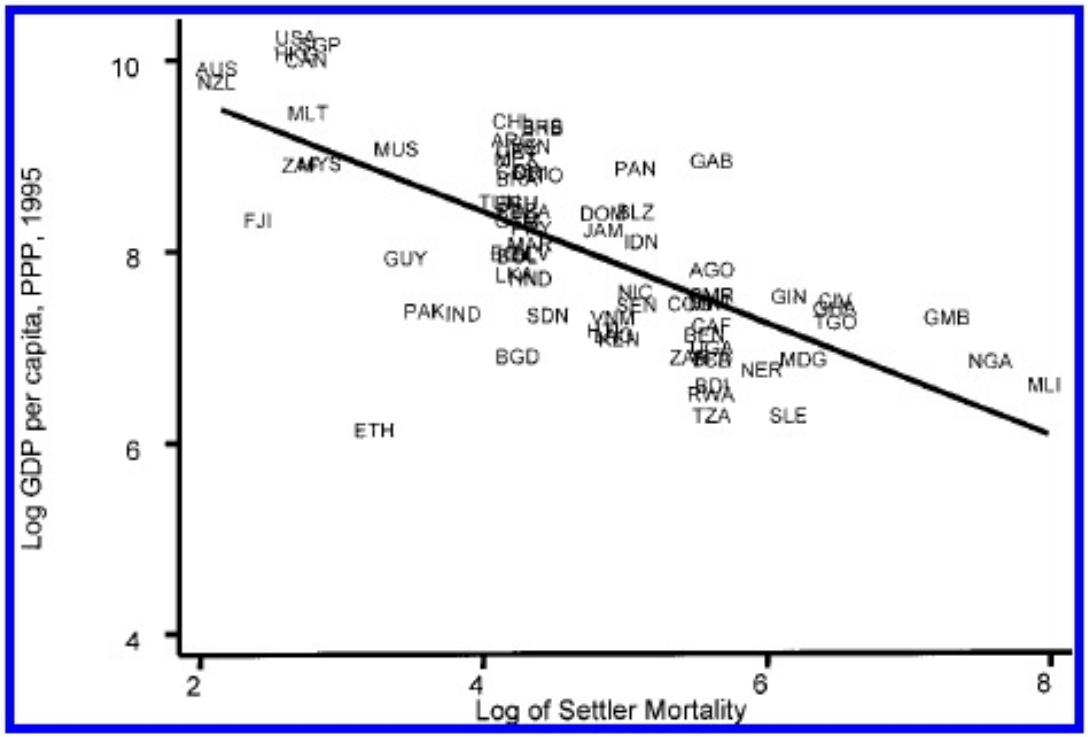
Extractive institutions

The idea that extractive institutions favoring some elites decrease GDP goes back to the work from North (1981):

"From the redistributive societies of ancient Egypt dynasties throughout the slavery systems of the Greek and Roman world to the medival manor, there was a persistent tension between the ownership structure which maximized the rents to the ruler (and his group) and an efficient system that reduced transaction costs and encouraged economic growth."

Recently, the Chinese political system may suggest that autocratic regimes are more successful than democratic institutions to get growth starting, yet, there are many counter examples.

