# The role of industrial policies in productive development and sustainable growth

Ricardo Hausmann

Growth Lab - Harvard University, Santa Fe Institute

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# Agenda

- Who needs industrial policy?
- A puzzling fact about international convergence patterns
- A theory of technology and of adoption obstacles
- Goal-oriented industrial policy
- The dimensions of industrial policy

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- **Who needs industrial policy?**
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# Who needs industrial policy?

- "Little else is requisite to carry a state to the highest degree of opulence from the lowest barbarism but ***peace***, ***easy taxes***, *and a* ***tolerable administration of justice***: all the rest being brought about by the natural course of things."
- - Adam Smith, Lecture in 1755

# Traditional definitions of industrial policy

- Investors lack either money or adequate incentives
- Solution: give them credit or subsidies
- They will buy what they need
- Implementation: line item in the budget of the  Ministry of Industry + selection mechanism on who to give the money to
- A typical Pigou problem
  - Subsidize positive externalities
  - Tax negative externalities

**Industrial policy is seen as an instrument**

# Typical criticism of industrial policies as instruments

- Government cannot “pick winners”
- Investors that receive support might have come anyway
- It will be captured by inefficient, politically-connected players
- It is best to let the market work

# Policy as instrument vs policy as goal

- Some policies are defined by the goals they pursue
  - Citizen security,
  - Climate policy
  - Instruments are developed to achieve the goal
- Other policies are defined by the instruments they use
  - Tax policy
  - Monetary policy
- Industrial policy has been seen as a set of instruments
  - Incentive: tax expenditures, subsidies, soft loans
- I think of it as defined by the goals that want to be achieved
  - Diversification, technology adoption and adaptation to assure sustained growth and economic convergence

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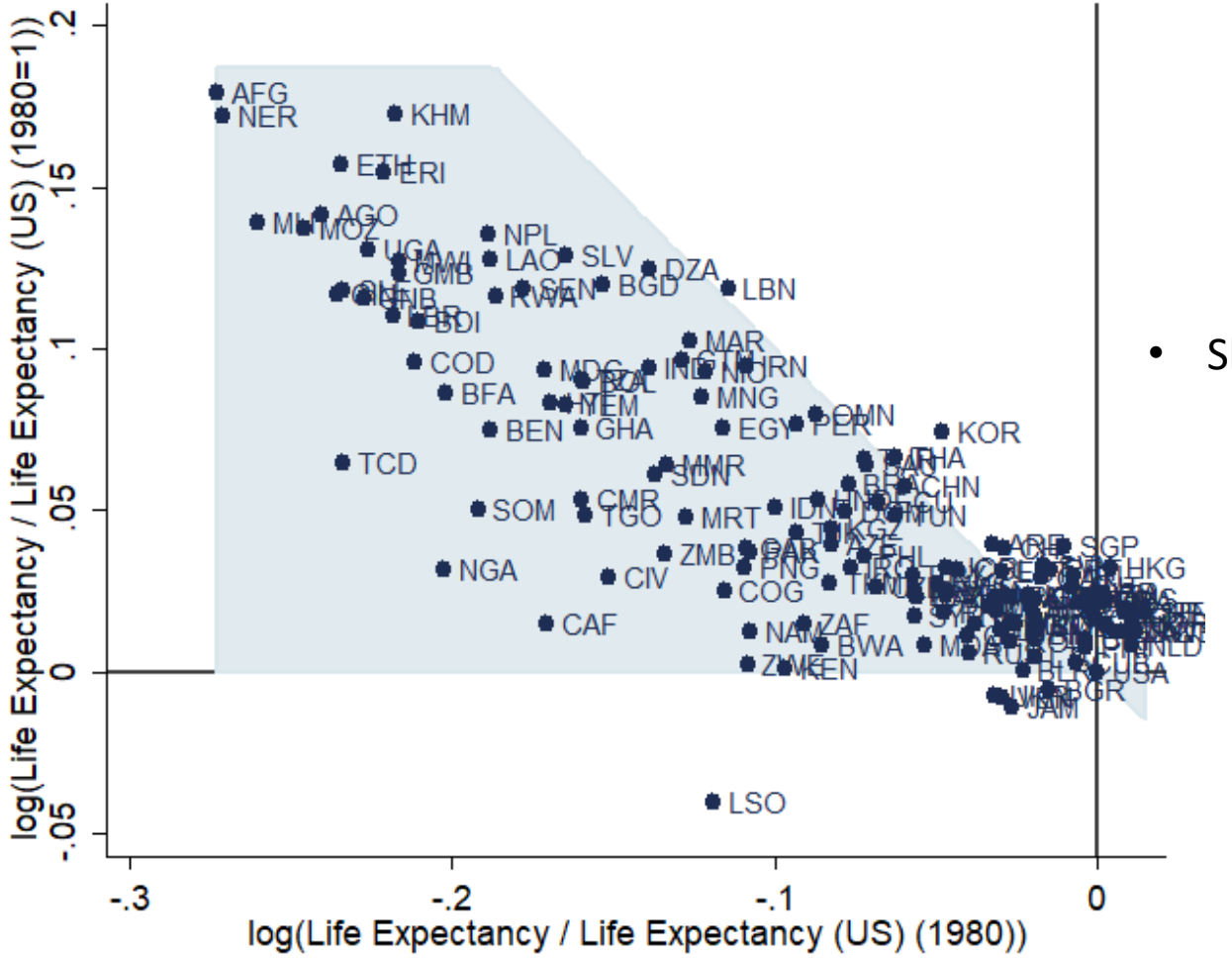
# The view of modern growth

- Improvements in health
  - Declining infant mortality
- The demographic transition
  - Declining fertility rates
  - Declining rates of population growth
- Education
- Female empowerment
- Urbanization
- Investment
- **Technology will naturally flow** to the newly educated, empowered, urbanized households, leading to **economic convergence and sustainable growth**

# Unconditional Convergence in Life Expectancy

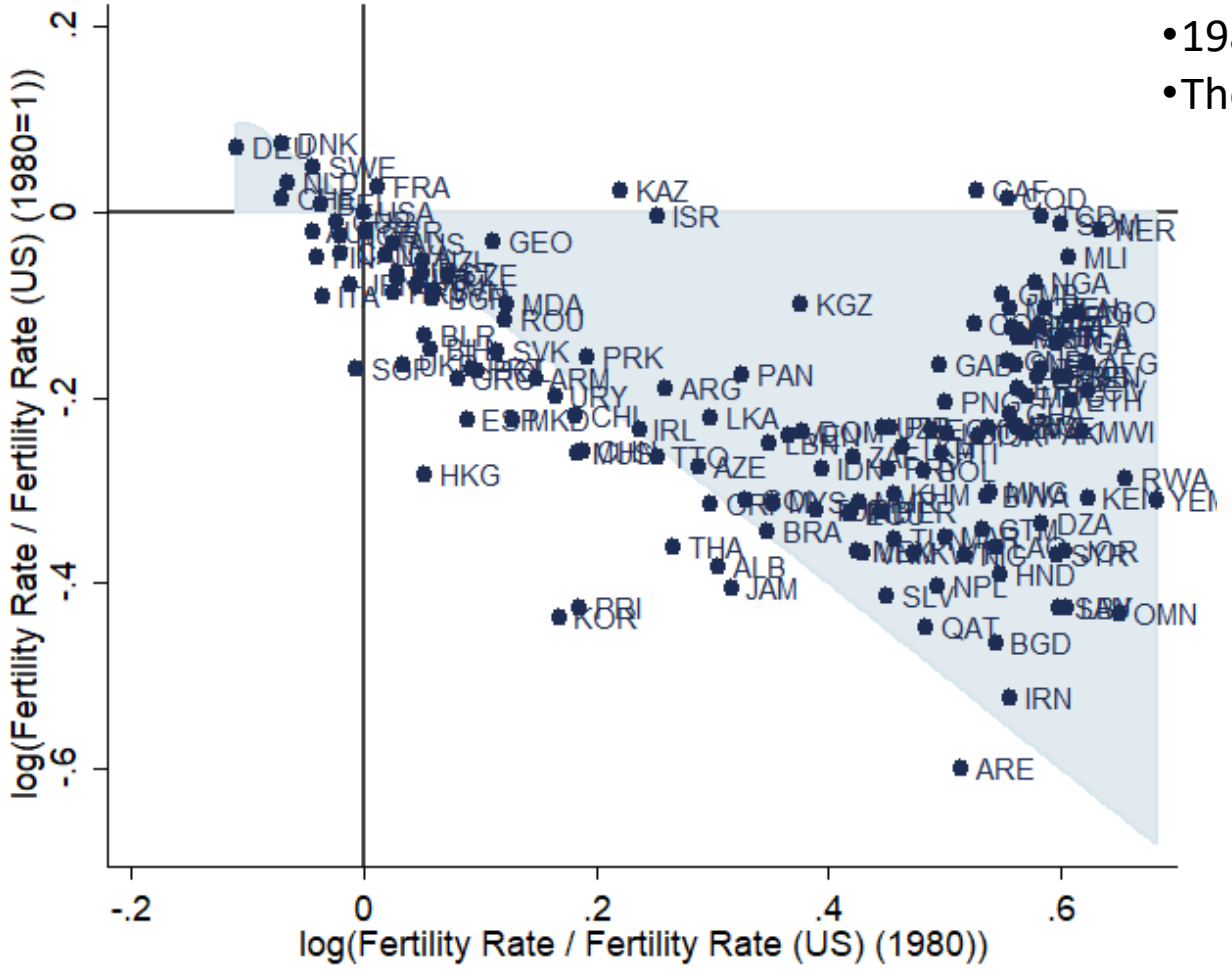



- 1980 below US: 137/150
- Thereof converged: **96%**

- Shaded area:
  - 2nd quadrant: country converged to the USA but did not surpass

