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Topic 5. Economic growth

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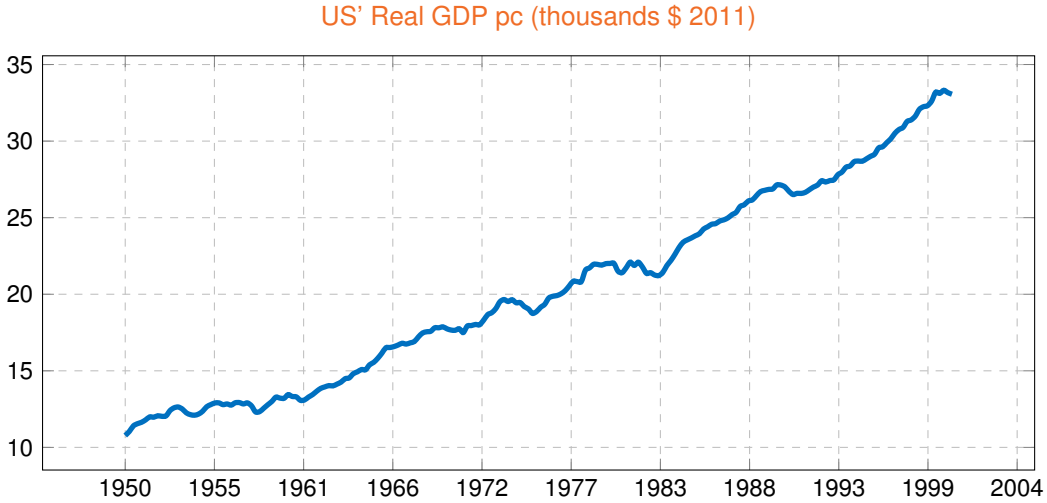
Introduction

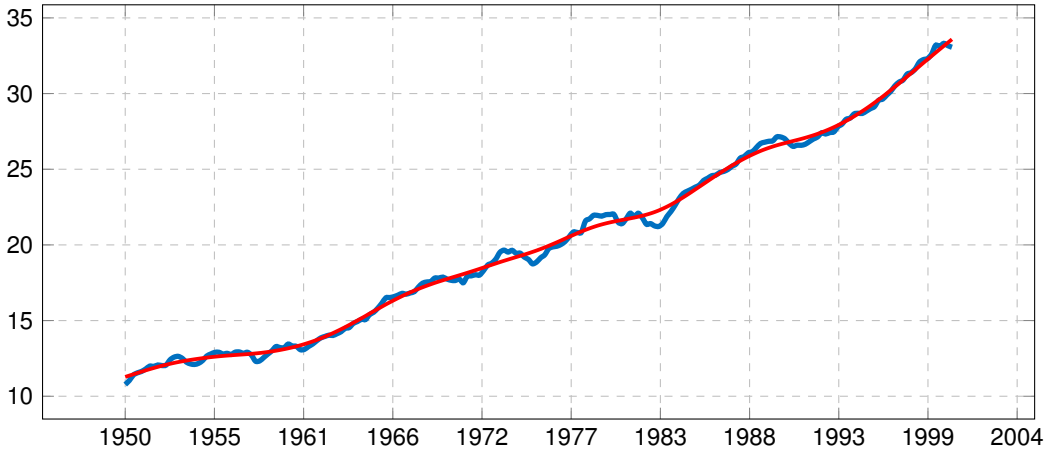
- In the next two topics we are going to study how an economy's GDP evolve over time.
- To this end, it is important to decompose GDP in two (additive) components:
  - Trend: long-run evolution of GDP
  - Cycle: short-term variations of GDP around its trend.
- This decomposition allows us to understand the underlying forces driving each of them.
  - In this Topic 5 we are going to understand the trend component
    - → Why are we much richer today than we were at the beginning of the 19th century?
  - In next topic, we will understand the cycle component
    - → Why does GDP grow by 3% or by 6% this year?

Introduction



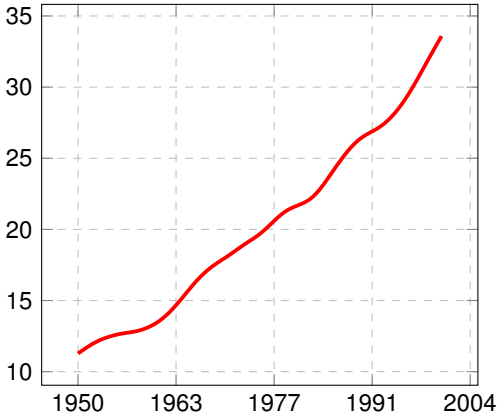
Introduction

US' Real GDP pc (thousands $ 2011)

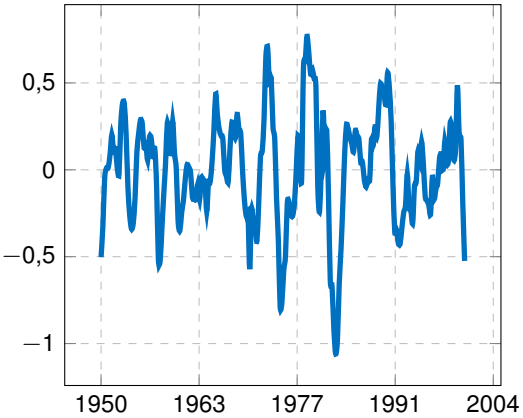


Introduction

Trend component



Cycle component



Outline

1. Measuring economic growth
2. Stylized facts of growth
3. Sources of economic growth

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Measuring economic growth

- We define economic growth as sustained increase in the level of production over time.