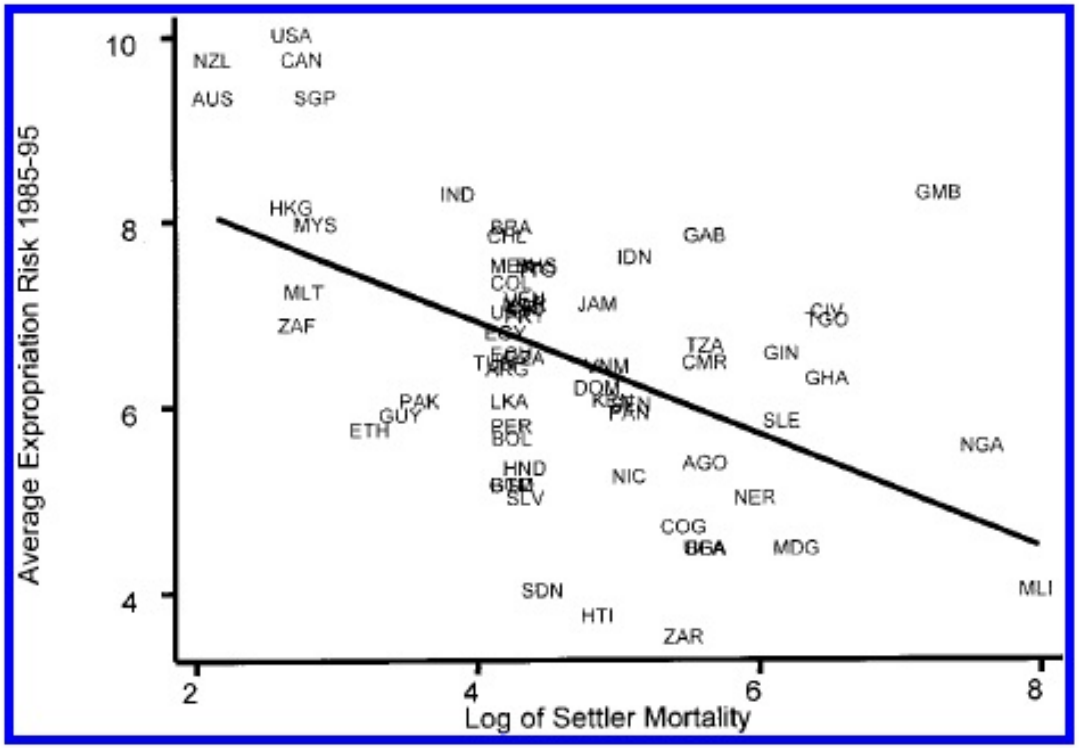
Settler mortality correlates with income differences today



Source: Acemoglu et al. (2001)

A two-stage identification:

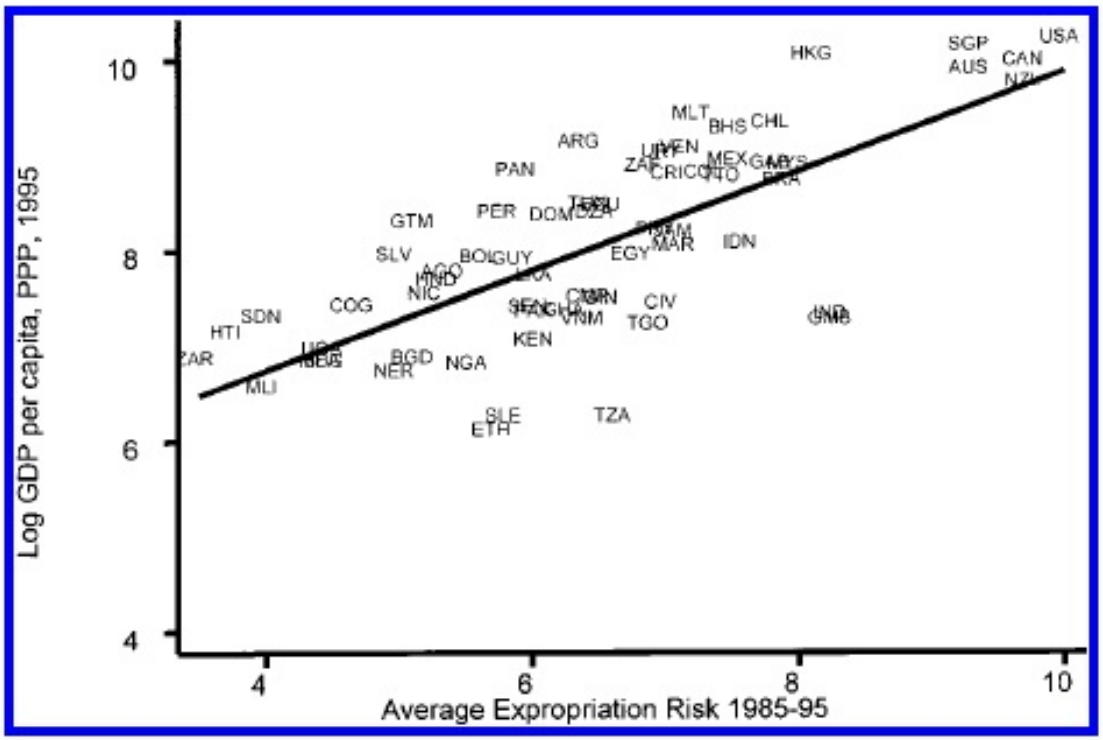
Settler mortality predicts institutions today



Source: Acemoglu et al. (2001)

A two-stage identification:

Institutions today predict income differences today



Source: Acemoglu et al. (2001)

Provides a rational for the "Reversal of Fortune"

1. Europeans settled in low population (poor) areas and introduced good (private, inclusive) institutions.

2. Where Europeans found existing populations/could not settle they established bad institutions and sought rents.

Why do extractive institutions persist?

