

GEM 2014

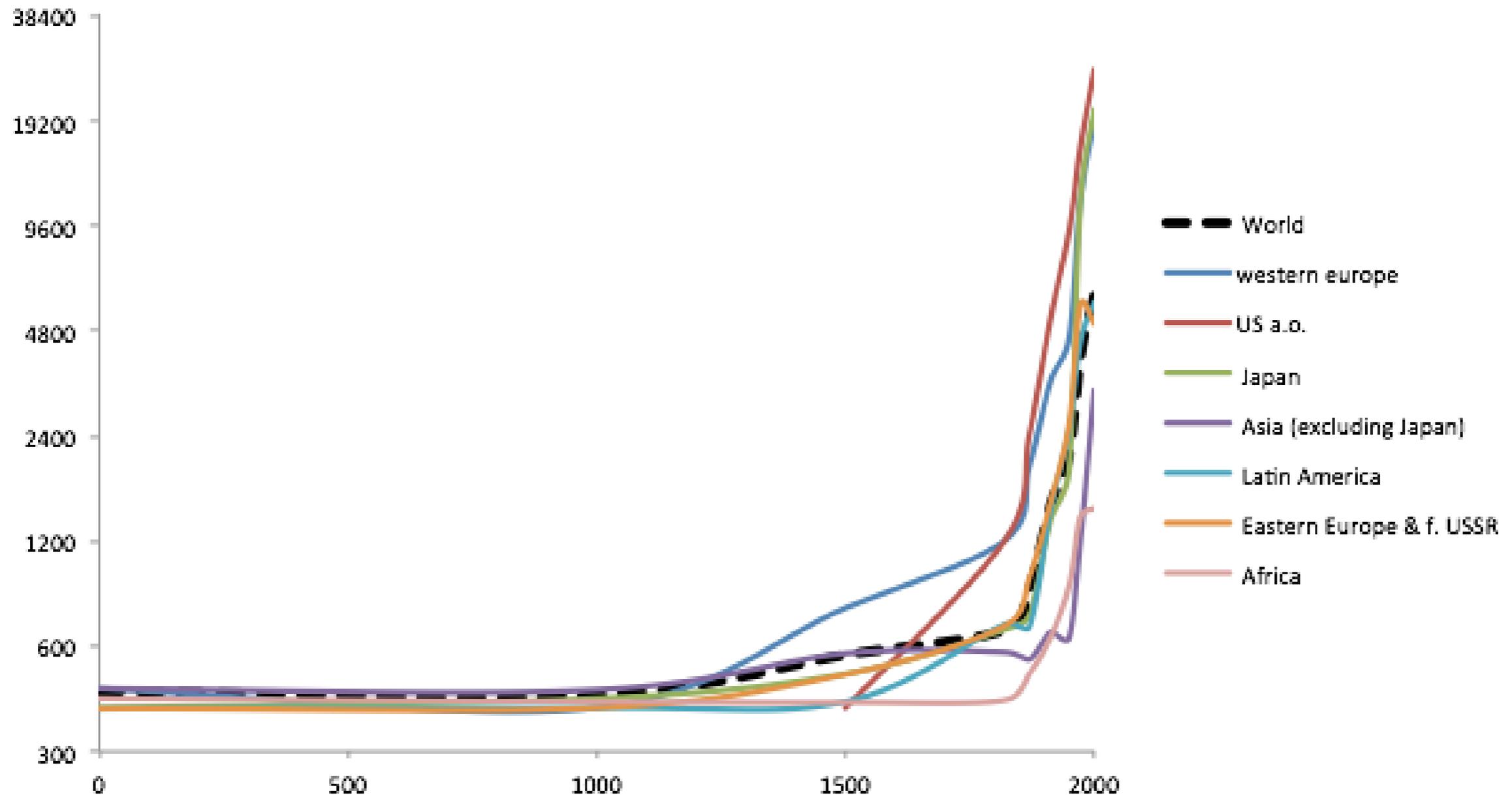
# COORDINATED EXPERTISE:

## Obstacles to the diffusion of knowhow

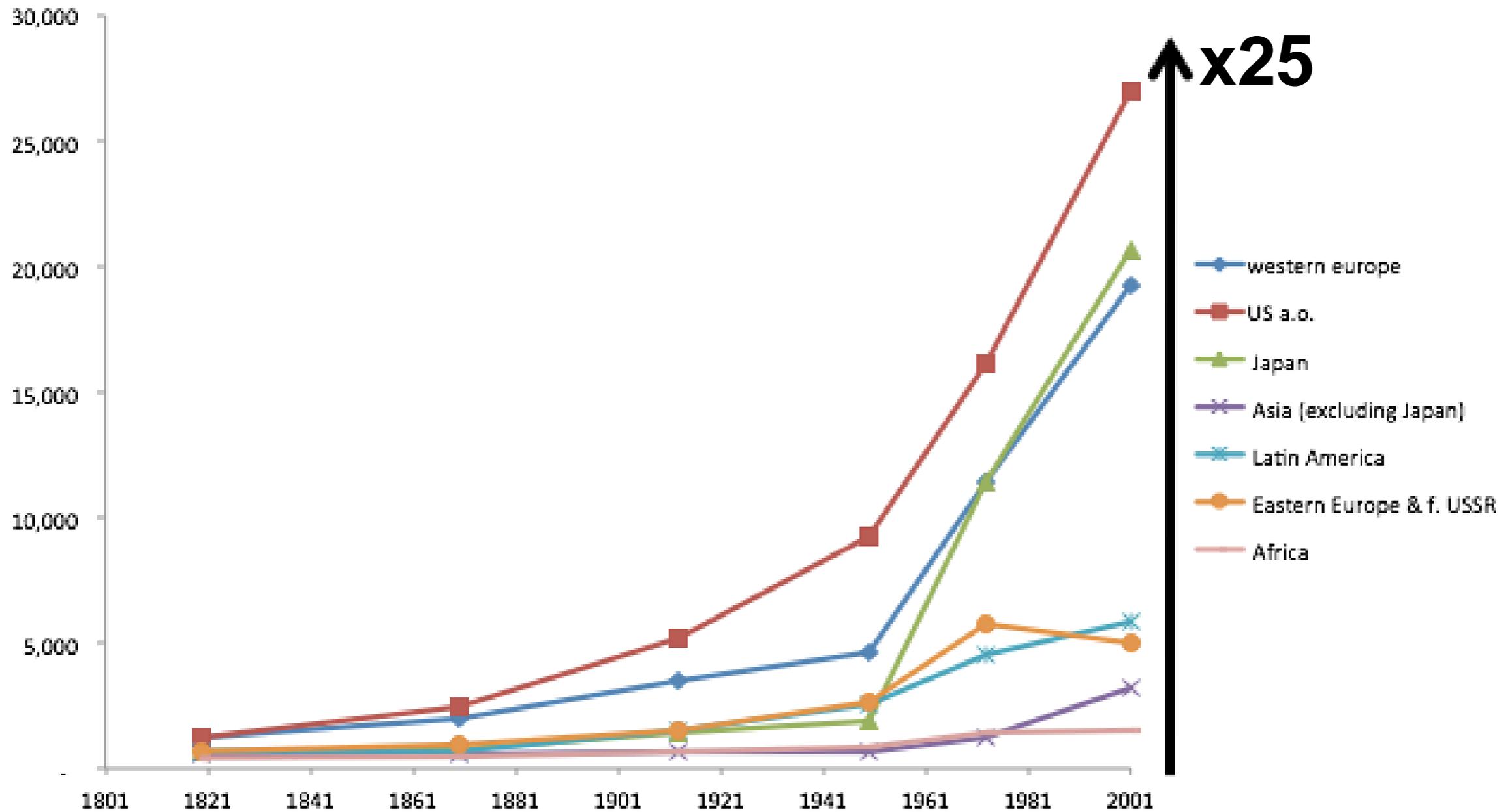
Ricardo Hausmann

Director, Center for International Development  
@ricardo\_hausman

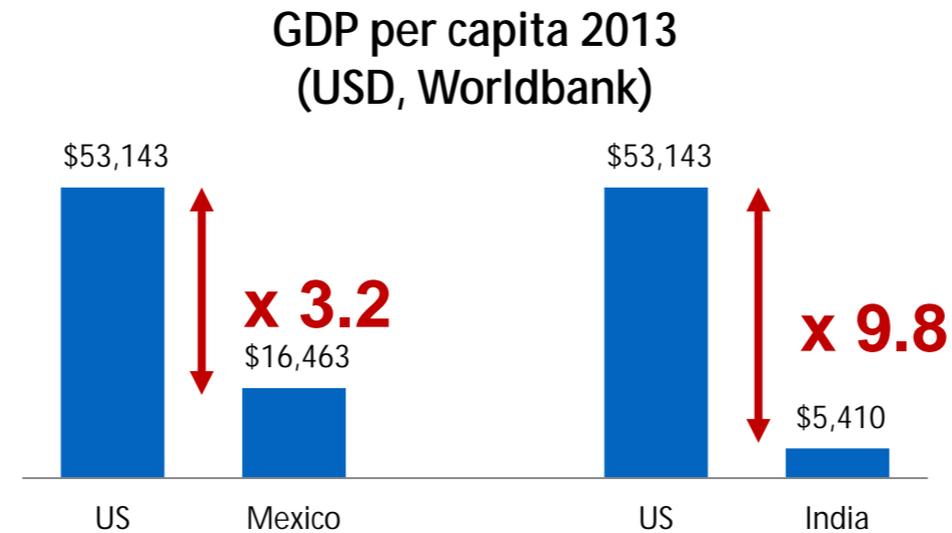
# The great acceleration



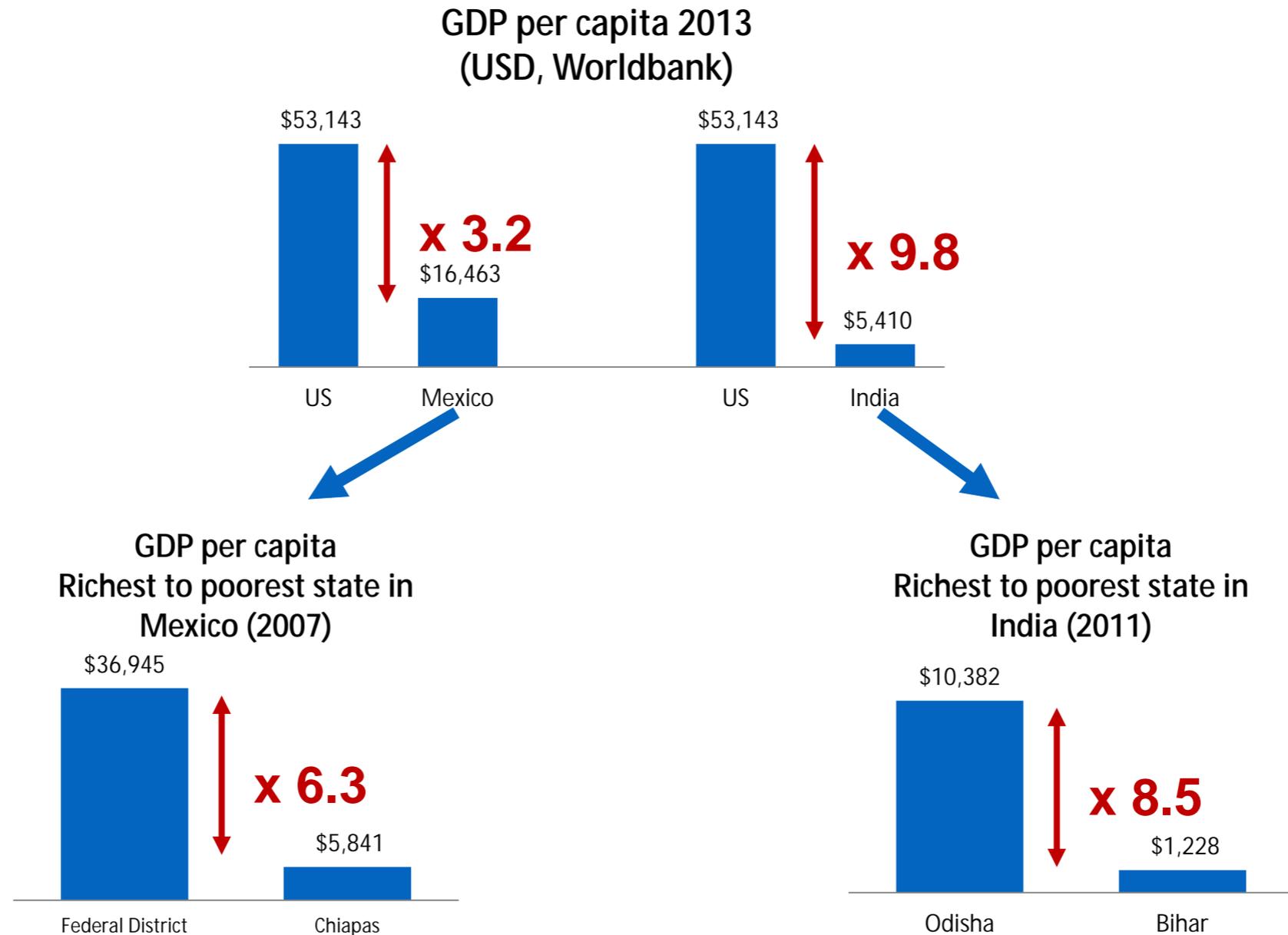
# The great divergence



# Income disparities across and within countries



# Income disparities within and across countries



# It's technology!

But why does it diffuse so slowly?

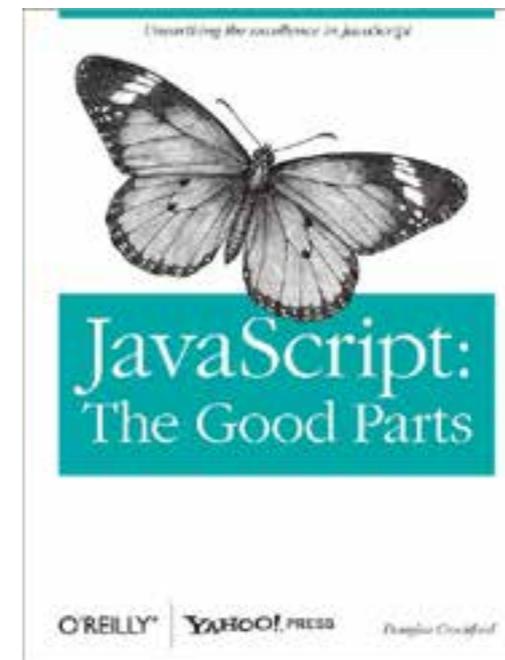
# What is technology?

# Tools



---

# Codes



# Tools can be shipped



# CODES CAN BE SHARED



[Create account](#) [Log in](#)

Article [Talk](#) [Read](#) [Edit](#) [View history](#)

## 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.<sup>[1]</sup> 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

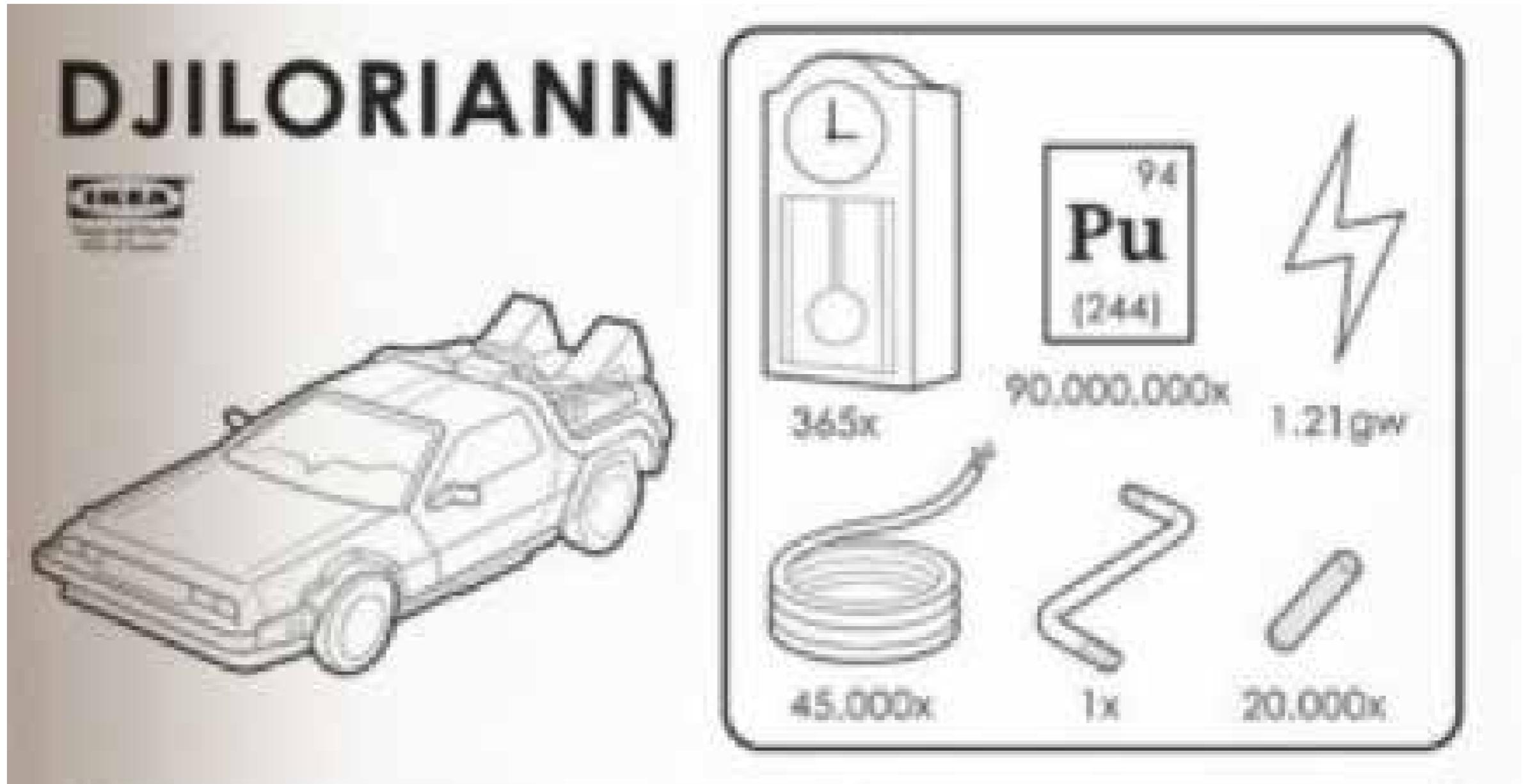
- [Main page](#)
- [Contents](#)
- [Featured content](#)
- [Current events](#)
- [Random article](#)
- [Donate to Wikipedia](#)
- [Wikimedia Shop](#)
- Interaction**
  - [Help](#)
  - [About Wikipedia](#)
  - [Community portal](#)
  - [Recent changes](#)
  - [Contact page](#)