  An increase in GDP from one year to the next is not economic growth.

- Why do we care about economic growth?

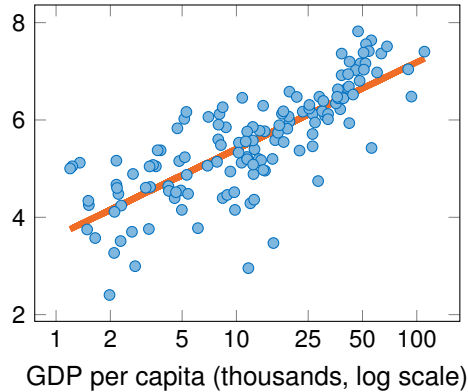
  Economic growth allows countries to improve living conditions in a sustainable way.

  Remember: GDP equals the sum of all incomes generated in the economy.

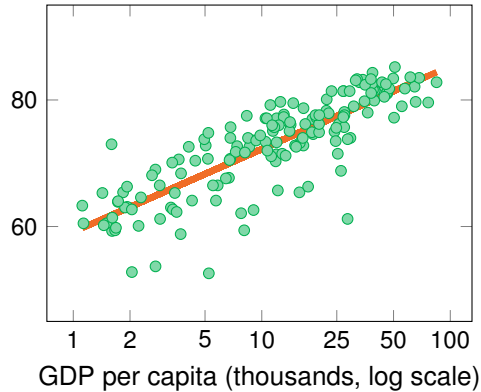
  - We know that GDP is not a perfect measure of well-being $\rightarrow$ Topic 4
  - But it is highly correlated with many measures of happiness/satisfaction.

Measuring economic growth

Life satisfaction index and GDP per capita (2018)



Life expectancy and GDP per capita



Source: Our World in Data.

Measuring economic growth

- How do we measure economic growth?

  We want a measure of living standards... but GDP is not a good measure for this.

  Why? Four reasons:

  1. Different countries have different currencies
  2. Larger countries mechanically have higher GDP
  3. Prices change over time
  4. Different countries have different prices

Measuring economic growth

1. Different countries have different currencies

   China's GDP in 2023 was CNY 210 trillion, while the US's was $ 27.7 trillion.

   - Can we say that China is 10 times richer than the US? NO!!
     - China and the US use different currencies, so these two figures are not comparable: we need to measure GDP in a single currency to be able to compare.
     - We can exchange currencies of different countries at a price: the exchange rate.
     - In 2023, you could buy 0.1415 USD per CNY: 0.1415 is the USD/CNY exchange rate
   - Using USD as common currency: China GDP was $29.7 T (7% higher than in the US).

   China and the US had a relatively similar level of production in 2023.

Measuring economic growth

2. Larger countries mechanically have higher GDP

China and the US had a relatively similar GDP in 2023: $ 29.7 trillion and $ 27.7 trillion

- Can we say that China is as rich as the US? NO!!
  - China is much larger than the US so they mechanically have higher GDP: more people working, more machines, more land, etc.: we need to compare production per person.
  - If we divide GDP by the population, we get the GDP per capita, or GDPpc.
    - China's GDPpc in USD: $ 13,020
    - US's GDPpc in USD: $ 82,800

In per capita terms, US production is 6.4 times higher than China's.

Measuring economic growth

3. Prices change over time

Spain's GDPpc in 2020 was 4.4 times higher than in 1980: $6,208 vs. $27,230.

- Can we say that we live 4 times better today than in 1980? NO!!
  - Each dollar in 1980 worth much more than today $\rightarrow$ Prices change!!

    For instance, renting an apartment was around 10 times cheaper in 1980 than in 2020.
  - Measure GDPpc in different moments using the same level of prices: real GDPpc
- Using the 2010 prices, GDP pc in 2020 was $24,939 while in 1980 was $14,727

In real terms, Spain's GDP pc is 2020 is 1.7 times higher than in 1980.

Measuring economic growth

4. Different countries have different prices

In 2020, real GDP pc in Spain was 170% higher than in Poland: $24,939 vs. $14,661

- Can we say that Spaniards live 1.7 times better than Polish? NO
  - With $1, you can buy more things in Poland than in Spain.
  - When analyzing living standards, we don't care about how much money you make but about how much consumption you can pay for.
  - Solution: use a common set of prices for both countries (typically US prices). This is called purchasing power parity numbers, or PPP-adjusted
- Using PPP numbers, Spanish real GDP pc was $37,756, while Poland's was $34,287.

In PPP numbers, Spanish are 10% richer than Polish

Measuring economic growth

- How do we measure economic growth?

  We want a measure of how well people in a country/year life. A country's GDP is not a good measure for this. Why? Four reasons:

  1. Different countries have different currencies $\rightarrow$ Use common currency (US dollars).
  2. Larger countries mechanically have higher GDP $\rightarrow$ Use GDP per capita.
  3. Prices change over time $\rightarrow$ Use real GDP.
  4. Different countries have different prices $\rightarrow$ Use purchasing power parity (PPP) units.

  We use the real GDP pc in PPP to measure economic growth over time and across countries.