Source: Own illustration based on WDI

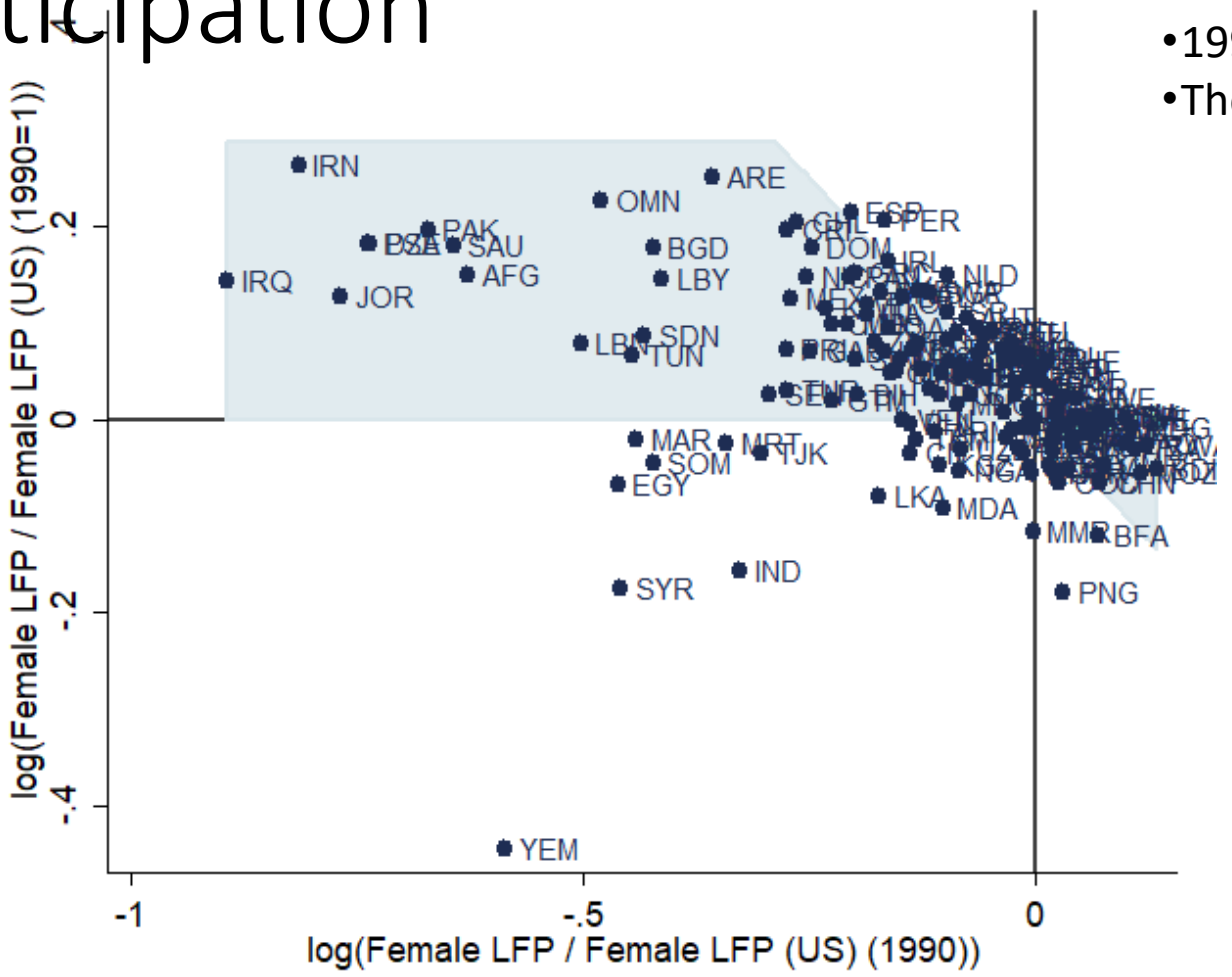
# Unconditional Convergence in Fertility




- 1980 below US: 136/150
- Thereof converged: **96%**

Source: Own illustration based on WDI

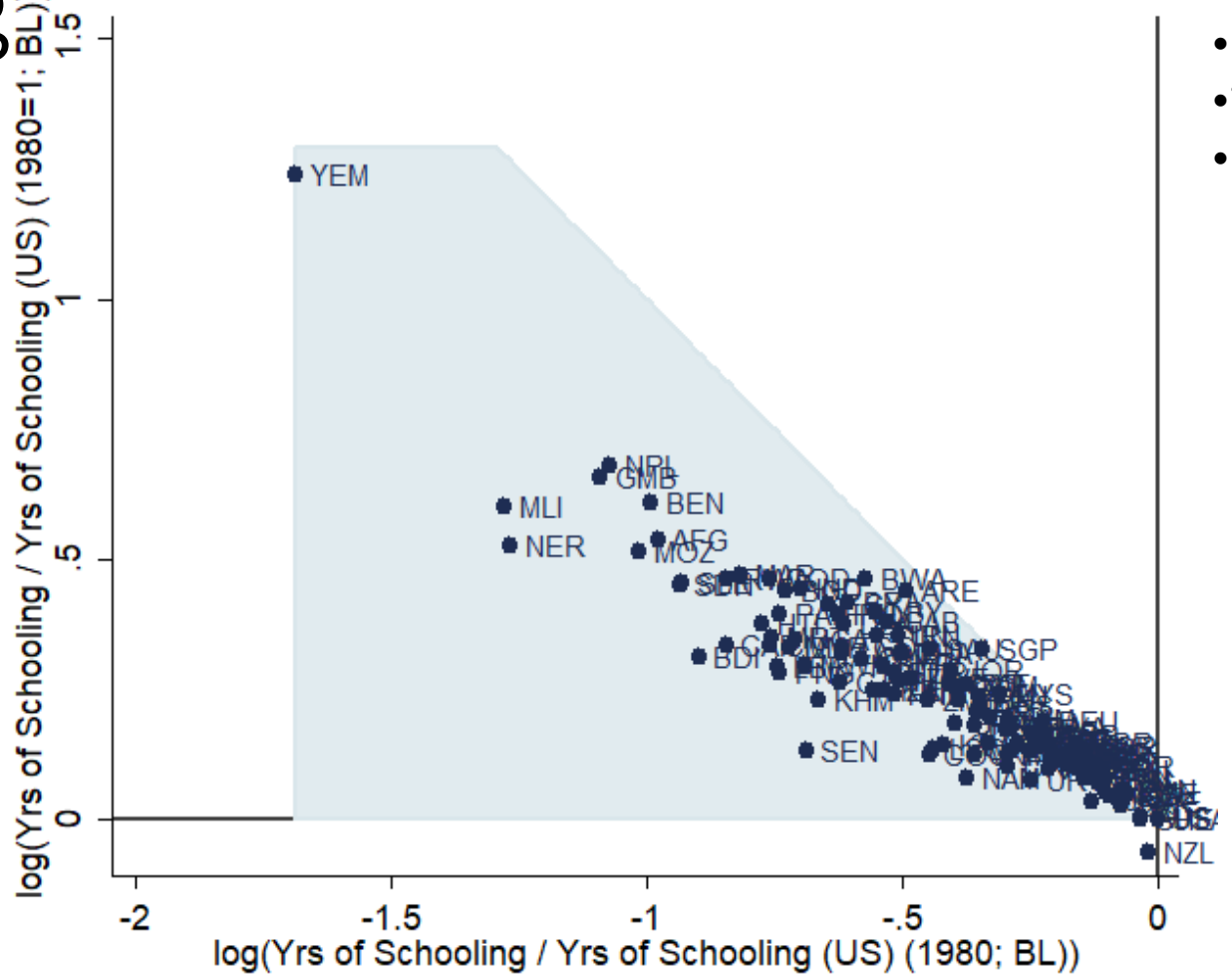
# Unconditional Convergence in Female Labor Force Participation




- 1990 below US: 114/152
- Thereof converged: **75%**

Source: Own illustration based on WDI

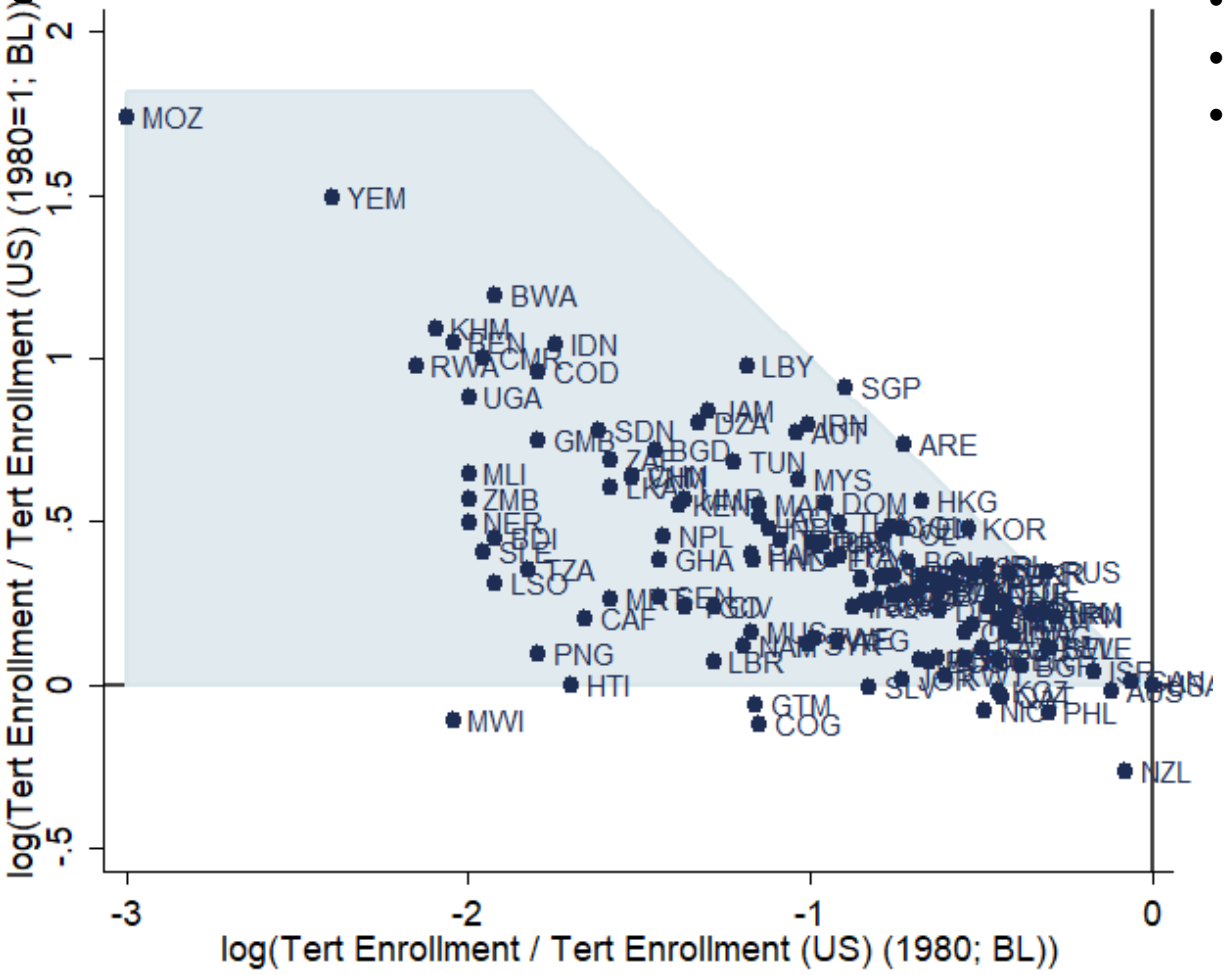
# Unconditional Convergence in Years of Schooling