- Tools**
  - [What links here](#)
  - [Related changes](#)

**Contents** [\[hide\]](#)

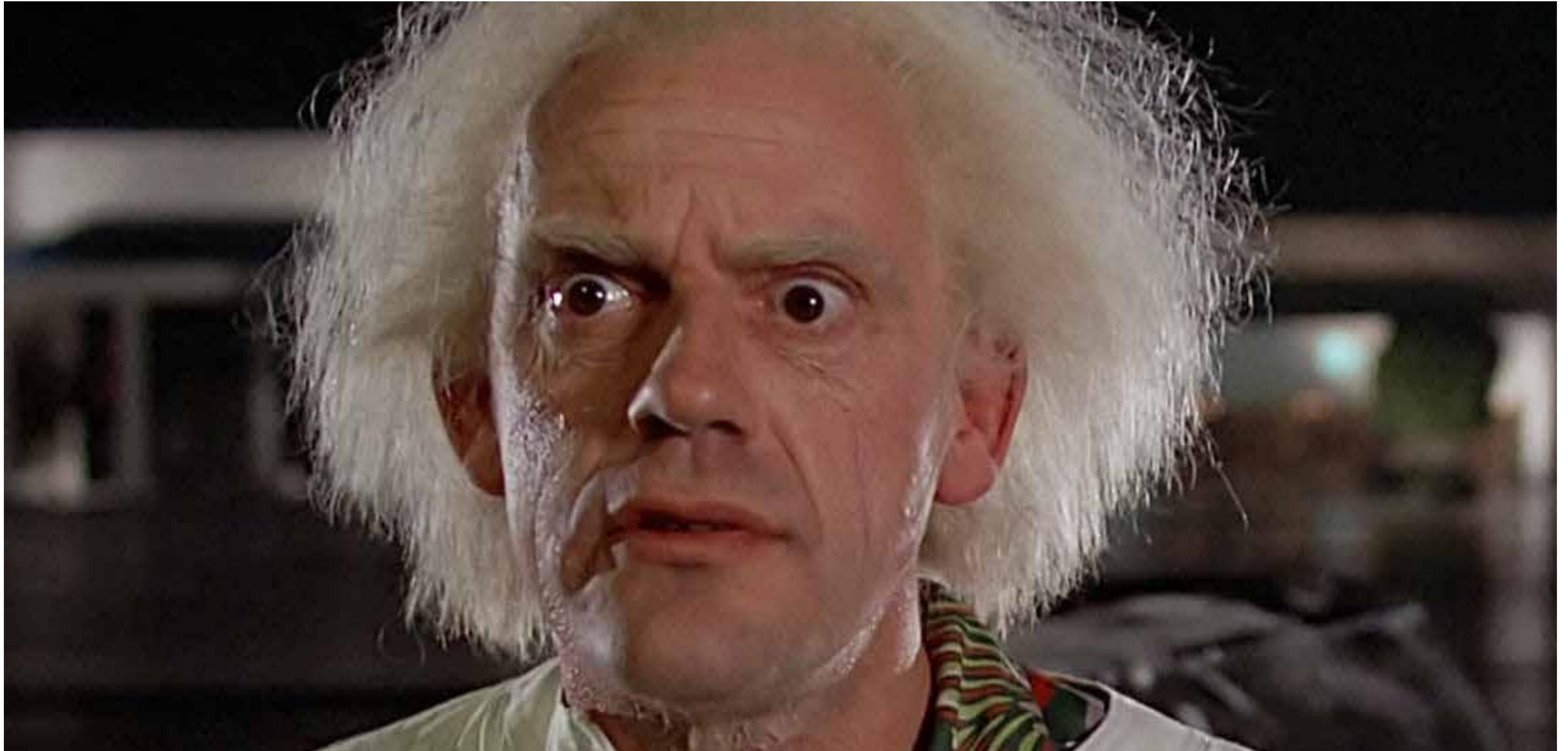
- [1 Overview](#)
- [2 Simplified physical explanations of lift on an airfoil](#)
  - [2.1 Flow deflection and Newton's laws](#)
    - [2.1.1 Limitations of deflection/turning](#)

# Codes aren't enough

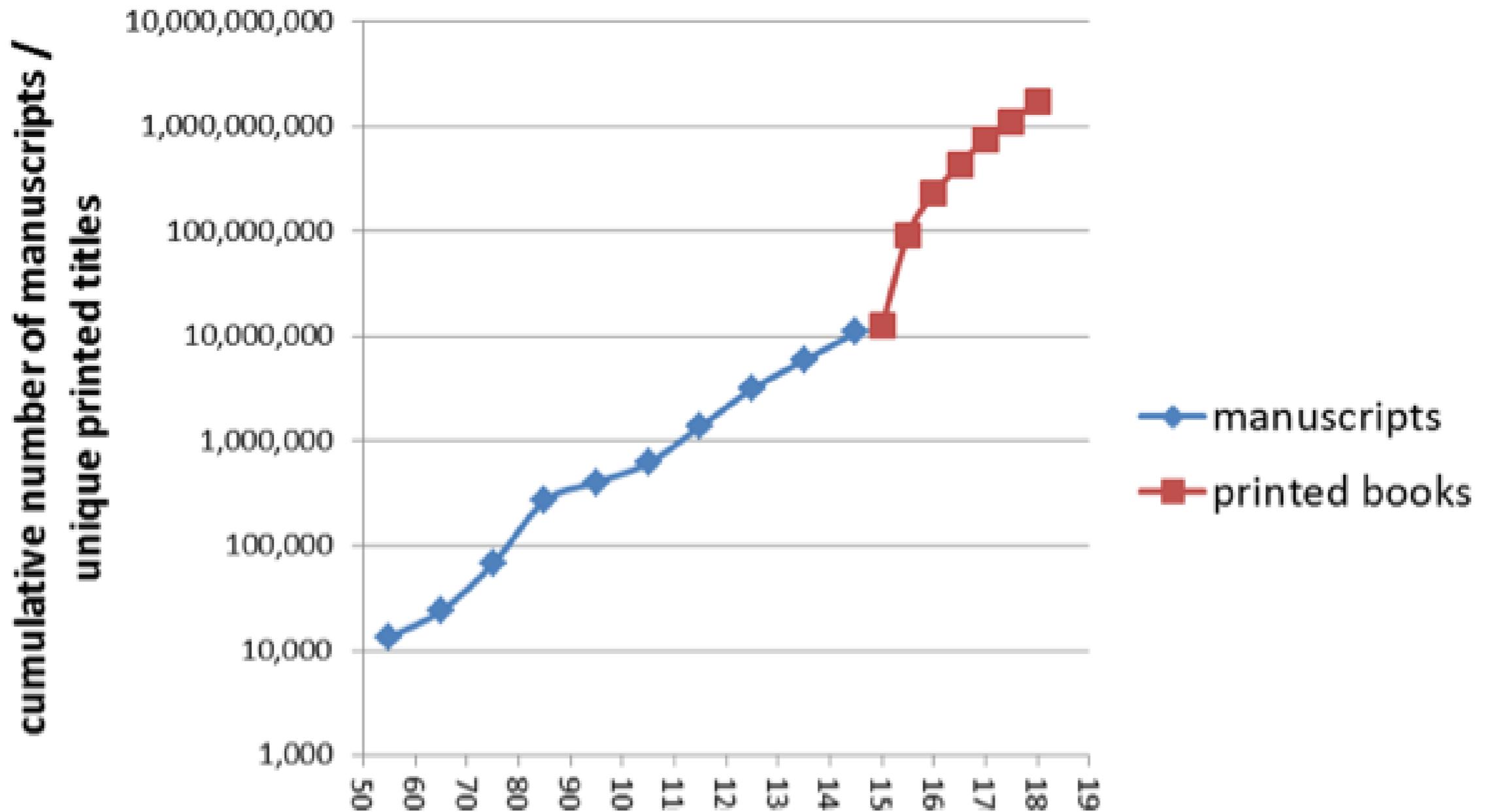


# You need know-how

Know-how resides in experts.