Outline

1. Measuring economic growth
2. Stylized facts of growth
3. Sources of economic growth

Stylized facts of growth

- What does the data tell us about economic growth? Three main facts:
  1. If we focus on the main economies, we observe a very strong growth over the last century.
  2. If we look further back in time, we observe that this growth is pretty recent: Malthusian trap.
  3. If we look beyond the main economies, we observe that economic growth has not reach all regions equally.

Fact 1. The main economies has grown strongly over the last century

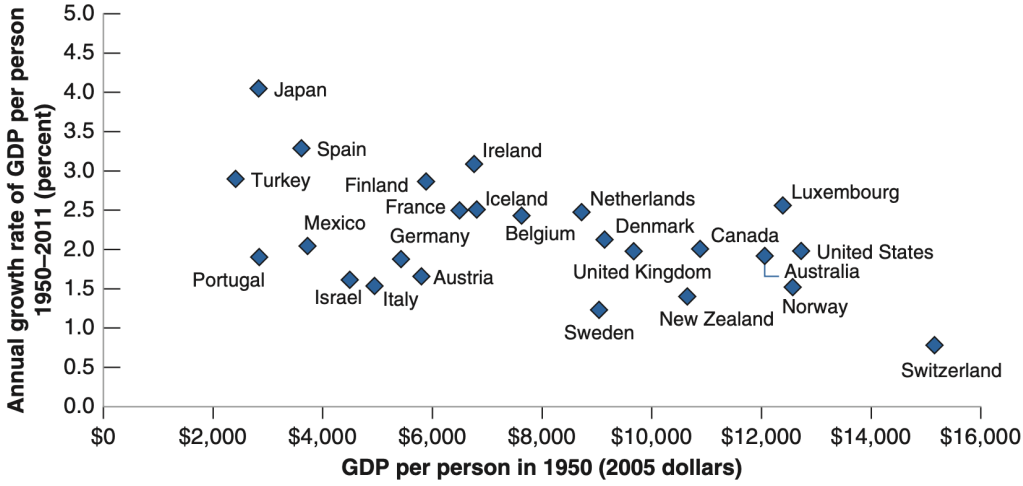
- GDP pc (in PPP) in 2010 was between 3 and 12 times larger than in 1950.
  - Spain's GDP in 2010 was 9 times larger than in 1950.
  - The US's GDP pc in 2010 was 3 times larger than 60 years before.
- We observe a remarkable convergence trend.
  - Those countries that were initially poorer, grew faster than the initially richer.
  - Eg.: Spain has growth 3 times more than the US over the same period.

Fact 1. The main economies has grown strongly over the last century

GDP pc cápita (PPA, $ 2011)

Country	1950	2010	Change	Annual growth %
GBR	11,061	34,754	× 3.14	1.93%
USA	15,240	49,267	× 3.23	1.97%
FRA	8,266	36,087	× 4.37	2.49%
ITA	5,582	34,766	× 6.23	3.10%
DEU	6,186	41,110	× 6.65	3.21%
ESP	3,464	31,786	× 9.18	3.76%
CHN	799	9,658	× 12.09	4.24%

Fact 1. The main economies has grown strongly over the last century



Source: Blanchard, 7th Edition.

Fact 2. Economic growth is a very recent phenomenon

- European living conditions in in the 18th c. were very similar to those in Rome in the 1st c.

  "Economics and World History: Myths and Paradoxes", Paul Bairoch

- Between 1500 and 1820, world GDP pc grew at an anual rate of 0.05% (Europe: 0.14%)

  "The World Economy: A Millennial Perspective", Angus Maddison

- Why? Malthusian trap: the improvements in technology (higher GDP pc) were "absorbed" by increases in population (lower GDP pc).
  - When living conditions increased, fertility started increasing up to a point were living conditions deteriorated so much that population begun to fall.

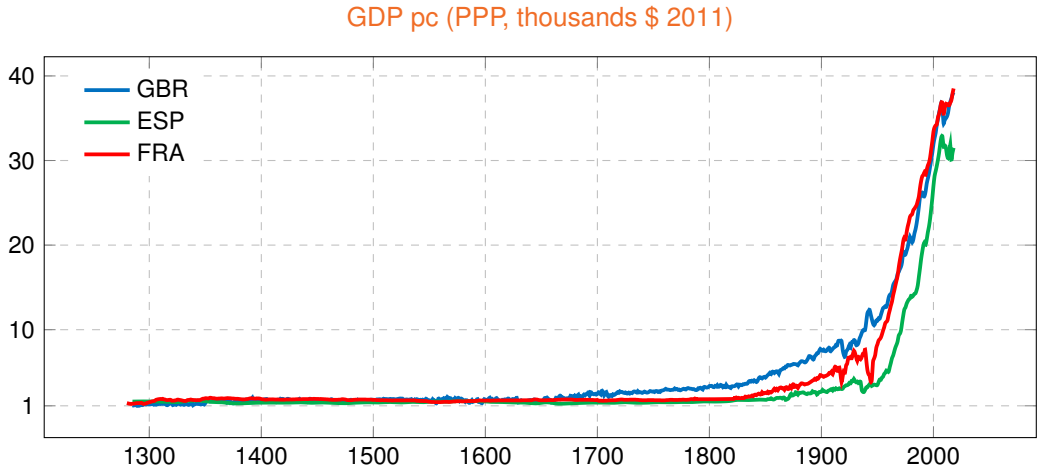
    $\uparrow$ GDP pc $\rightarrow$ $\uparrow$ Population $\rightarrow$ $\downarrow$ GDP pc $\rightarrow$ $\downarrow$ Population $\rightarrow$ $\uparrow$ GDP pc $\rightarrow$ ...