- 1980 below US: 130/130
- Thereof converged: **98%**
- Last year: 2015

Source: Own illustration based on Barro-Lee

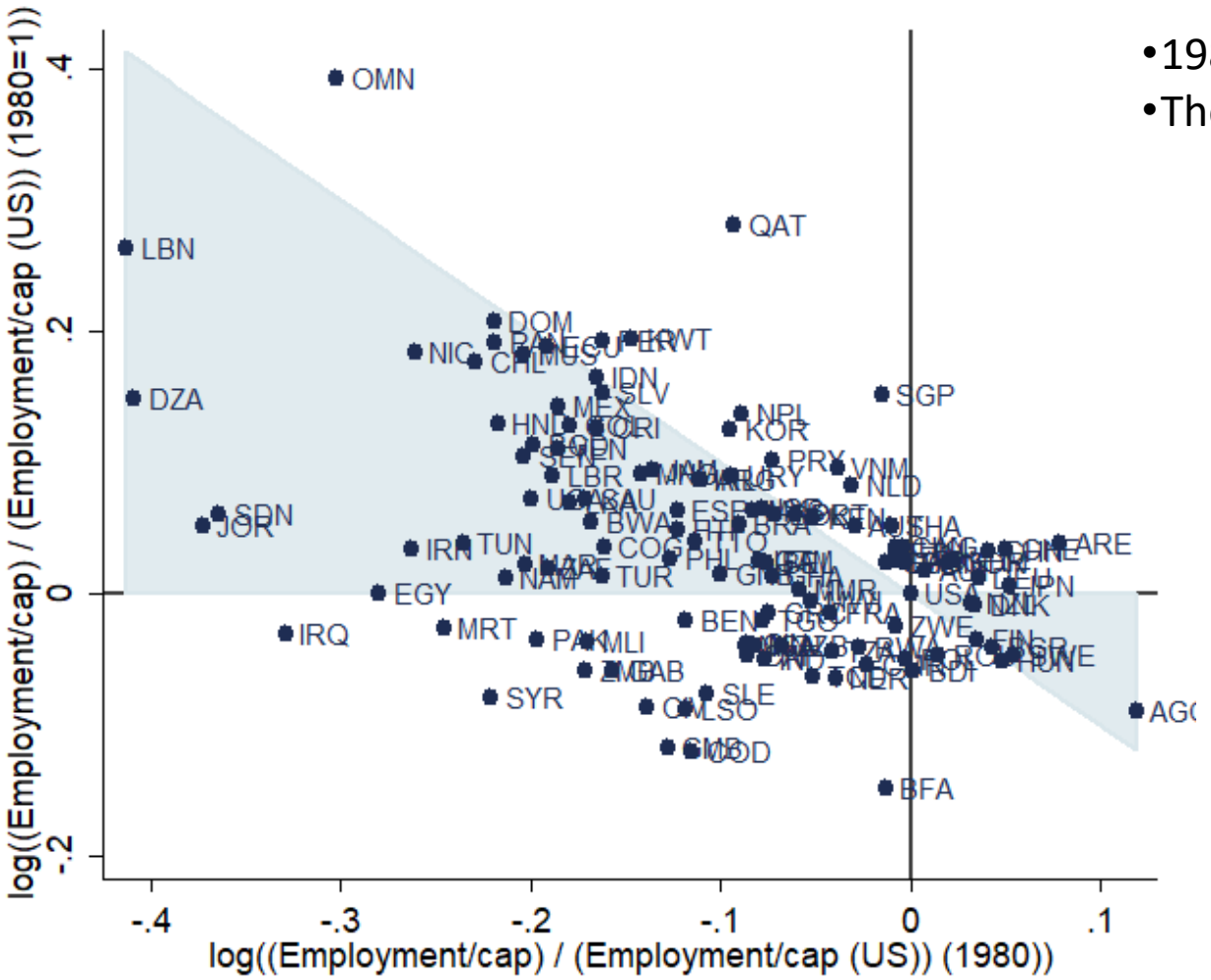
# Unconditional Convergence in Tertiary Enrollment




- 1980 below US: 130/130
- Thereof converged: **91%**
- Last year: 2015

Source: Own illustration based on WDI

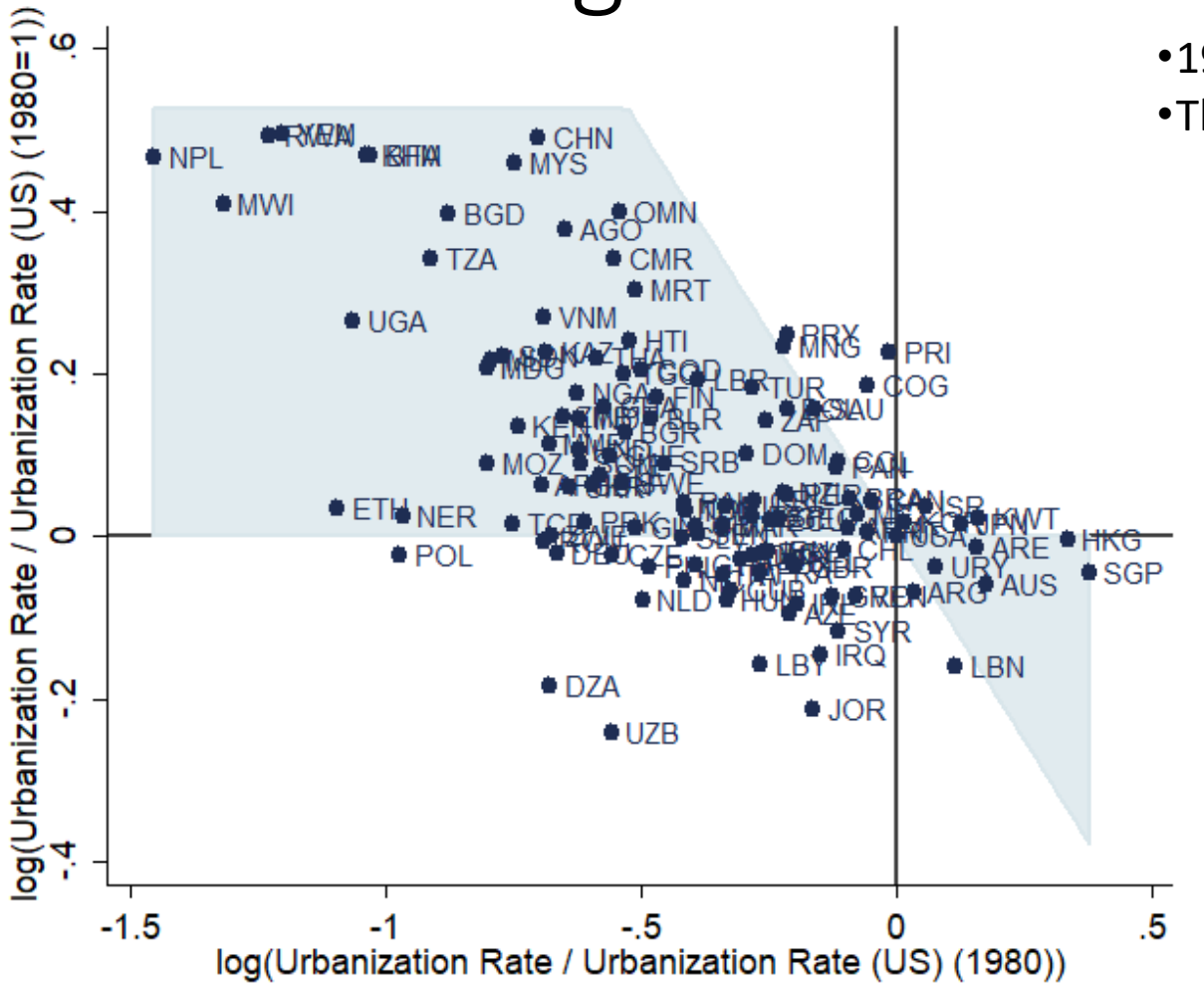
# Unconditional Convergence in Employment Ratio