# Codes have exploded



# Alexandria

400,000 scrolls



# Vatican

1.1 million books



# Library of Congress

23,592,066 books



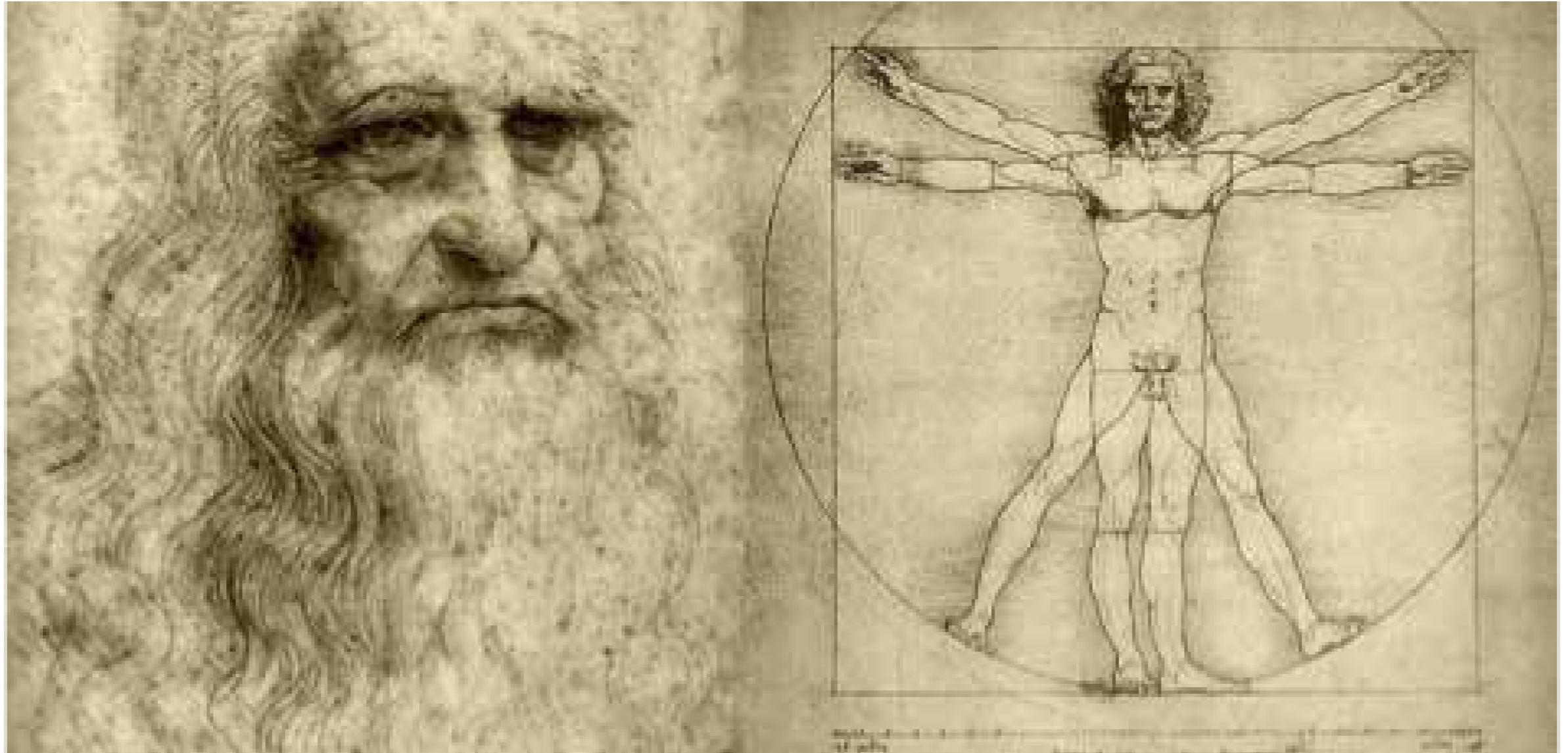
# World Wide Web

14.3 trillion pages



# How is expertise stored?

Homo Universalis?