Fact 2. Economic growth is a very recent phenomenon

GDP pc (PPP, $ 2011)

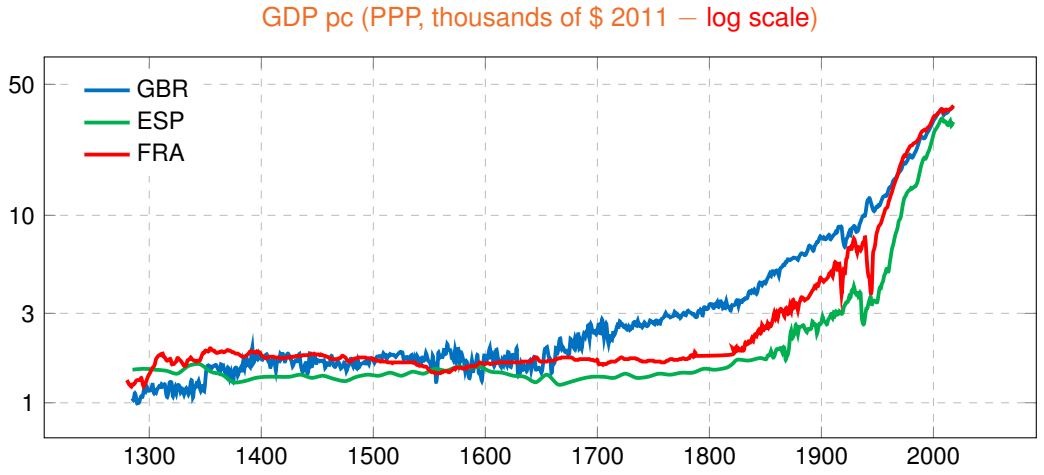
Country	1400		1800		2000
United Kingdom	1,717	×1.95	3,343	×9.56	31,946
France	1,795	×1.00	1,809	×18.5	33,410
Spain	1,376	×1.09	1,501	×17.9	26,995
Italy	3,087	×0.78	2,404	×13.6	32,717

Fact 2. Economic growth is a very recent phenomenon



Source: Madison Project database.

Fact 2. Economic growth is a very recent phenomenon



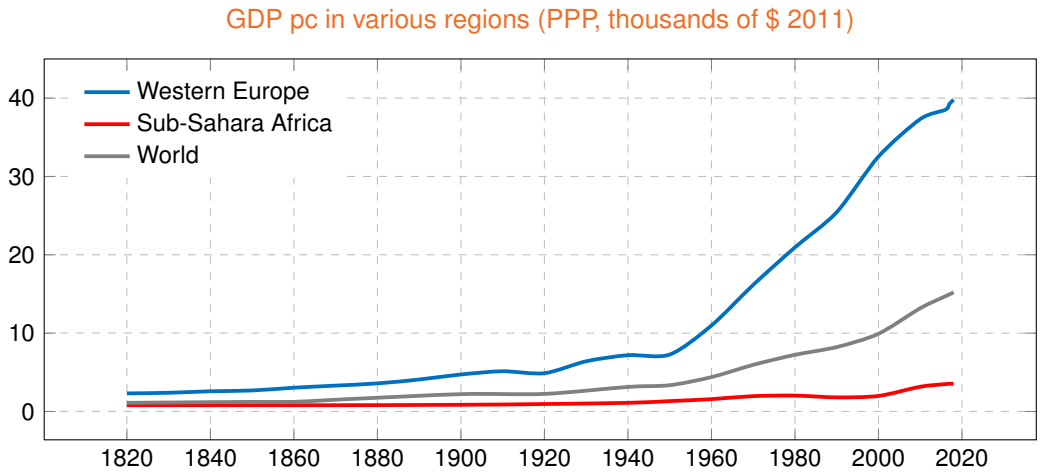
Fuente: Madison Project database.

Fact 3. Economic growth has not reached all regions in the world

GDP pc in various regions (PPP, thousands of $ 2011)

Region	1820	2018	Change	% y-o-y
World	1,102	15,212	$\times$ 13.8	1.33%
Western Europe	2,307	39,790	$\times$ 17.2	1.45%
Latinamerica	953	14,076	$\times$ 14.8	1.37%
Asia	929	7,649	$\times$ 8.2	1.07%
Subsaharian Africa	800	3,532	$\times$ 4.4	0.75%

Fact 3. Economic growth has not reached all regions in the world



Source: Madison Project database.