Coase theorem:
"*In the case of zero transaction costs, no matter how the rights are initially allocated, negotiations between the parties will lead to the Pareto optimal allocation of resources*" .

Extractive institutions leave large potential rents on the table. Possible negotiation outcomes:

1. The ruling elite takes a smaller slice of a greater pie and is still better off.
2. The ruled pay-off the elite to step aside and make place for better institutions.

Why do extractive institutions persist? II

Robinson and Acemoglu (2012) identify limited commitment as the core problem:

1. The ruling elite cannot commit to take a smaller slice of the pie once people have done the investments.

2. The ruled cannot commit to pay the elite once it has stepped down from power.

How to keep good institutions in the long run?

Democratic back-sliding has been on the rise. Can rights guaranteed by the constitution help? An example from the North Korean constitution:

Citizens have the freedom of speech, the press, assembly, demonstration and association (Article 67), freedom of religious belief (Article 68), right to submit complaints and petitions (Article 69), right to work (Article 70), right to relaxation (Article 71), right to free medical care (Article 72), right to free education (Article 73), freedom in scientific, literary and artistic pursuits (Article 74), **freedom of residence and travel** (Article 75) and inviolability of the person and home and privacy of correspondence (Article 79).

Key is to avoid the concentration of power through the structure of the constitution.

Are institutions everything?

- Economists are convinced that good institutions matter.
- It is, however, hard to quantify how much of cross-sectional differences in income per person are due to institutions.
- Countries with similar institutions still make very different policy choices that matter for outcomes.

What have we learned about policies

- In the 1990s, the Washington Consensus emerged leading the World Bank to push for protecting property rights, limited government, and free market reforms. This has been a very controversial approach.

- Nobel winning economist Micheal Spence surveyed the 13 biggest successes over the last decades and finds some common denominators:
  - Openness to trade that leads to technological adoption.
  - High savings rates.
  - Governments investing large shares of spending in infrastructure and education.

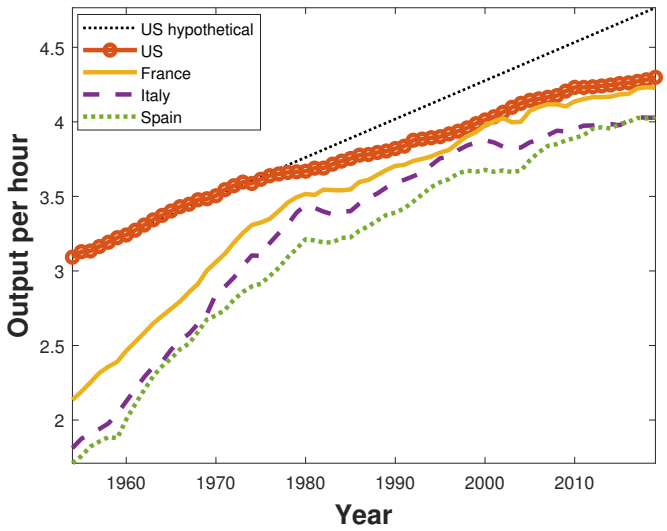
- Good financial institutions are needed to reduce misalloction.

What have we learned about policies

- Just spending on education is not enough, students actually need to learn something.
- Foreign aid is not particularly effective. One issue is that conditional aid is not working very well.

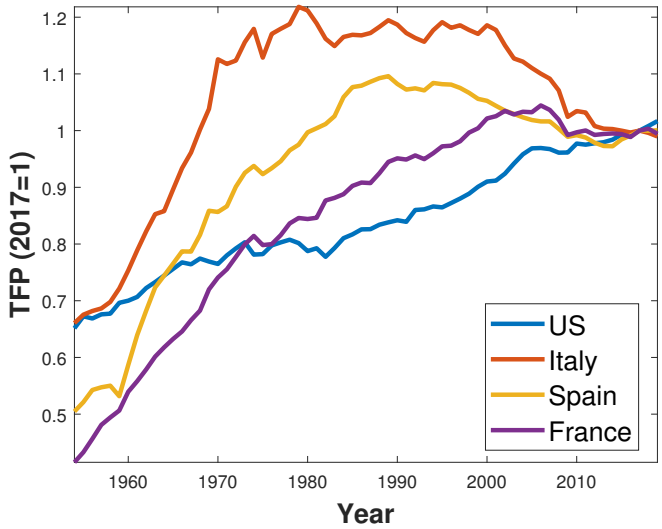
The growth slowdown

The growth slowdown in the 1970s



- In the developed world, output per hour started slow down in the 1970s.
- In the US, output per hour would be 40% higher if the old growth trajectory was intact.
- The slowdown was particularly strong in European countries. Italy today is not significantly richer than 20 years ago!