# How long does it take to get a college degree?

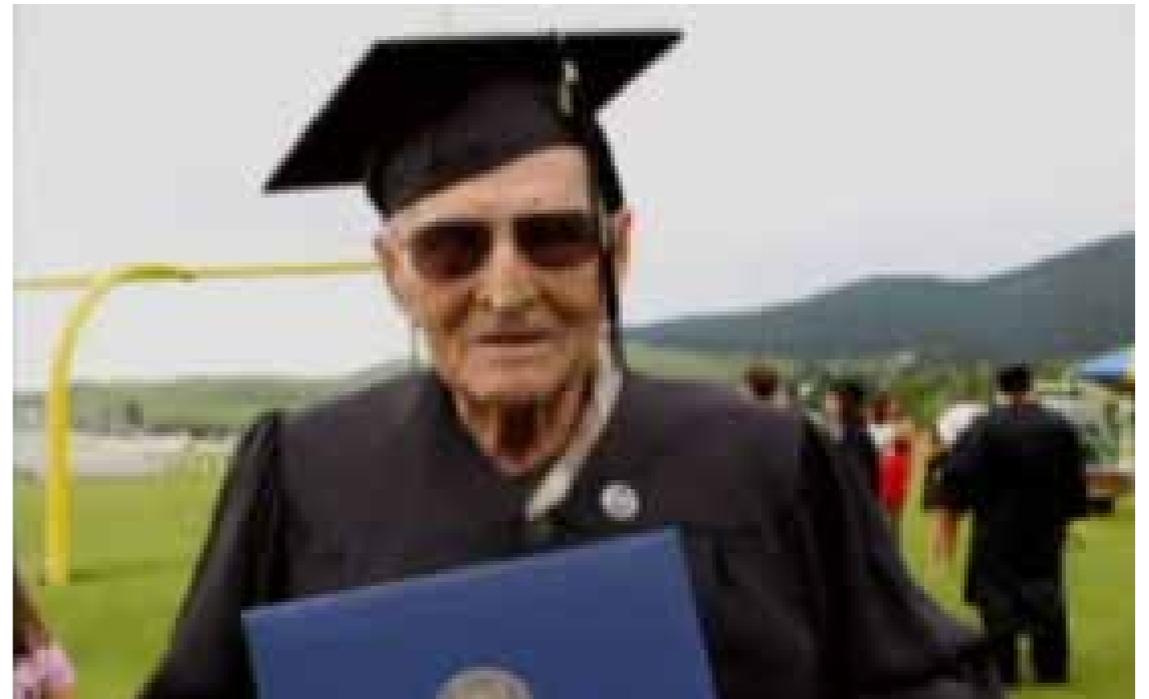
# Then



# Then



# Now?



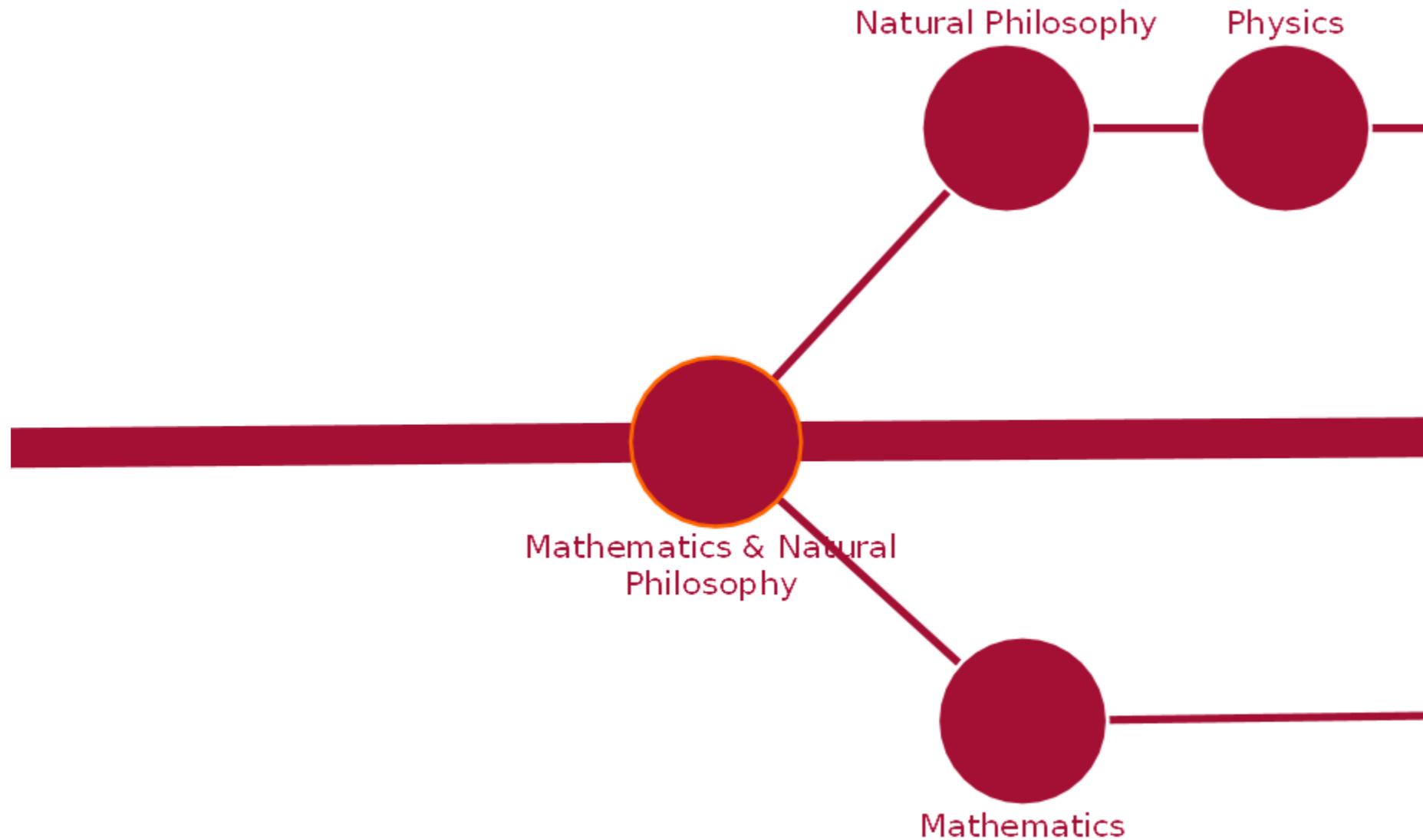
# The growth of Harvard

Speciation of knowledge

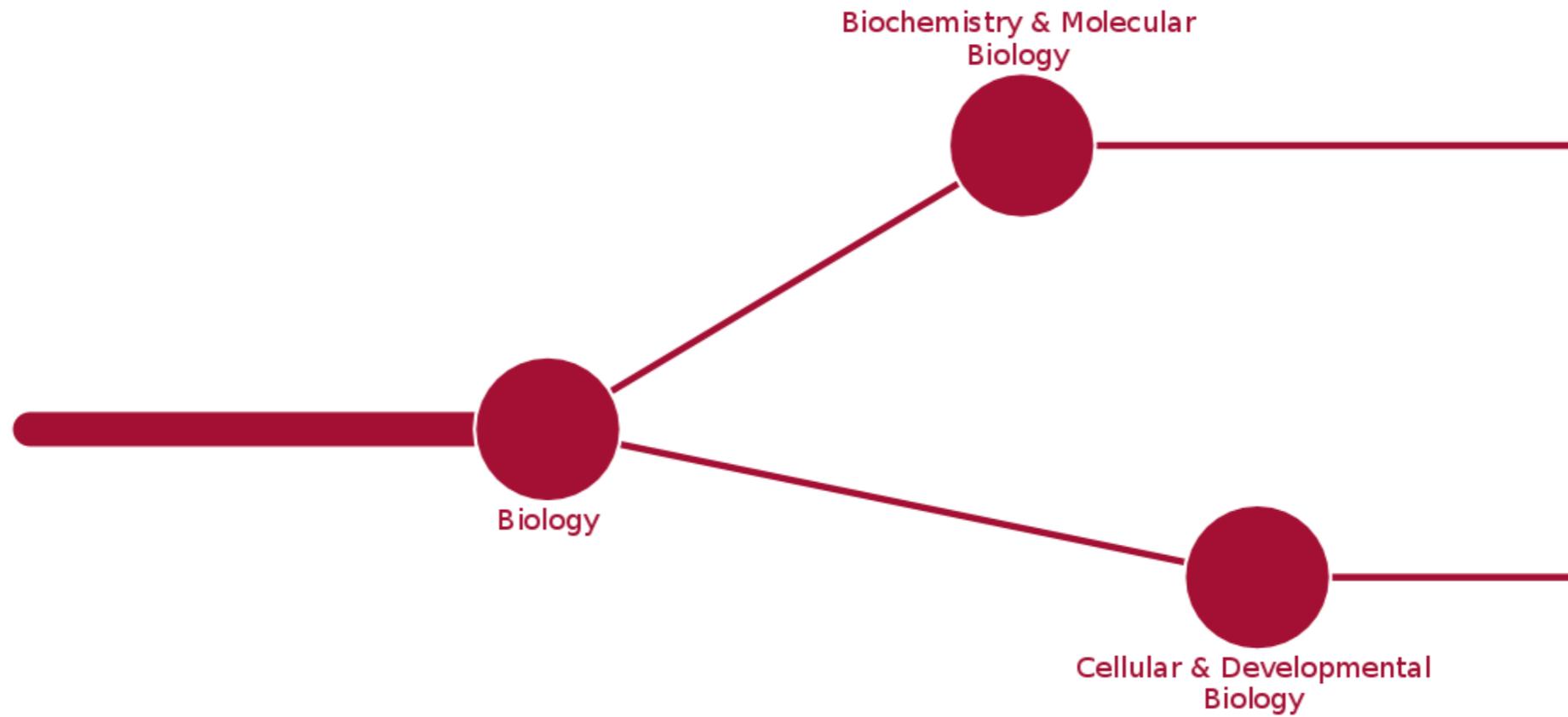
# Harvard College, 1636



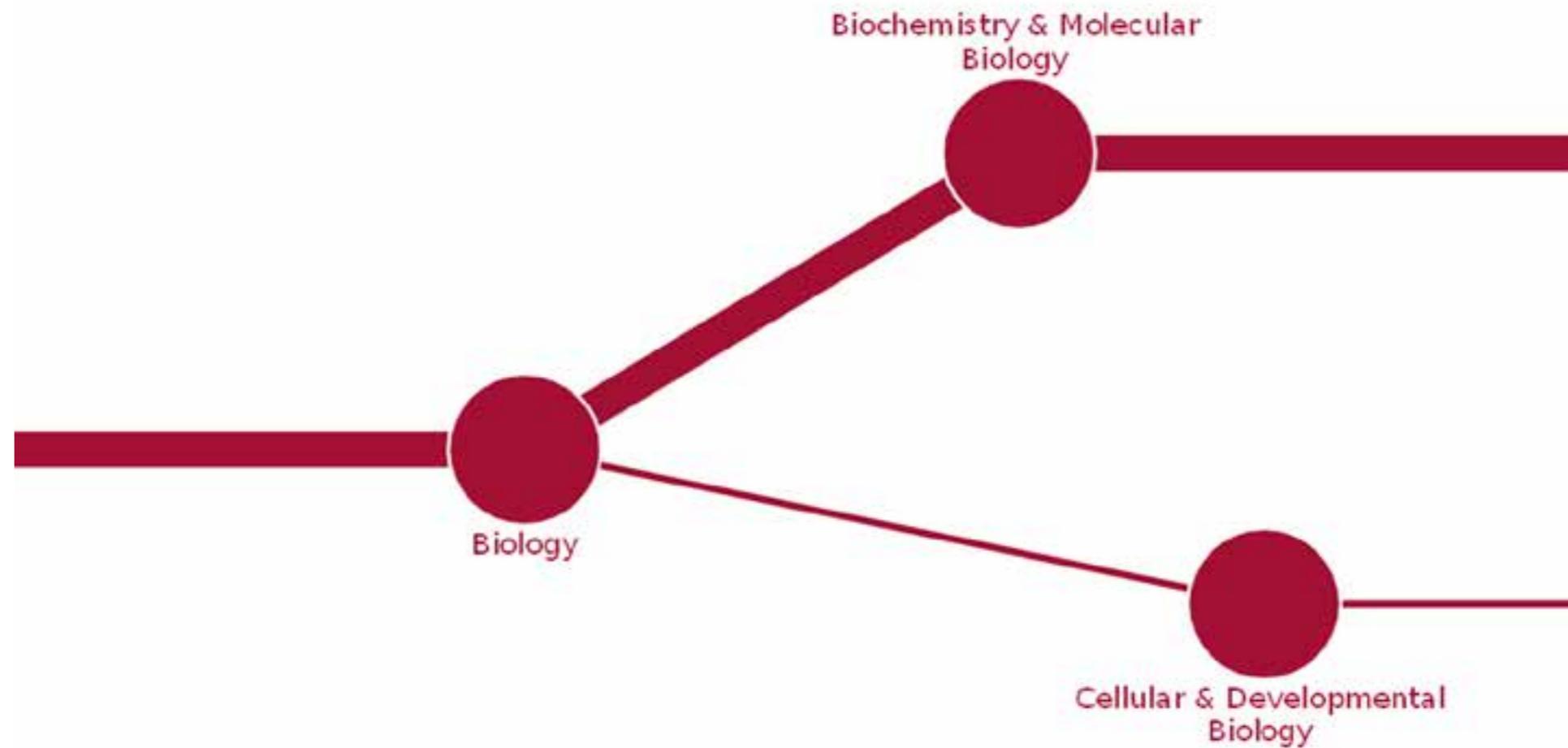
# Natural Philosophy, 1840



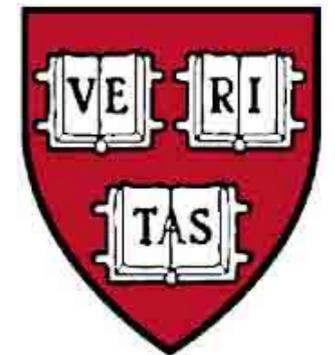
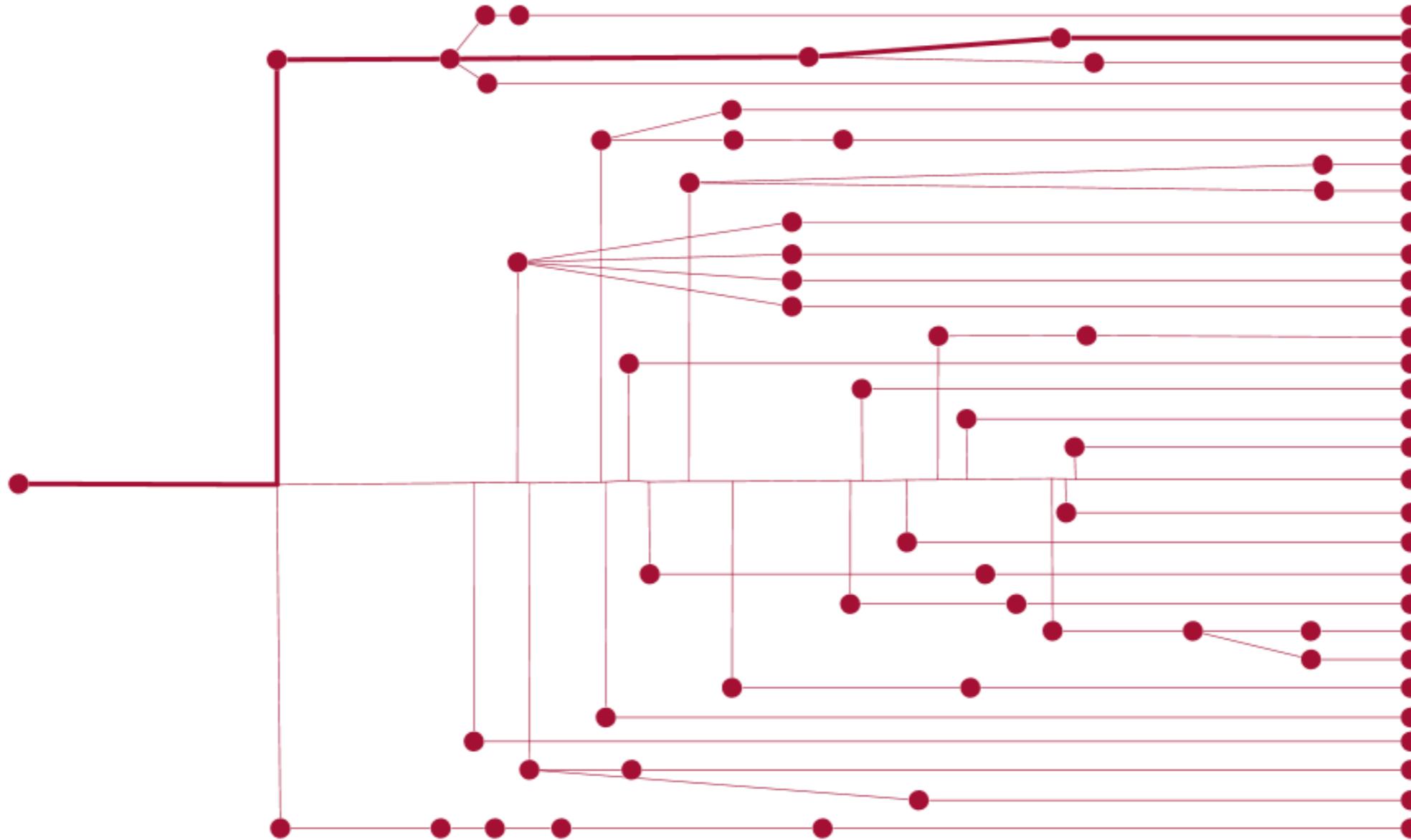
# Biology, 1920