GDP pc 2010 relative to GDP pc PPA 1950 — *Source: Madison Project database*

Equatorial Guinea	52.75
Libya	47.03
Oman	46.51
Republic of Korea	31.60
Botswana	25.65
Taiwan	25.61
Romania	19.88
Singapore	16.41
Malta	15.02
China	12.09
Saudi Arabia	12.02
Swaziland	11.91
Mongolia	11.57
Japan	11.43
Hong Kong	10.58
Thailand	10.25
Bahrain	10.15
Puerto Rico	9.72
Cyprus	9.58
Spain	9.18
Norway	9.07
Dominica	8.95
Ireland	8.83
Greece	8.69
Saint Lucia	8.17
Turkey	7.95
Portugal	7.66
Seychelles	7.65
Malaysia	7.47

Egypt	7.39
Dominican Republic	6.89
Austria	6.82
Germany	6.65
Indonesia	6.55
Iran	6.47
Israel	6.36
Brazil	6.36
Former Yugoslavia	6.26
Italy	6.23
Tunisia	6.03
Cabo Verde	6.00
Myanmar	5.98
Lao People's DR	5.90
Panama	5.89
Algeria	5.78
Albania	5.78
Bulgaria	5.58
Finland	5.55
Poland	5.28
Trinidad and Tobago	5.16
Hungary	5.07
Gabon	5.05
Switzerland	4.96
Iraq	4.73
India	4.59
Netherlands	4.58
Angola	4.48
Czechoslovakia	4.40

Mauritania	4.39
Jordan	4.38
France	4.37
Vietnam	4.36
Belgium	4.33
Iceland	4.27
Pakistan	4.25
Mexico	4.19
Sri Lanka	4.17
Mauritius	4.13
Nigeria	4.09
Luxembourg	4.04
Lebanon	4.03
Sweden	3.97
Denmark	3.88
Costa Rica	3.85
Australia	3.84
Lesotho	3.67
Former USSR	3.61
Canada	3.55
Barbados	3.53
Congo	3.39
Philippines	3.34
Jamaica	3.32
Yemen	3.31
Colombia	3.26
United States	3.23
Chile	3.22
Cambodia	3.16

United Kingdom	3.14
Ecuador	3.14
El Salvador	3.10
U.R. of Tanzania	3.06
Bangladesh	3.02
Morocco	2.99
Paraguay	2.99
Palestine	2.94
Zambia	2.88
Guinea-Bissau	2.88
Sudan	2.83
South Africa	2.80
Qatar	2.78
Comoros	2.68
Nepal	2.68
Peru	2.58
Cuba	2.49
Kenya	2.49
Guinea	2.48
Sao Tome & Principe	2.42
Argentina	2.39
United Arab Emirates	2.39
New Zealand	2.34
Uruguay	2.34
Cameroon	2.26
Honduras	2.13
Malawi	2.12
Chad	2.11
Mali	2.07

Venezuela	2.02
Namibia	1.97
Guatemala	1.96
Gambia	1.81
Ethiopia	1.78
Burkina Faso	1.75
Bolivia	1.71
Syria	1.70
Uganda	1.67
Ghana	1.65
Sierra Leone	1.58
Cote d'Ivoire	1.54
Nicaragua	1.53
Kuwait	1.5
Afghanistan	1.41
Rwanda	1.39
Togo	1.37
Zimbabwe	1.26
Burundi	1.21
Benin	1.14
Senegal	1.07
Madagascar	0.89
Haiti	0.87
Niger	0.82
Djibouti	0.74
D.R. of the Congo	0.70
Central African	0.70
Mozambique	0.53
Liberia	0.27

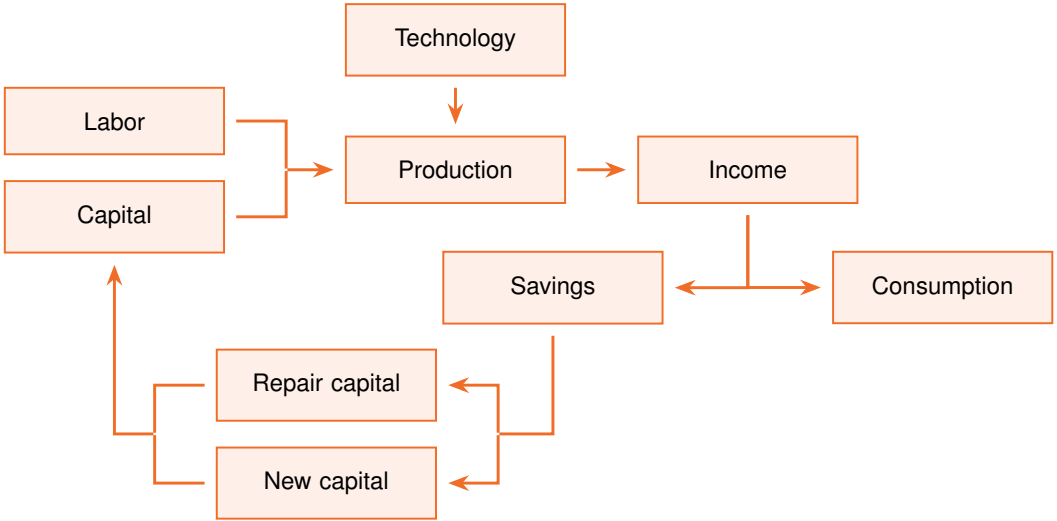
Outline

Sources of economic growth

Why do economies grow?

- Firms (and therefore, countries) produce their output combining two things:
  - Inputs: labor and capital (machines, software, etc.)
    - Production can grow by accumulating more workers, but this increases production, not production per capita $\rightarrow$ higher GDP but no higher GDP pc.
    - Production can grow by accumulating more capital per worker, which allows each of them to produce more output $\rightarrow$ higher GDP pc.
  - Technology: the way inputs are combined to produce output.
    - Production can grow by improving the technology: more output given the levl of capital and the number of workers $\rightarrow$ higher GDP pc.
- Two sources of growth: (1) more capital per worker, and (2) better technology.