- 1980 below US: 103/120
- Thereof converged: **68%**

Source: Own illustration based on PWT

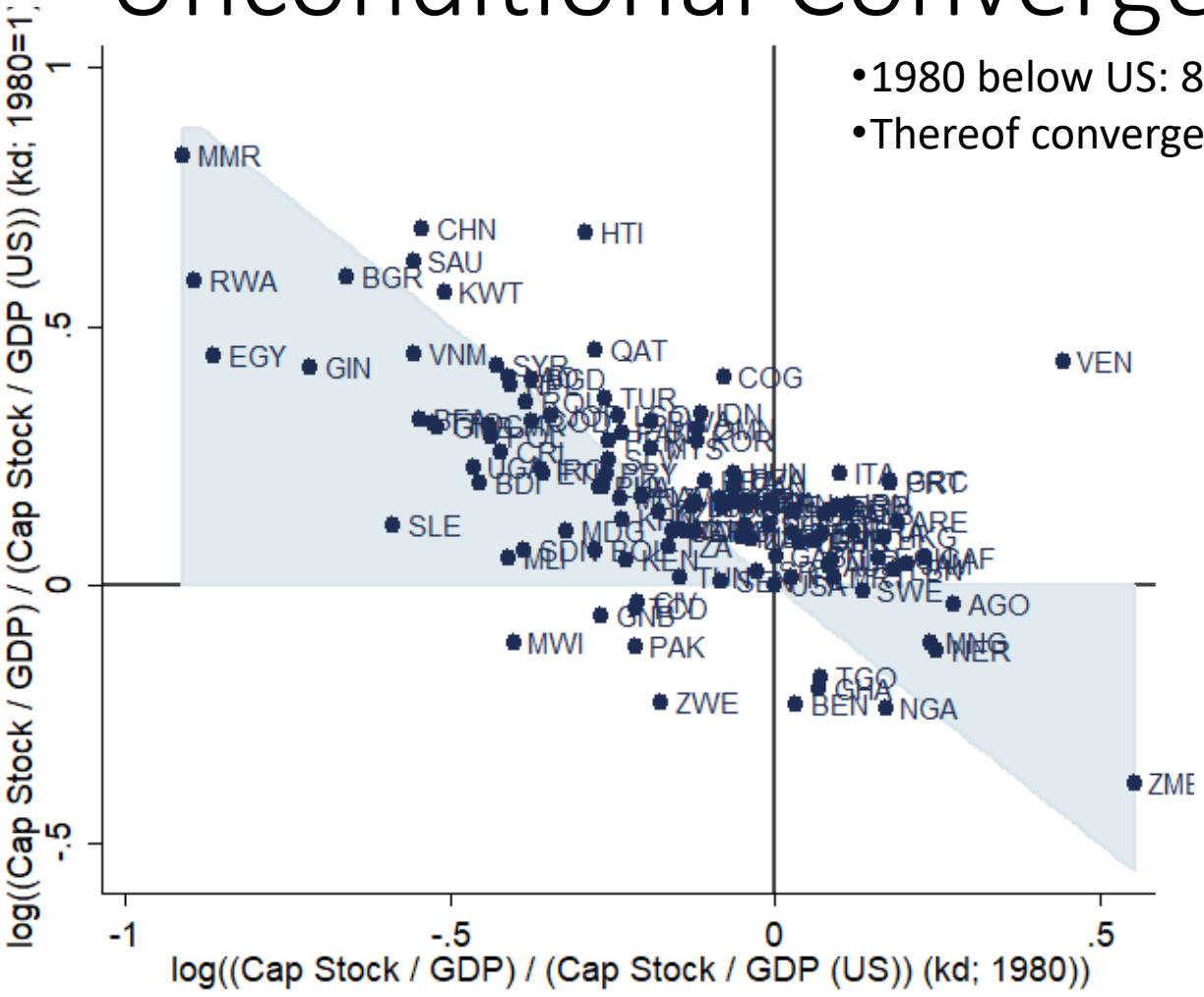
# Unconditional Convergence in Urbanization




- 1980 below US: 110/121
- Thereof converged: **72%**

Source: Own illustration based on WDI

# Unconditional Convergence in K/Y




- 1980 below US: 85/121
- Thereof converged: **92%**

- Horizontal axis: baseperiod

$$\left[\log_{10}\left(\frac{\frac{K_c}{GDP_c}}{\frac{K_{US}}{GDP_{US}}}\right)\right]_{1980}$$

- Vertical axis:

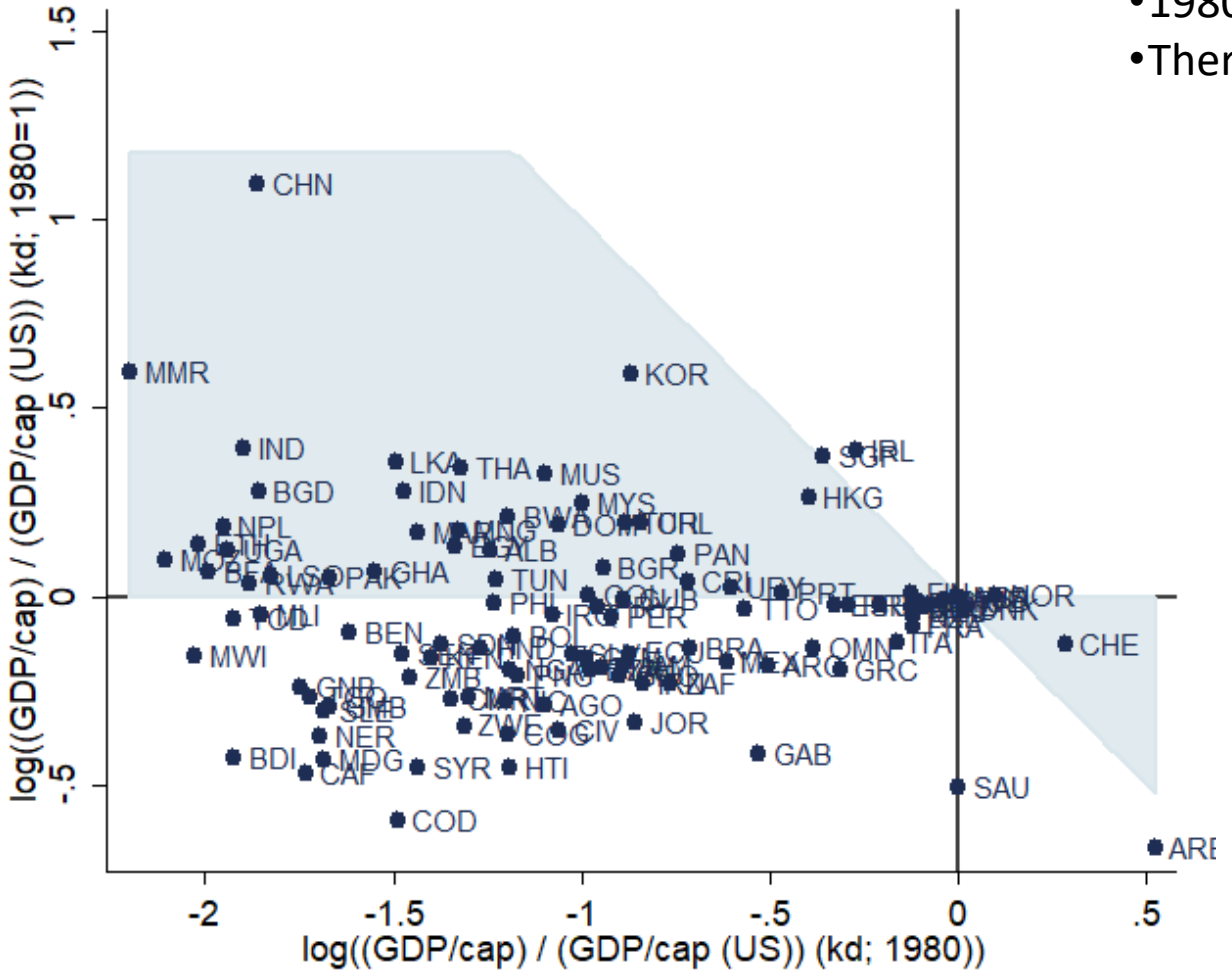
$$\left[\log_{10}\left(\frac{\frac{K_c}{GDP_c}}{\frac{K_{US}}{GDP_{US}}}\right)\right]_{2020} \Big/ \left[\log_{10}\left(\frac{\frac{K_c}{GDP_c}}{\frac{K_{US}}{GDP_{US}}}\right)\right]_{1980}$$

- All data: 5-year centered MA
- Shaded area:
  - 4th quadrant: country converged to the USA but did not surpass
  - 2nd quadrant: vice versa