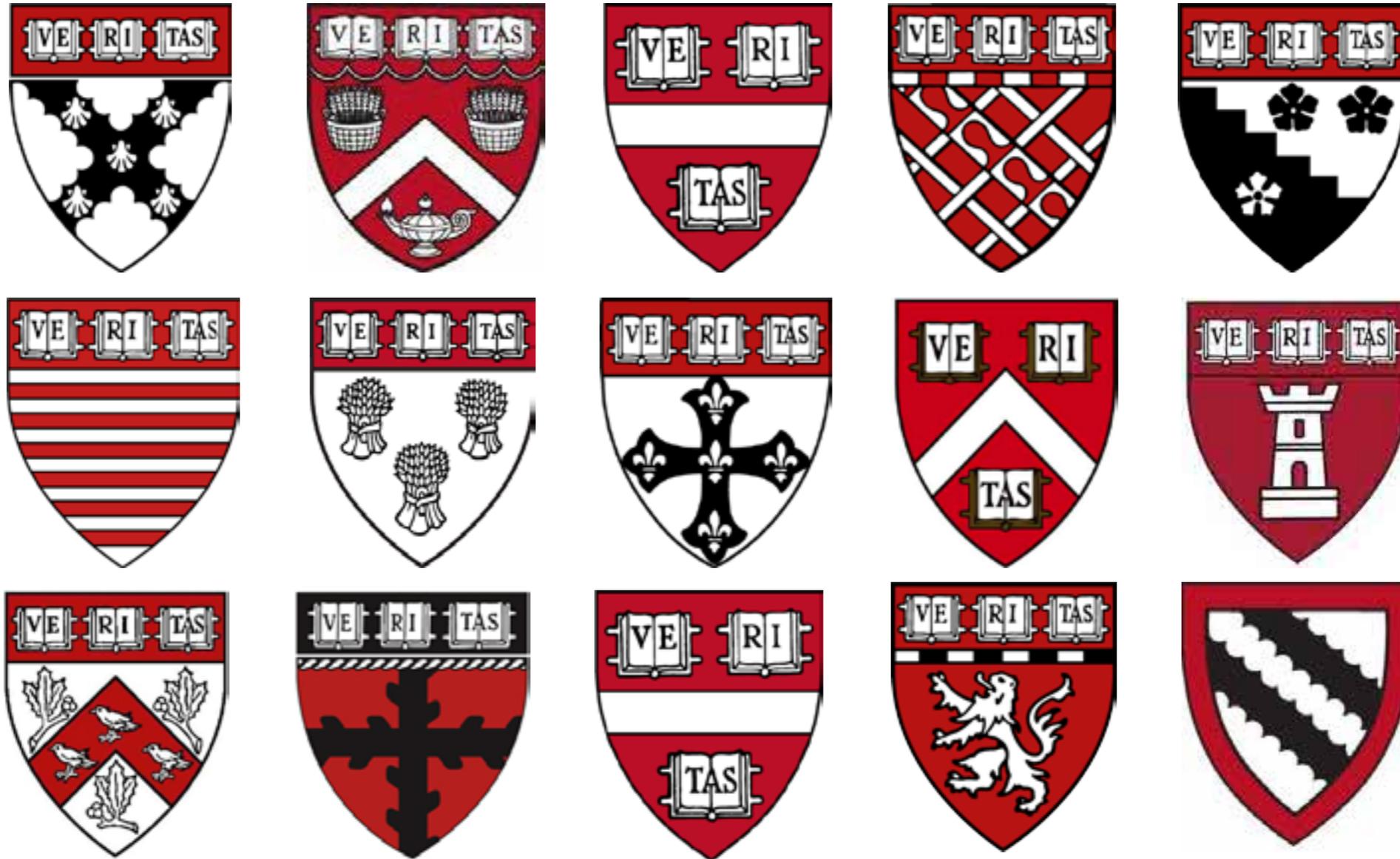
# Biochemistry & Molecular Biology, 1967



# Faculty of Arts & Sciences, 2014



# Schools of Harvard, 2014



# Schools of Harvard, 2014



# Division of knowledge *then*:

Each profession could make something



**Butcher**



**Baker**



**Candlestick maker**

# Division of knowledge *now*:

Multiple experts are required to create products



# Modern production

Requires bringing together many different experts



# The Scrabble Theory of economic development

# If you have one letter...

You can't write many words.



If you have three letters...