Sources of economic growth



Capital accumulation

Source of growth 1. Economies can grow by accumulating capital per worker.

- There are two limitations of capital accumulation as a source of economic growth:
  - Accumulating capital is costly: we cannot accumulate infinite capital.
    - To accumulate capital we need to save, and thus, we need to give up consumption.
    - Capital depreciates: If capital is large, its maintenance becomes very expensive.
  - Law of decreasing returns: increasing capital generates an increase in output, but this increase in production gets smaller as capital grow.

    Do you think an extra oven has the same impact on a small bakery than on a big factory?
    - If you increase capital per worker by x%, output will increase by less than x%

Capital accumulation

- Overall, as the capital per worker in the economy grows...
  - It becomes more and more expensive to maintain this capital
  - It generates less and less extra output
- As a result, the capital per worker reaches a level such that the cost of maintaining it is higher than the output it generates $\rightarrow$ Capital cannot grow more!
- Conclusion:
  - Accumulating capital per worker generates economic growth but up to a limit
  - Accumulating capital per worker cannot generate growth infinitely

Productivity growth

Source of growth 2. Economies can grow by improving their technology (productivity growth).

- By "technology improvements" we mean any improvement in knowledge, production processes and/or technological products that allow the economy to produce more given an amount of labor and capital.
- As opposed to capital, technology is not subject to the law of decreasing returns: if you improve your technology by x%, output increases by x%.

  Technology improvement can generate limitless economic growth
- Three sources of technology improvement
  - Technological innovation
  - Allocative efficiency
  - Human capital

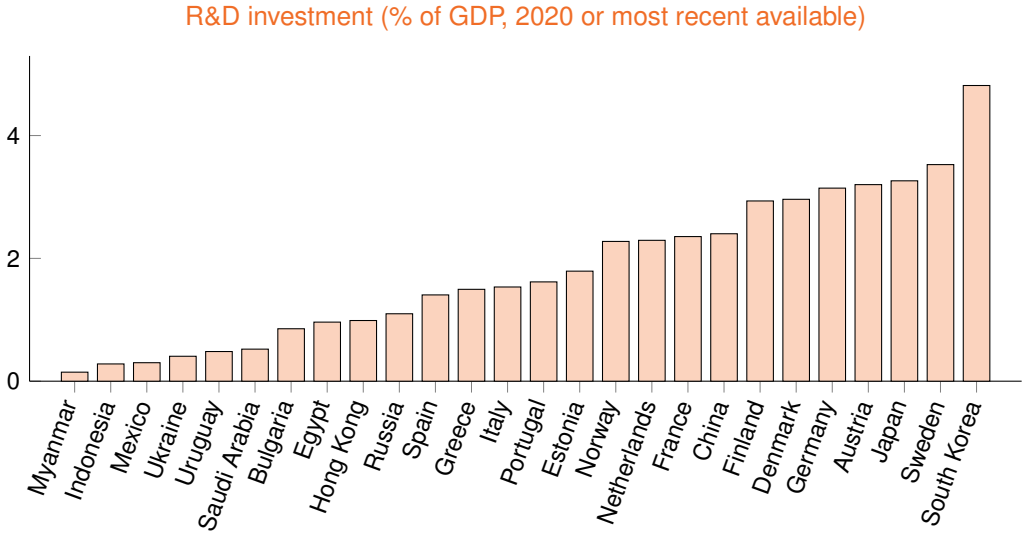
Productivity growth: Technological innovation

- New technologies that give rise to new products/markets and/or new production processes.
- Innovation is (mainly) the result of R&D activities.

  Most industrialized countries spend between 1% and 3% of their GDP in R&D activities.

  - Three key factors explaining investments in R&D:
    - "Fertility" of innovation: how likely it is to produce an innovation.
    - Protection of intellectual property: ability to capture the benefits of one's innovations.
    - Business dynamism, degree of business competition
- The impact of technological innovation depends on the extend to which the innovation is implemented in the production process $\rightarrow$ the price of technology is key!

Productivity growth: Technological innovation



Productivity growth: Technological innovation

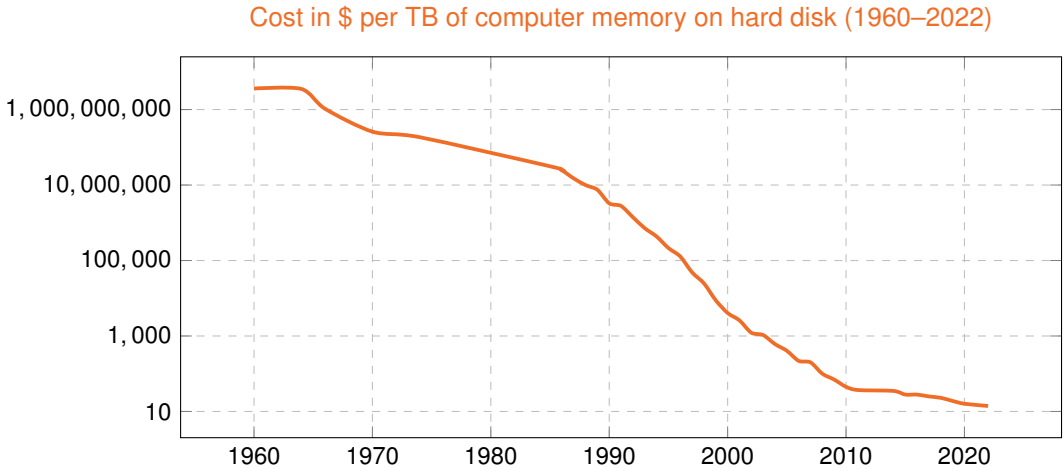
First computer in Spain, 1960

Price: € 34, 400 (monthly rent)