Source: Own illustration based on PWT

# And yet...

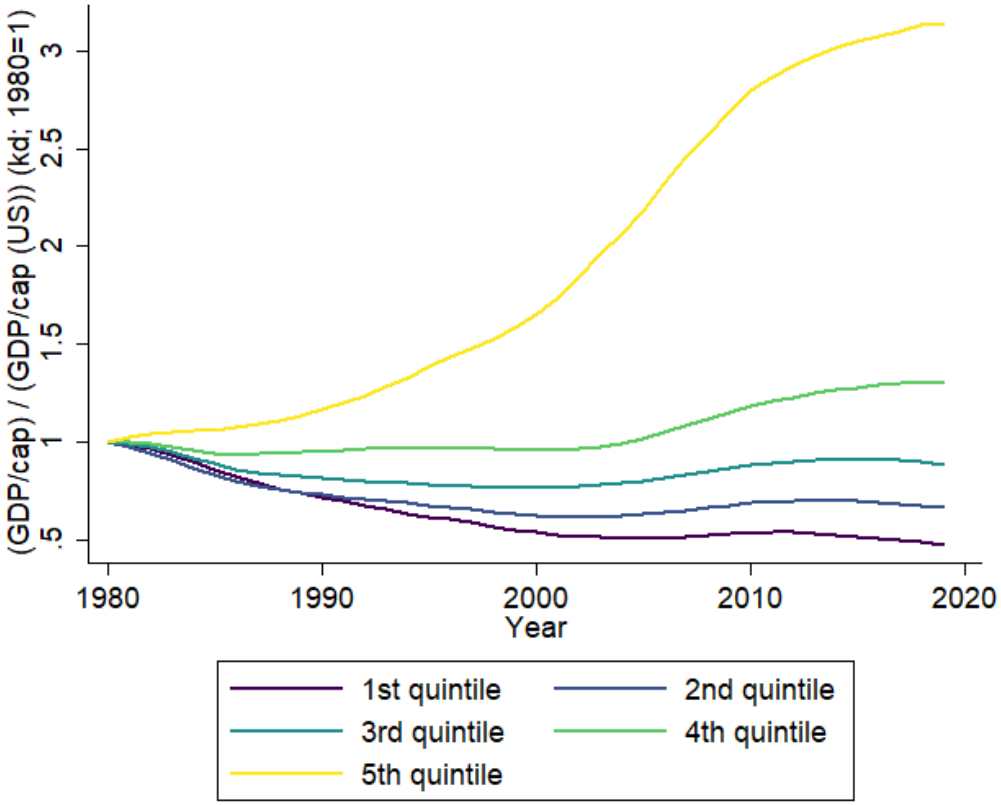
# No Convergence in GDP/cap




- 1980 below US: 104/109
- Thereof converged: **37%**

Source: Own illustration based on WDI

# Very few countries narrowed income gaps



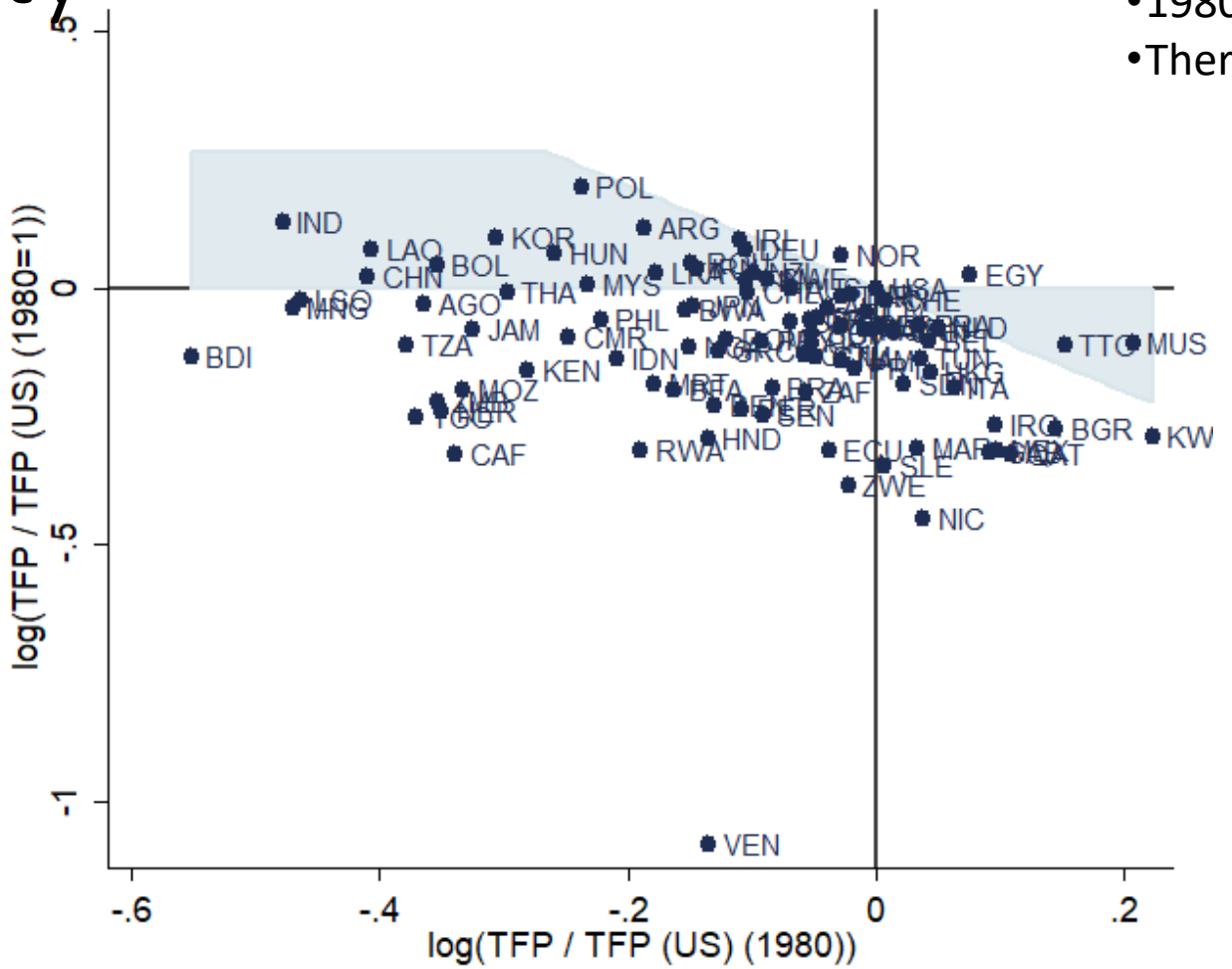

- The median country did not narrow the income gap
- Despite all the narrowing on education, health, female empowerment and urbanization

- Countries in the bottom 75% of incomes in 1980 only, grouped by their subsequent growth

# …hence, significant divergence in Total Factor Productivity

# No Convergence (or even divergence) in productivity

- 1980 below US: 71/93
- Thereof converged: **25%**




Source: Own illustration based on PWT

# So maybe technology adoption is not so easy

- It cannot be just a case of bad institutions
- Because institutions have been good enough to
  - Extend life, educate, empower women, urbanize, invest
- What is weird about technology?

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# The neoclassical production function