You can write four words

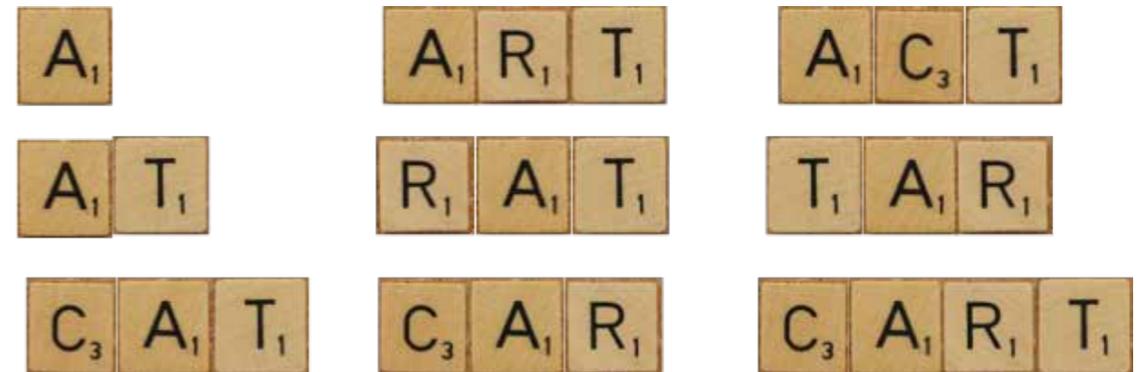


# If you have four letters...



---

## You can write nine words

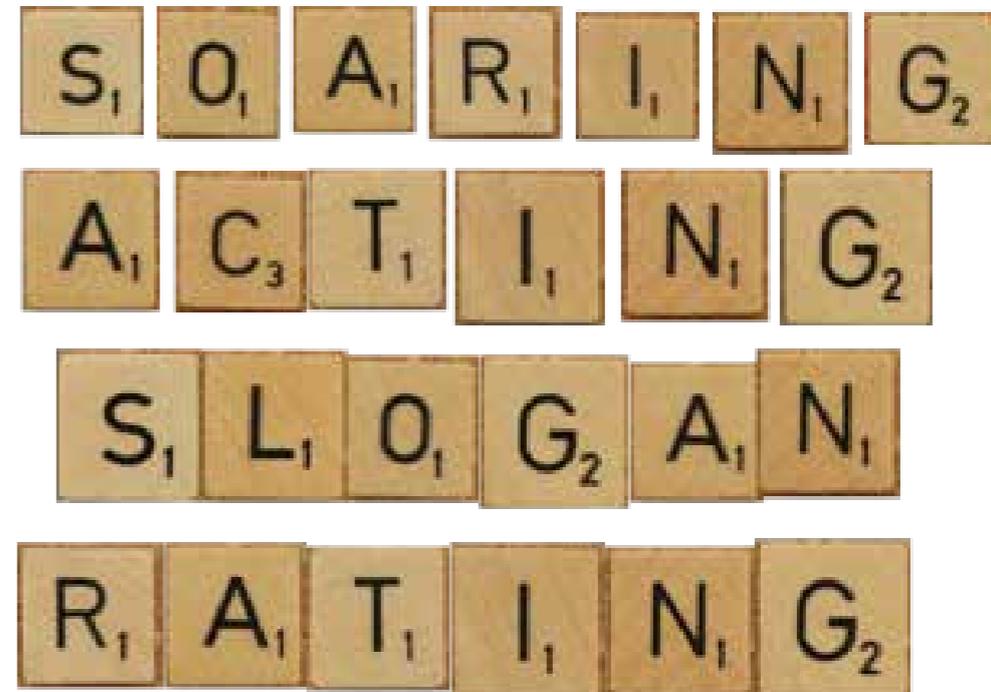


# With 10 letters...



---

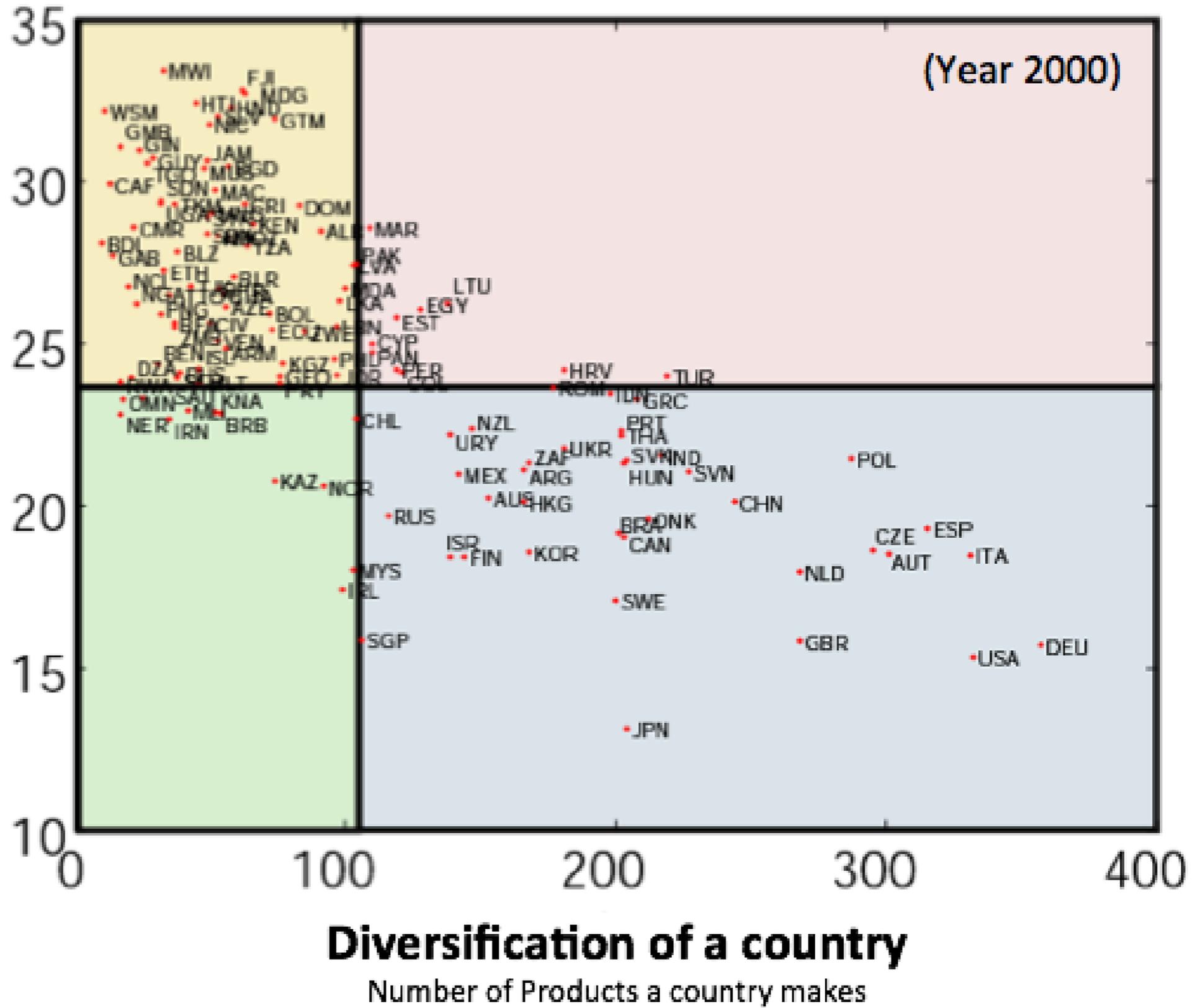
## You can write 595 words



# Evidence of the connection between the diversity of inputs and that of outputs

# Products Ubiquity

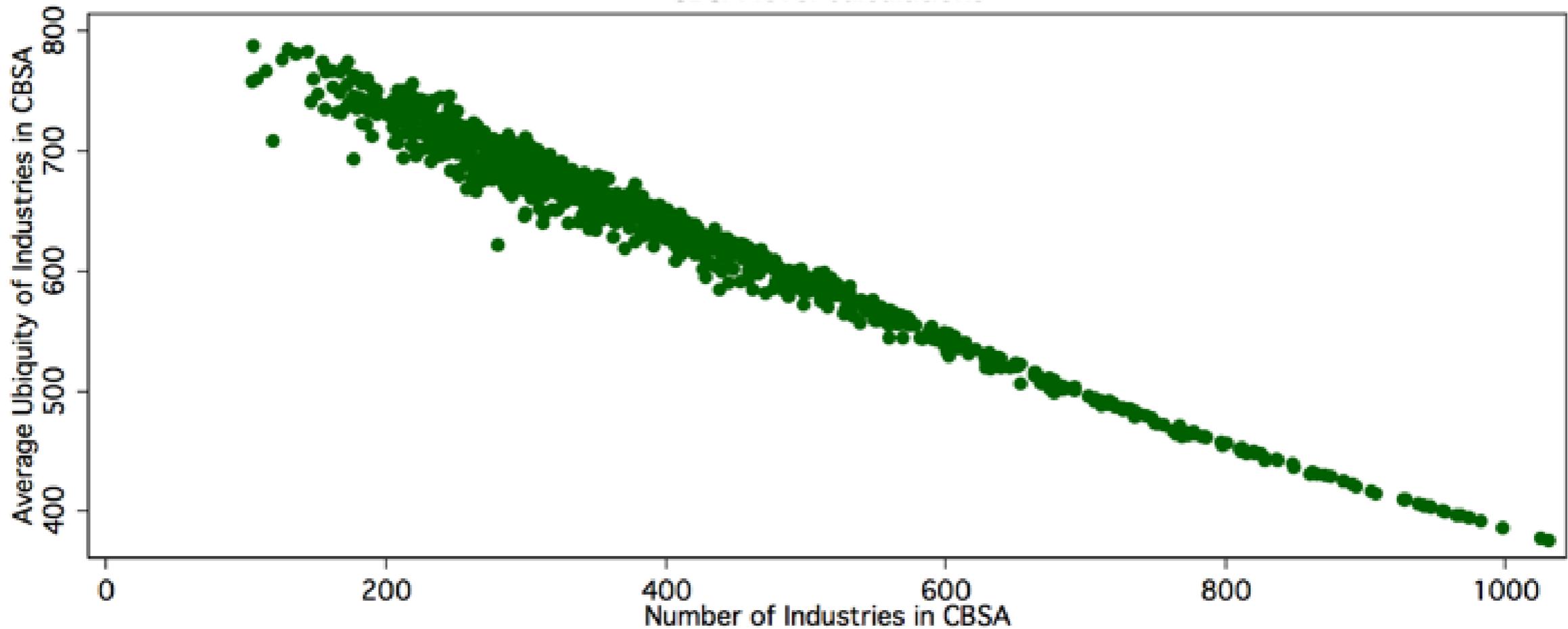
Avg. number of countries that make the same products





# The United States

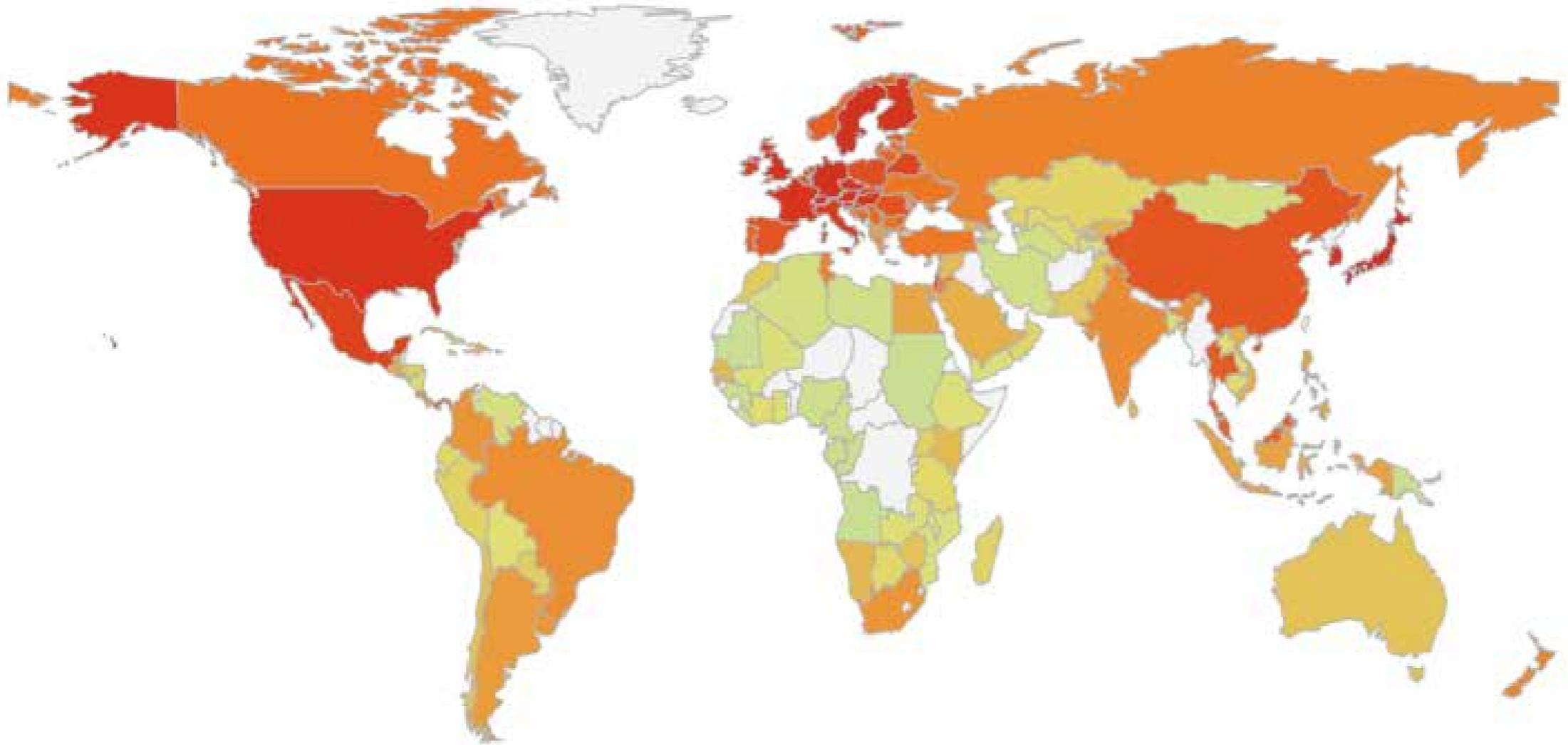
US Diversity-Ubiquity Schedule  
CBSA-level calculations