HP EliteDesk 800 G1

Price: $<$ € 200

Productivity growth: Technological innovation



Source: OurWorldInData.org (John C McCallum, 2023)

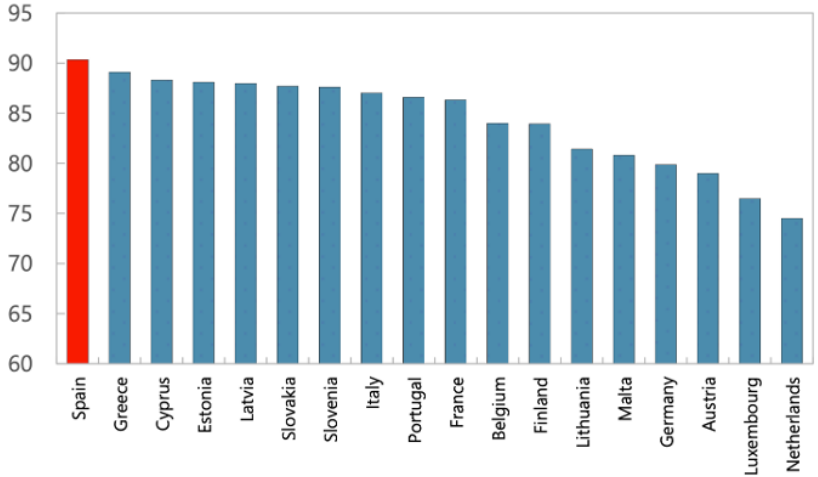
Productivity growth: Allocative efficiency

- A second way of improving technology is by allocating existing resources efficiently.
  - Efficient allocation: more capital and labor is employed in more productive firms.
  - In Europe, GDP pc would grow 0.2 p.p. faster if capital and labor were efficiently allocated.

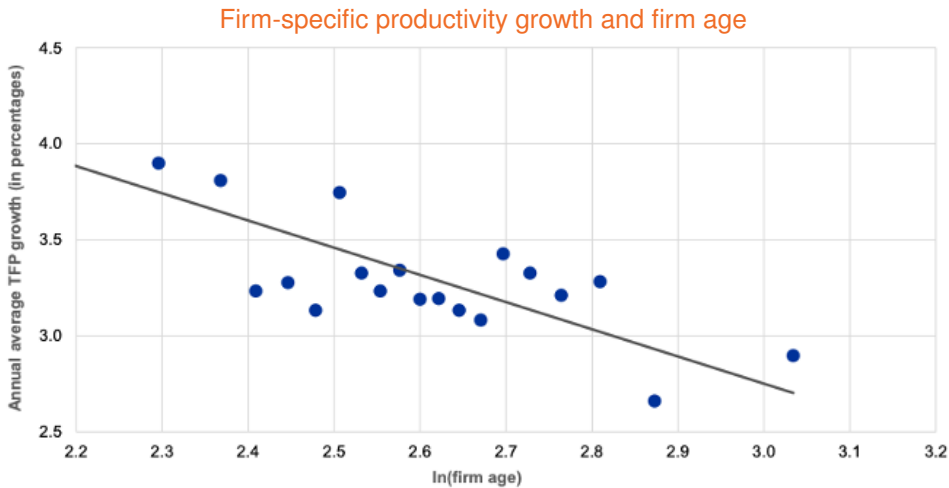
    GDP would be 20% higher in 10 years, and 146% higher in 50 years
- Two main sources of inefficiencies:
  - Regulations protecting inefficient firms (small firms, local firms, etc.)
  - Low business dynamism: potential firms finding it difficult to enter the market.
    - New ideas, products or process improve the efficiency int he economy.
    - If entry is difficult, these potential gains are forgone.

Productivity growth: Allocative efficiency

Share of total employment working in small firms (1 to 9 workers), 2019



Productivity growth: Allocative efficiency



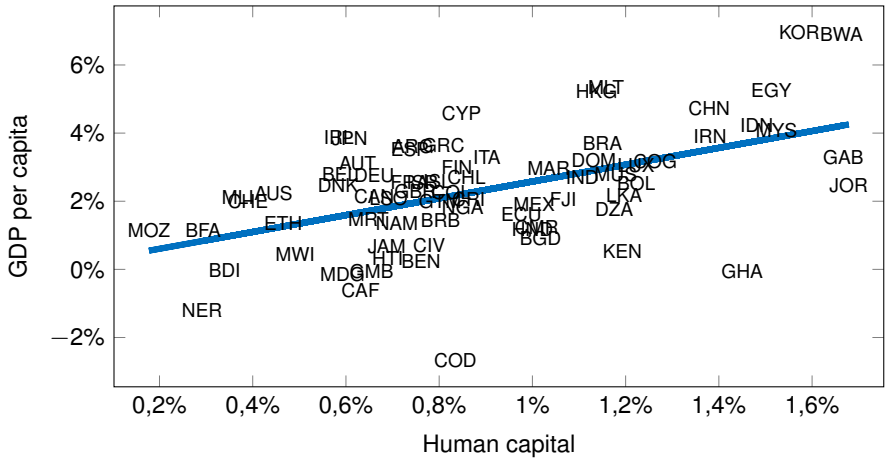
Productivity growth: Human capital

- Given a number of workers and a given amount of capital, if workers are more skilled the economy is able to produce more $\rightarrow$ That's technology!
- Human capital is not only a source of technology improvement itself; it also facilitates other technology improvements:
  - Better scientist are able to produce more and better innovations
    - $\rightarrow$ More innovation
  - More educated managers are able to efficiently organized their production
    - $\rightarrow$ More allocative efficiency

That's why human capital is one of the most important things in an economy (if not the most).