$$Y=F(A,K,L,H)$$

# The neoclassical world

Product

Black Box

Technology

Capital

Labor

Human Capital

$$Y=F(A,K,L,H)$$

Min. of Science

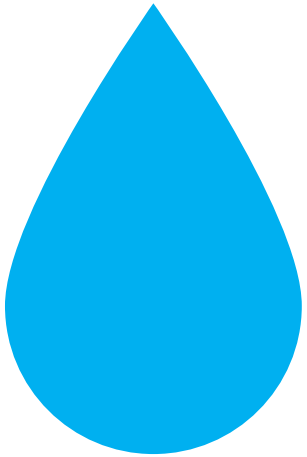
Min. of Finance

Min. of Labor

Min. of Education

# A Greek version of the world

Earth

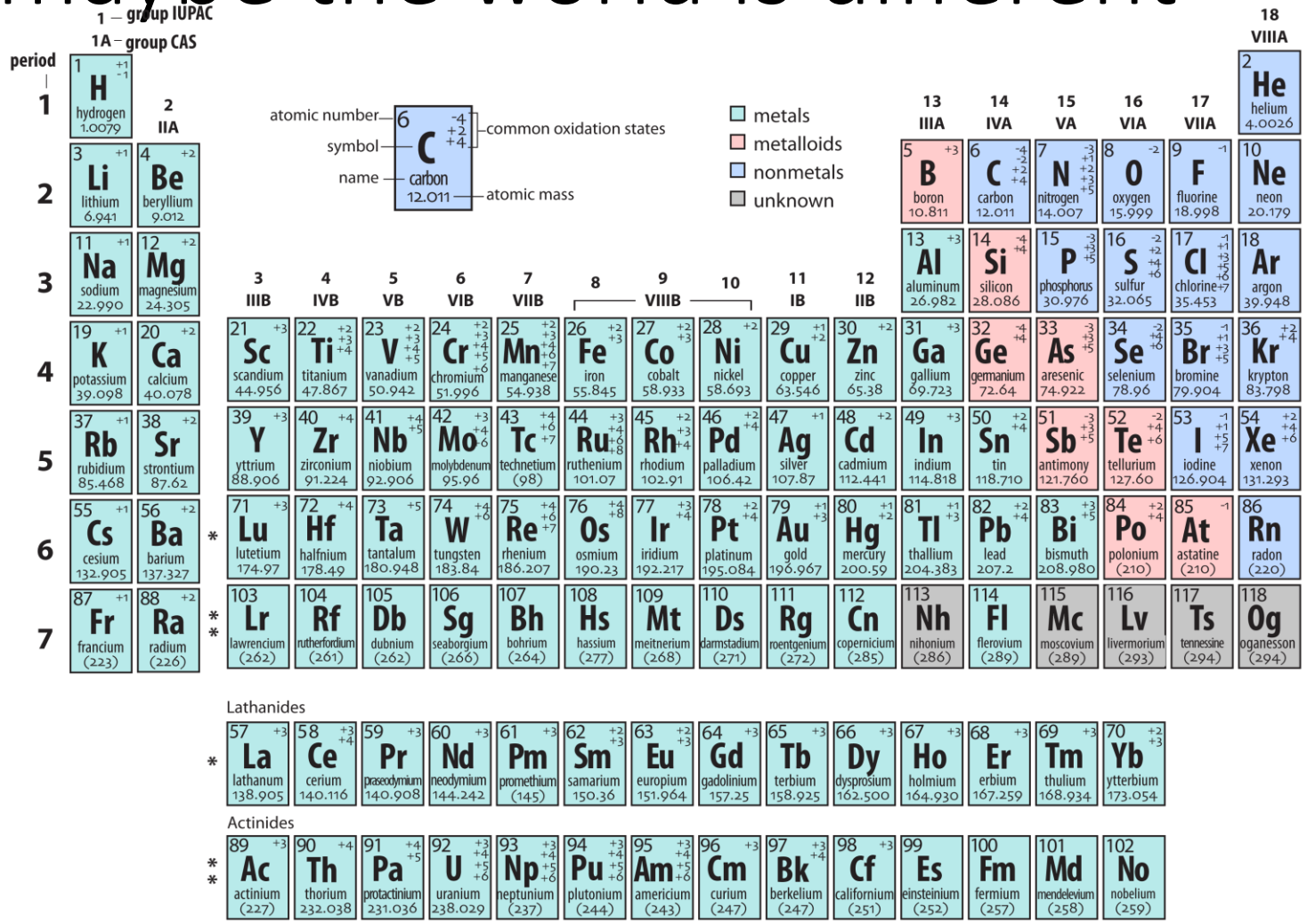


Water

Wind

Fire

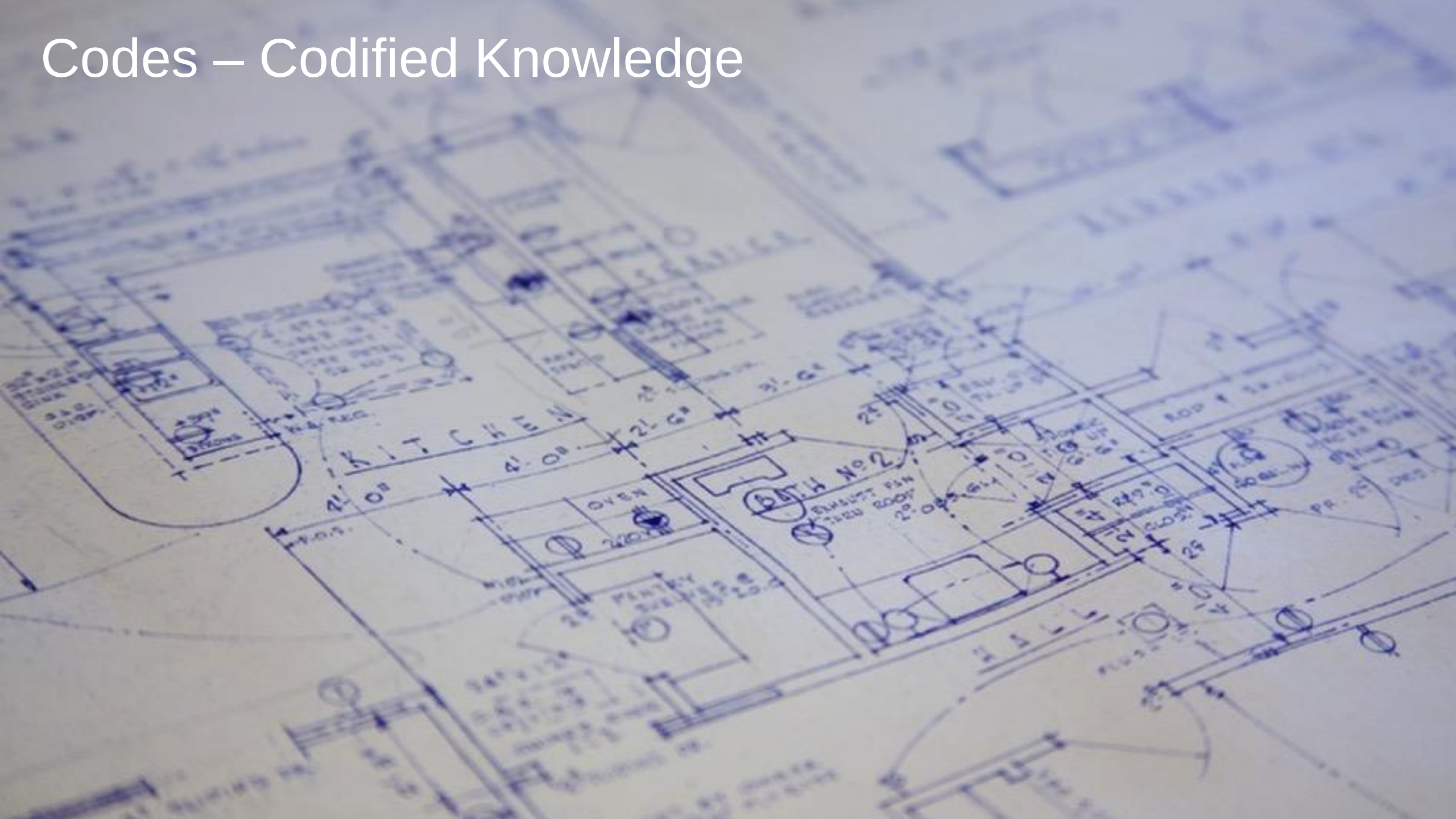
# … but maybe the world is different



# What is technology?

# Tools – Embodied knowledge

# Codes – Codified Knowledge



# Knowhow – Tacit Knowledge


HANJIN

# Lift (force)

From Wikipedia, the free encyclopedia

*For other uses, see Lift (disambiguation).*

A fluid flowing past the surface of a body exerts a force on it. **Lift** is the component of this force that is perpendicular to the oncoming flow direction.[1] It contrasts with the drag force, which is the component of the surface force parallel to the flow direction. If the fluid is air, the force is called an aerodynamic force. In water, it is called a hydrodynamic force.

Boeing 747-8F landing

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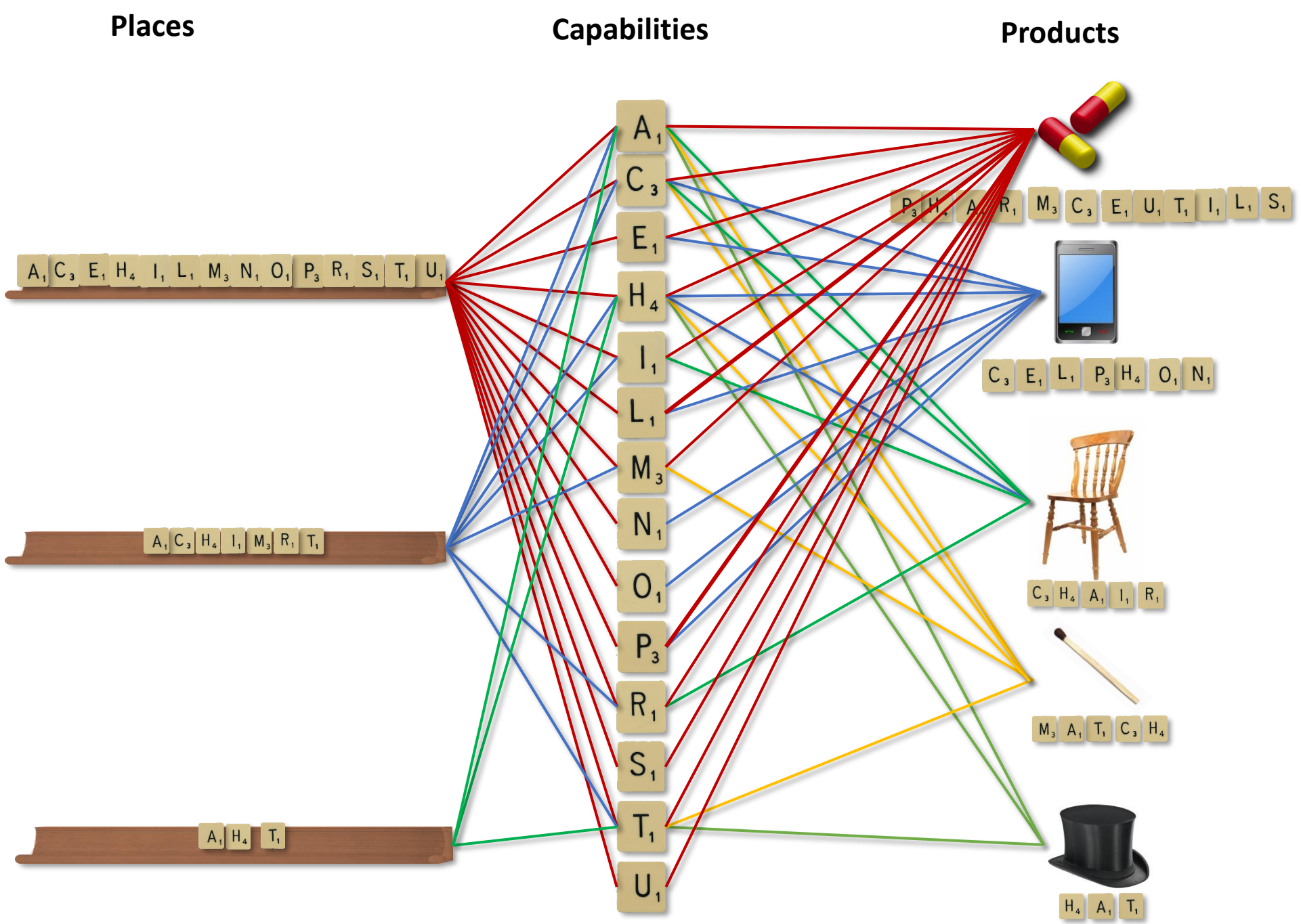
# Collective Knowhow

= the competence to do things that can only be done by teams


Places
Capabilities
Products
A1 C3 E1 H4 I1 L1 M3 N1 O1 P3 R1 S1 T1 U1
A1 C3 H4 I1 M3 R1 T1
A1 H4 T1
A1
C3
E1
H4
I1
L1
M3
N1
O1
P3
R1
S1
T1
U1
P3 H4 A1 R1 M3 C3 E1 U1 T1 I1 L1 S1
C3 E1 L1 P3 H4 O1 N1
C3 H4 A1 I1 R1
M3 A1 T1 C3 H4
H4 A1 T1

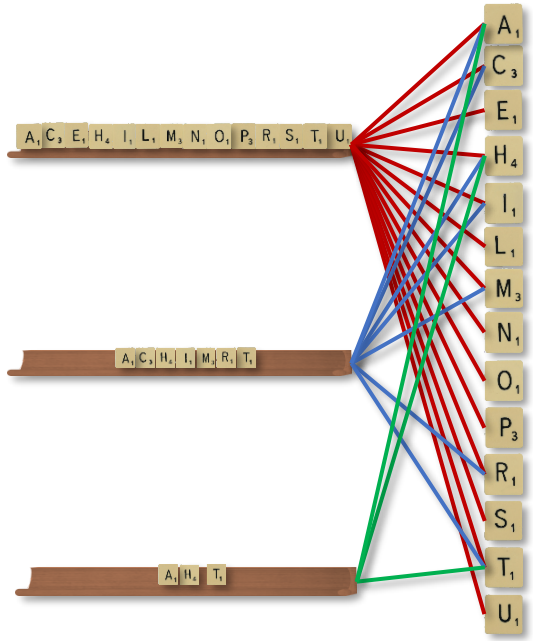
# What are letters?

- Productive capabilities
- Non-tradables: they need to be in the places where production takes place
- Include collective knowhow: different abilities needed by the production process
- Including non-tradable inputs
- And public goods