The problem is slower TFP growth



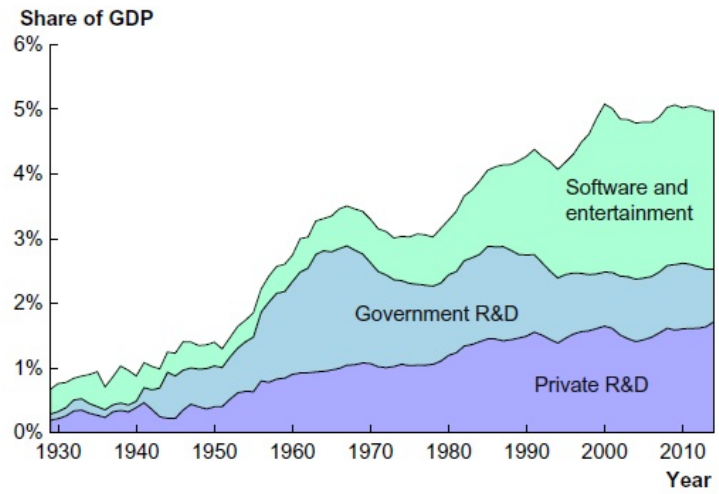
- In all countries, TFP growth slowed down.
- In many European countries, TFP today is lower than in 2000.
- The development is particularly poor in southern Europe.

Is it all mismeasurement?

- As discussed at the beginning of the course, GDP is a measure designed to measure physical output. Measuring service output is much more difficult and the economy has shifted to services.
- For example, the internet 2.0 is mostly missing from GDP though people appear to value it highly.

- In the 1960s and 1970s, the average U.S. household acquired a dish washer, a laundry machine, and a car.
- During the 2000s and 2010s, the average U.S. household acquired a cell phone.
- We were promised flying cars and all we got is 140 characters.

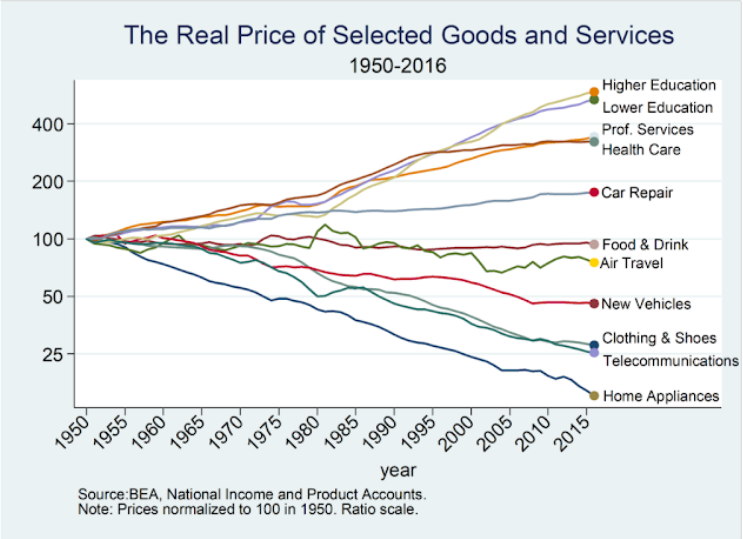
The changing nature of research



Source: Jones (2016)

- Overall spending on research as share of GDP is increasing over time.
- Government spending as a share of GDP had its height in the 1960s with the space program.
- Recent growth comes mostly from computer codes and entertainment.
- Some economists argue that government R&D may have more favorable spillover effects as it is more fundamental.