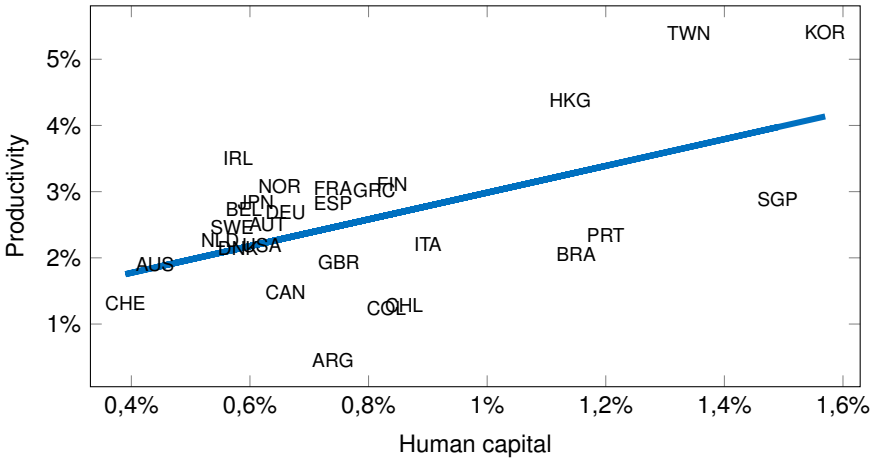
Productivity growth: Human capital

Annual growth rate of GDP pc and human capital (1960–2010)



Productivity growth: Human capital

Annual growth rate of productivity and human capital (1960–2010)



The key role of institutions

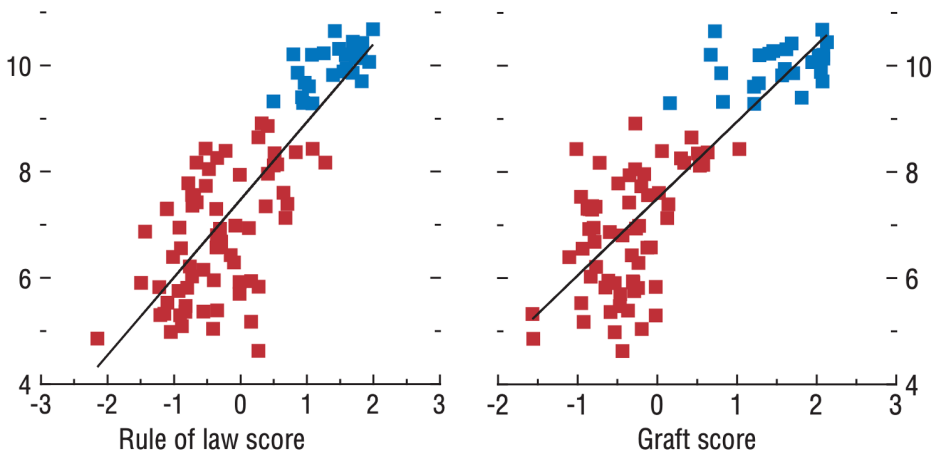
- To sum up...
  - Economies growth by accumulating capital per worker and by increasing productivity.
  - Only productivity growth can generate sustained growth over time.
- If this is so clear, why there are poor countries? Why some countries do not accumulate capital? Why some do not generate productivity gains?

  Answer: because the economy does not have good institutions
  - Institutions: set of formal and informal rules that govern how agents interact.

    Examples: rule of law, absence of corruption, protection of private property, etc.
  - These are not a direct source of economic growth, but they are required for it to arise.

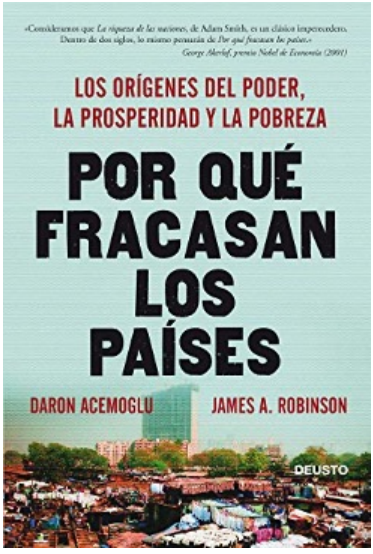
The key role of institutions

GDP per capita and institutions



The key role of institutions

GDP per capita and institutions



Por qué fracasan los países

by Daron Acemoglu and James A. Robinson

- Easy-to-read book on how two countries initially similar (i.e. North and South Korea) can end up with very different living standard.
- Spoiler: institutions!
- Available both in English and in Spanish.

Questions?