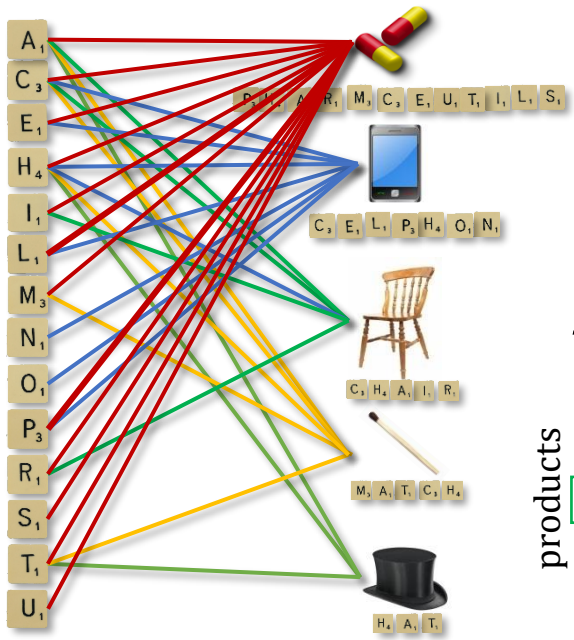
$C_{ca}$

countries

capabilities



$\odot$



$P_{pa}$

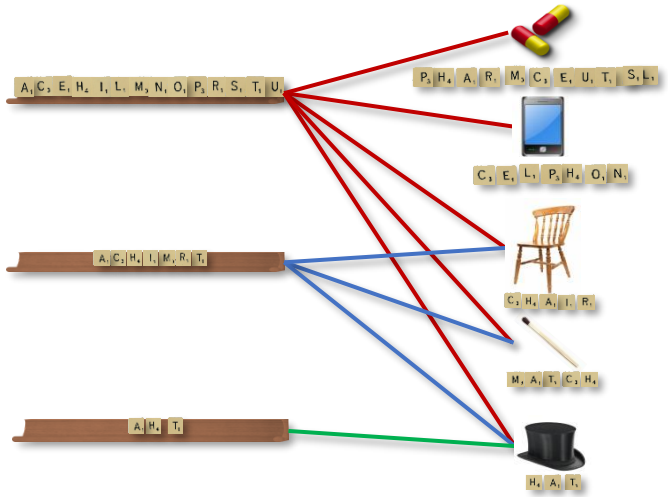
products

capabilities

$M_{cp}$

countries

products

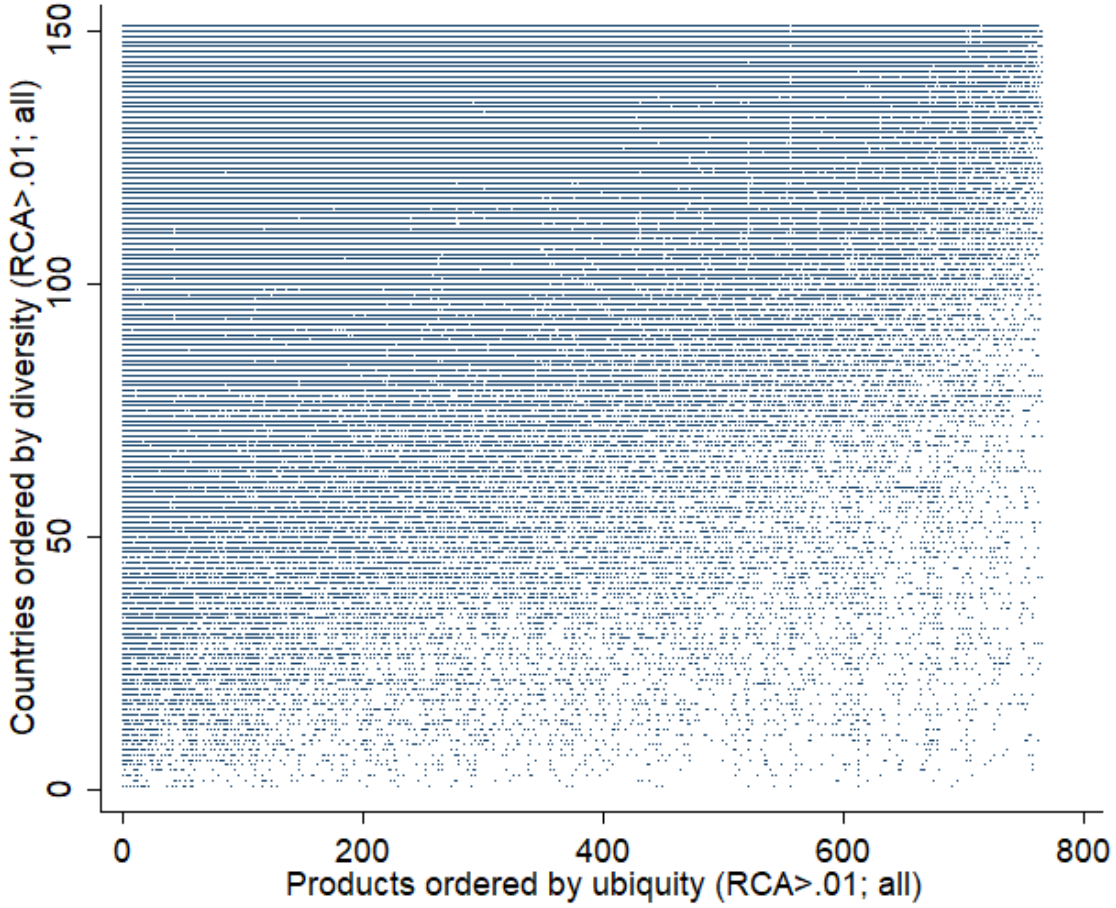


Production:

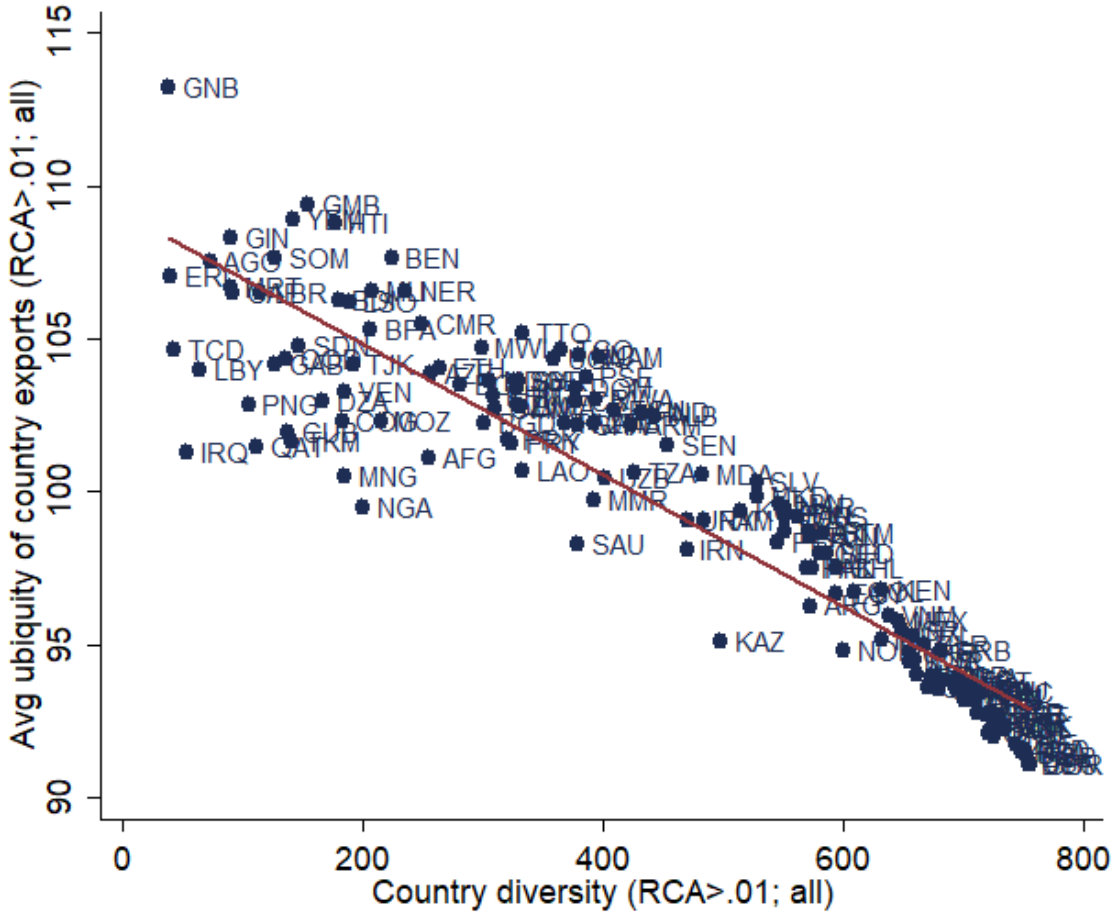
$[M_{cp}] = 1$ si $\vec{P}_p$ is a subset of $\vec{C}_c$