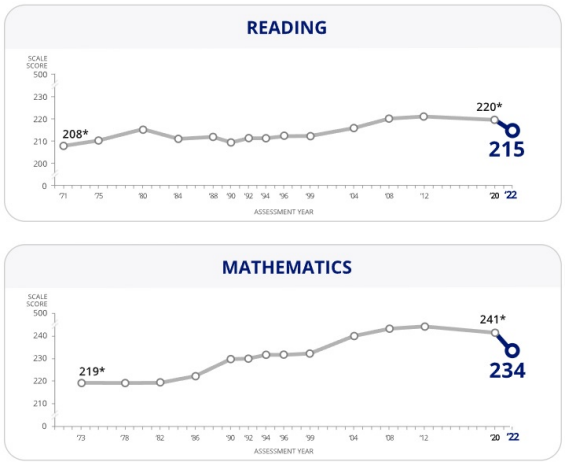
Sectorial shifts



Source: Marginal Revolution

- Our consumption has shifted over time away from manufacturing goods and towards services.
- Jorgenson and Stiroh (2000) shows that manufacturing industries have on average higher productivity growth.
- Government enterprises has the worst productivity growth yet, for example, health and education are rapidly increasing in importance.

Problems with improving education



Source: National Center for Education Statistics

- Many new technologies complement high-skilled labor and substitute low-skilled labor (automation).
- K-12 education spending per pupil has increased in real terms by 280 percent since 1960.
- However, standardized test scores have changed little over time.

Institutions may have become worse

- Approving the largest wind farm in the U.S. took 18 years. In part, due to long environmental impact evaluations.
- Building a high-speed rail in California began in 2015 and was projected to finish in 2028. In 2021, the projection moved to 2033.

Now compare this to...

Institutions may have become worse II

- The Apollo Program took 6 years to send humans to the moon.
- The Hoover Dam was build in 5 years. 96 workers died during construction.

Institutions may have become worse III

The Manhattan Project build the atomic bomb in 2 years:

- 1945, *Little Boy* with 12-18 kt of TNT.
- 1945, *Fat Man* with 18-23 kt of TNT.
- 1951, *George* with 225 kt of TNT.
- 1952, *Ivy Mike* with 10400 kt of TNT.
- 1954, *Castle bravo* with 15000 kt of TNT.
- 1961, *Tsar Bomba* with 50000 kt of TNT.

Why has it become more difficult to get things done?

The regulation of the economy is constantly growing over time:

- Vested interests have political power.
- As society has become richer, we may value security more making us more complacent.
- Today's society may value more consensus instead of individual success.

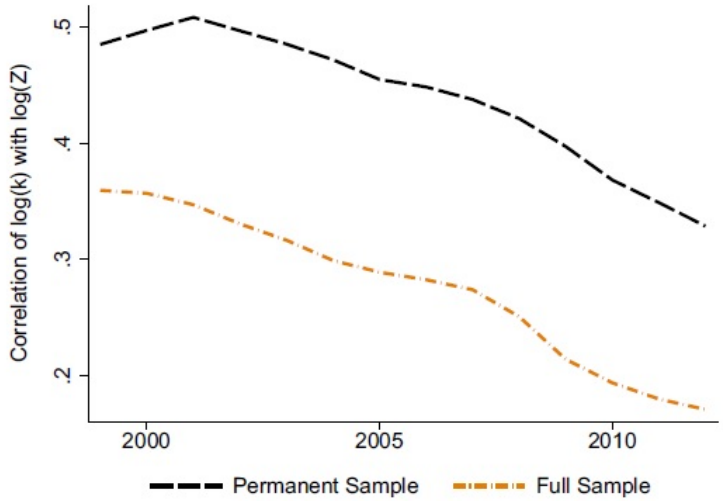
Residential misallocation

TABLE 1—EMPLOYMENT, AVERAGE WAGES, TFP, HOUSING PRICES, AND AMENITIES

	1964	2009
log employment		
New York, San Francisco, San Jose	2.89	2.55
Rust Belt cities	1.63	0.96
Southern cities	0.82	1.14
Other large cities	2.68	2.23
log TFP		
New York, San Francisco, San Jose	3.81	7.14
Rust Belt cities	2.77	1.14
Southern cities	1.14	1.95
Other large cities	3.36	3.68
log housing price		
New York, San Francisco, San Jose	0.409	0.610
Rust Belt cities	0.125	−0.104
Southern cities	−0.128	0.106
Other large cities	0.225	0.333

- Hsieh and Moretti (2019) study the misallocation of people across space because of housing restrictions.
- Over the last decades, productivity in some urban areas exploded but employment changed little.
- Reducing zoning restrictions in those areas to the U.S. median increases GDP by 3.7%.

Capital misallocation in Souther Europe



Gopinath et al. (2017) find that Spanish (and southern European) capital allocations has worsened after the introduction of the Euro. The latter decreased real interest rates leading to capital inflows. The financial system channeled too much of the additional capital to relatively inefficient firms.

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