# `Nestedness‘ of Country Exports

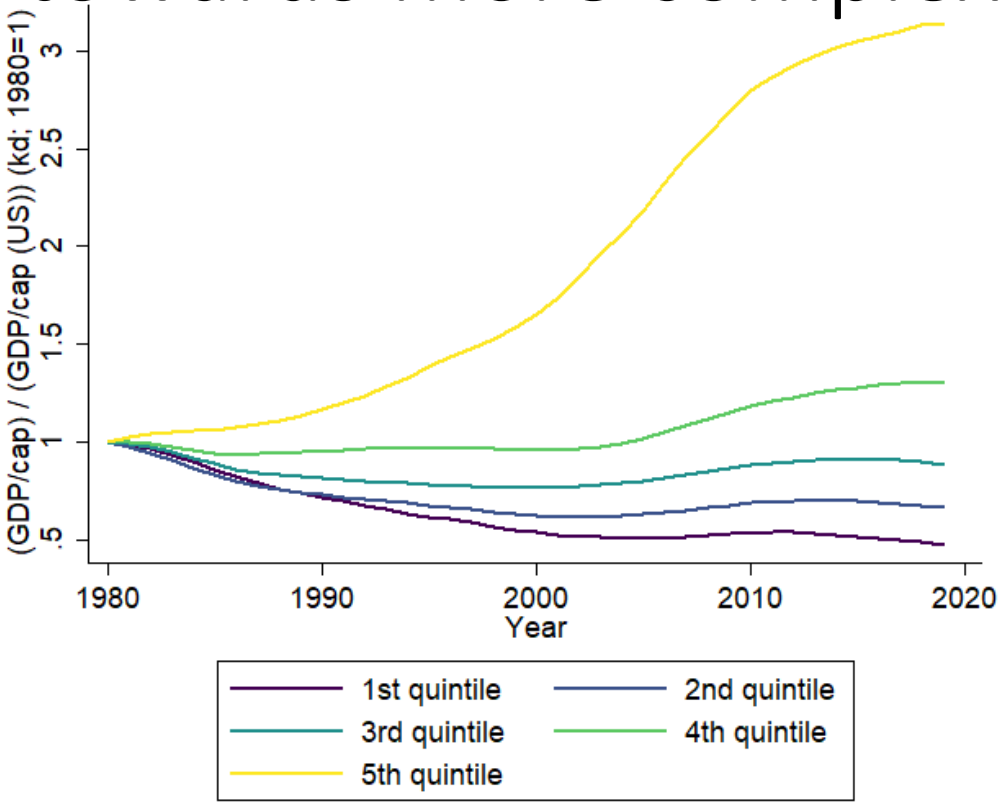
RCA > .01

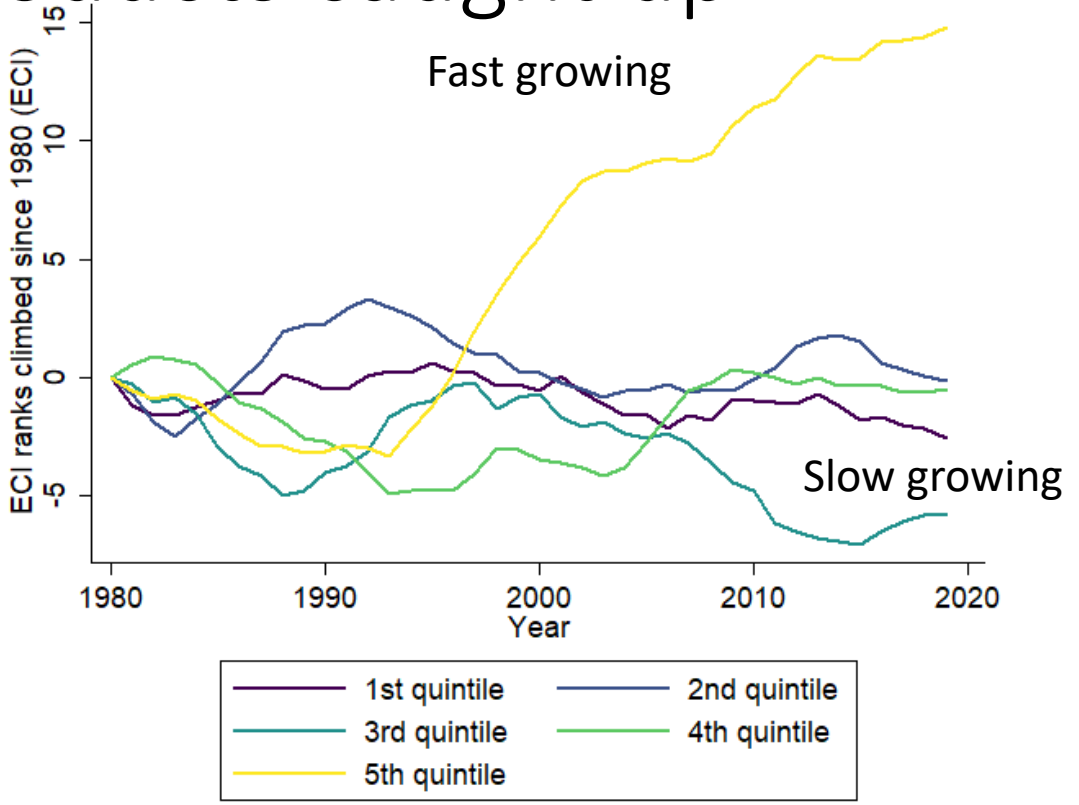



RCA > .01



# Only the countries that diversified their exports towards more complex products caught up




- Countries in the bottom 75% of incomes in 1980 only, grouped by their subsequent growth
- Source: Own illustration based on WDI and https://atlas.cid.harvard.edu/

# What can go wrong with technology adoption

- **Knowhow is hard to acquire**
  - **Because it is a slow process at the individual level**
  - **...and because of its collective (team) nature**
- **Coordination failures**
- **Knowledge spillovers**
- **Public goods**

# Which is the odd one out?

# Which is the odd one out?

# Knowledge spillovers: Silicon valley

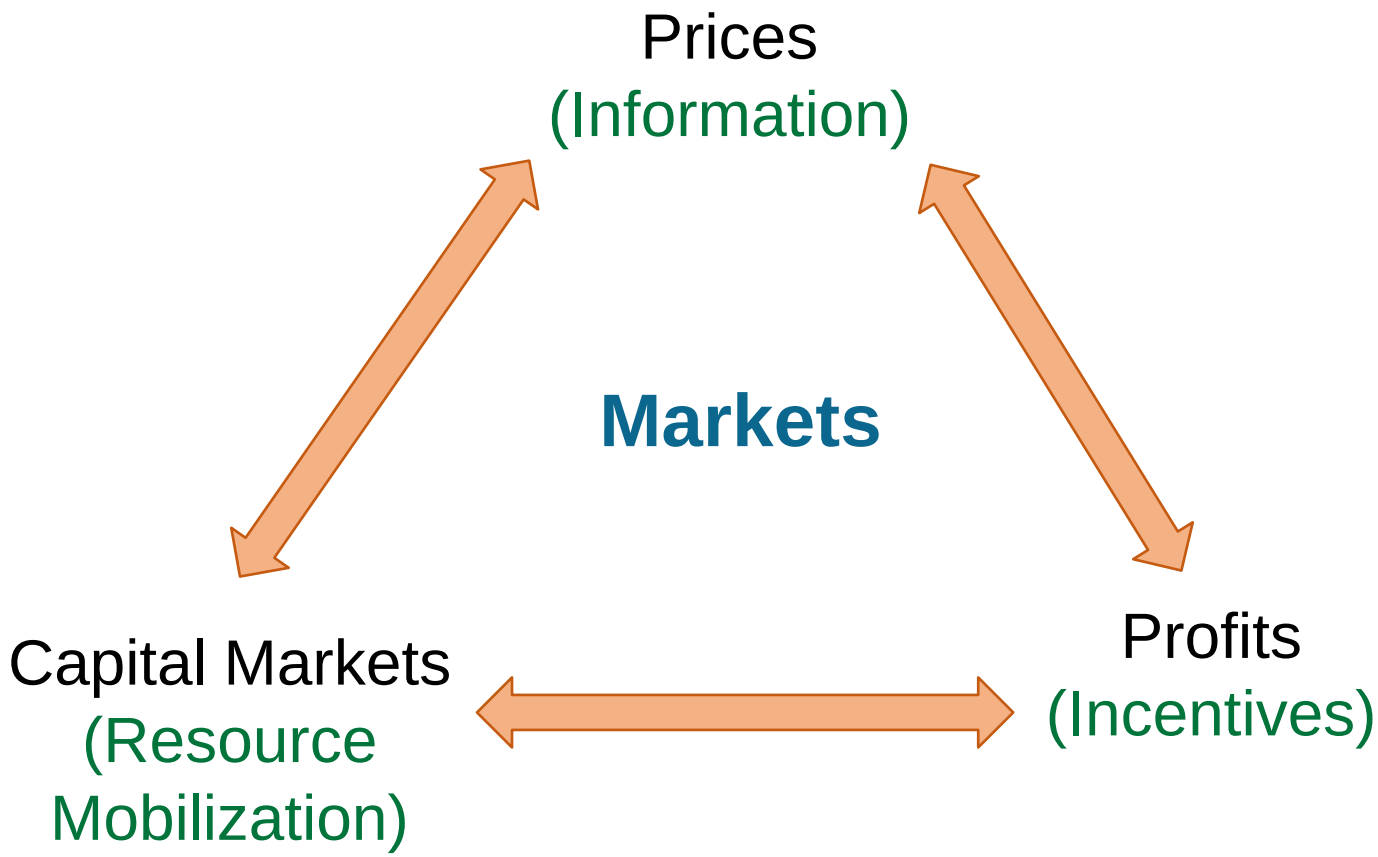
# Technology needs Public Goods

## Driving a car needs roads, traffic signs, road rules

# The Invisible Hand of the Market

# Markets Self-Organize

# The invisible hand of the market



# But Public Goods Are Different.
# The Government is NOT self-organizing

# Public Goods Are Different

**No prices ➔ No information**

# Public Goods Are Different

**No profit motive ➔ No incentive**

# Public Goods Are Different

**No internal capital markets ➔ No decentralized resource mobilization**

# How is the provision of public inputs organized?

- No prices
  - No information
- No profit motive
  - No incentive
- No decentralized capital market
  - Resource allocation mechanism
- How does the government set its very large basket of public inputs?
  - Where does it get its ***information****?*
  - ***Incentive*** to respond to the information
  - ***Resource mobilization*** to address the issue

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# What role for ”industrial policy”?

It is about diversification, and technology adoption and adaptation

# The problem that industrial policy needs to solve

- Production requires many relatively specific public goods
- ...and inputs from missing markets
- Giving money to firms does not solve the problem
  - They cannot buy public goods or spend money in missing markets
- You need to sort out what is missing
- …but you have no clue what it may be
  - $\sim 10^3$ government agencies and $\sim 10^6$ pages of legislation
- The obstacles may lurk anywhere
- You face an information revelation problem
- You cannot assign ex ante the area of legislation or the government ministry under whom the solution space lies

# These problems are particularly serious at the extensive margin

- Industries that exist can act or complain
- Industries that do not yet exist don’t complain
- Governments are bad at supplying the public goods needed by industries that exist
- But they are hopeless at supplying the needs of industries that don’t yet exist
- So you need organizations that can explore these spaces

# You may not know what to do

- But you know that you don’t know
- So the policy involves processes that reveal information, solve problems and accumulate institutional learning
- This requires reimagining institutions that can act in this role
  - E.g. Smart development banks, investment promotion, cluster organizations, SEZs
- Industrial policy needs a constellation of learning organizations that engage with economic activity, reveal information and learn
  - This is a continuous process in living organizations

# This policy needs to be high-bandwidth

- Industries need very different public goods
- ...and face very different coordination failures and missing markets
- Markets face very different distortions
- So, horizontal policies (treating all the same) will not work
- But how many vertical policies do you need? $10^0$? $10^1$? $10^2$? $10^3$?
  - Prioritize a few vs increase government bandwidth
  - METI in Japan has ~230 deliberation councils
- So, think ~$10^2$
- Most countries need to increase the bandwidth of their policies rather than prioritize fewer sectors

# Vertical policies will have to be very different because industries they differ along many dimensions

- Existing industries vs new industries
- Globally mature technologies vs nascent technologies
- Globally mature markets vs new markets
- Need for light vs heavy technological adaptation
- Possibility of starting small vs. need to start at a sufficient scale
- Presence of potential agents of change and their type

# Varieties of agents of change

- Foreign Direct Investment (FDI)
- Mergers & Acquisitions (reverse FDI)
- Conglomerates
- State-owned enterprises
- Development Corporations
- Immigration
- Diasporas and return migration

# In conclusion

- Industrial policy should be seen as defined by its goals, not its instruments
  - Economic convergence
  - Climate change
- It should focus on:
  - Identifying and solving coordination failures and missing public goods
  - Attracting missing capabilities and industries
  - Engaging with agents of change
  - Stimulating the development of R&D capabilities for technological adaptation and adoption