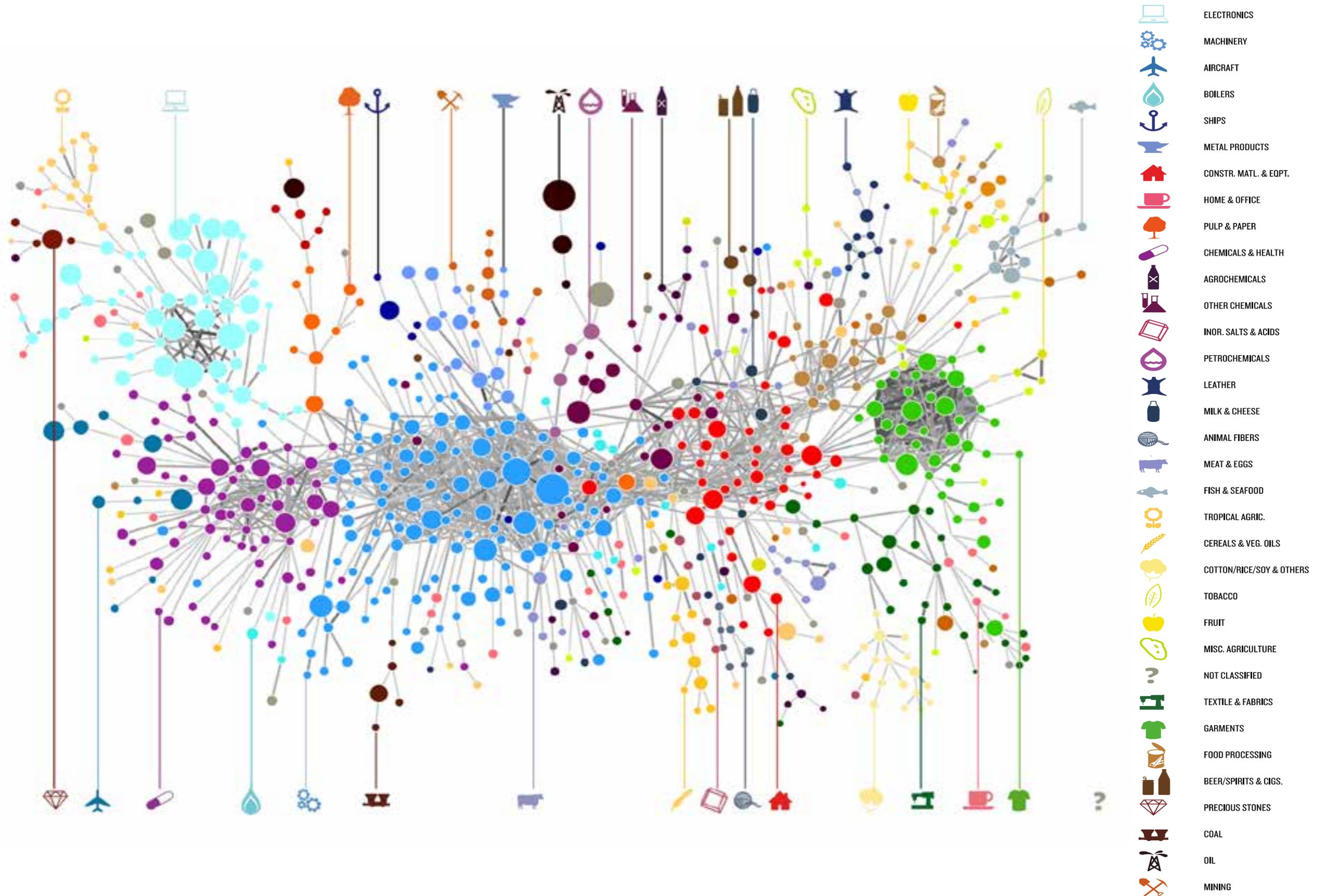


NOTE: Using data from the ACS and the Economic Census, 2009

# We can measure “letters”

That is, how many capabilities a country has





# What's new?

# Specificity

The first consequence of Scrabble

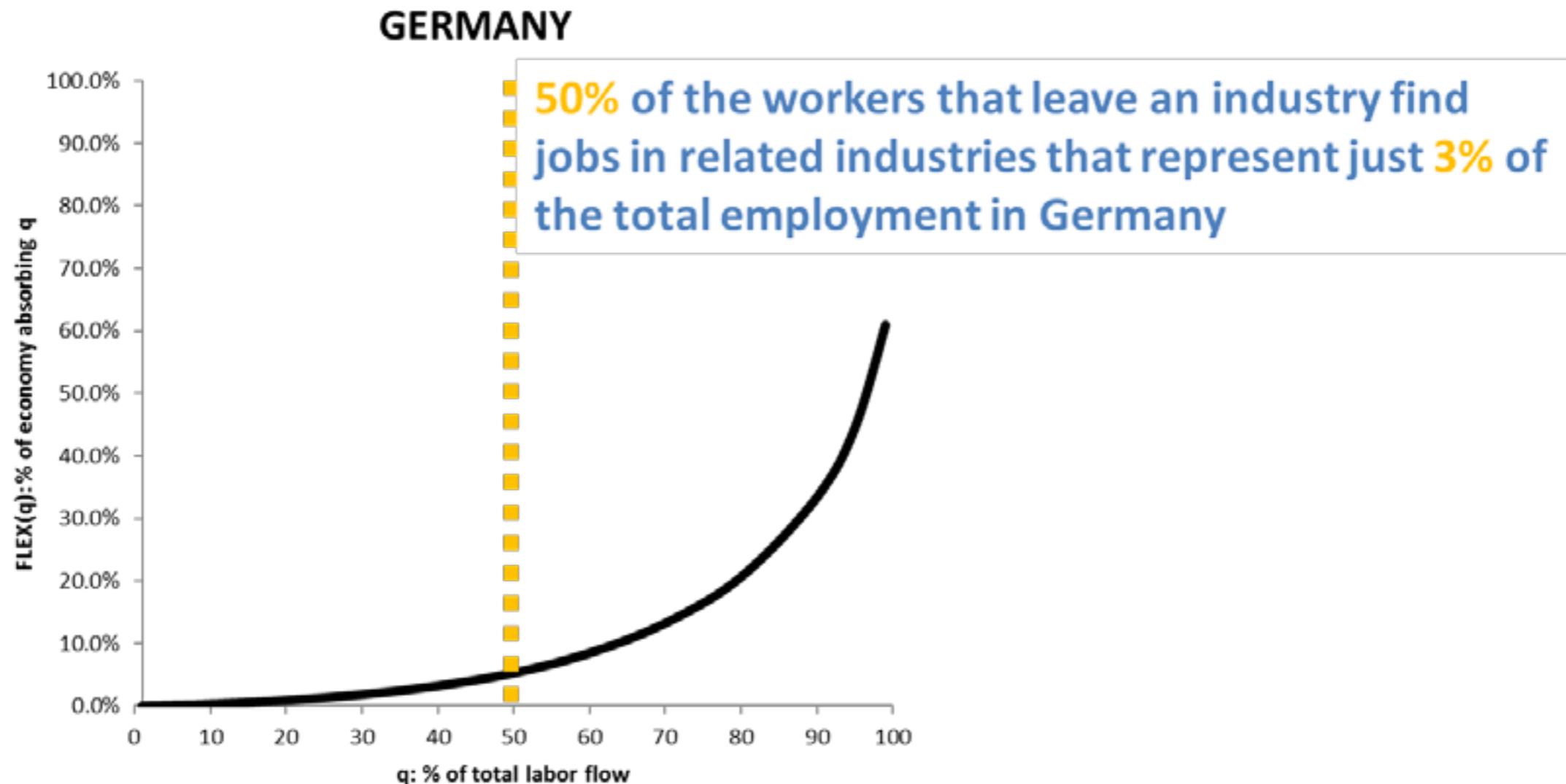
# Human capital

Are we more like Play-Doh or Scrabble pieces?



# Human capital is specific

How large are the labor markets on which workers search?



# Speciated expertise

The German labor market as a network of human capital linkages (1998-2008)



# Acquiring new letters



Moving knowledge into our brains  
is hard work.



**It's often easier to  
move the brains**

# Diffusion through mobility

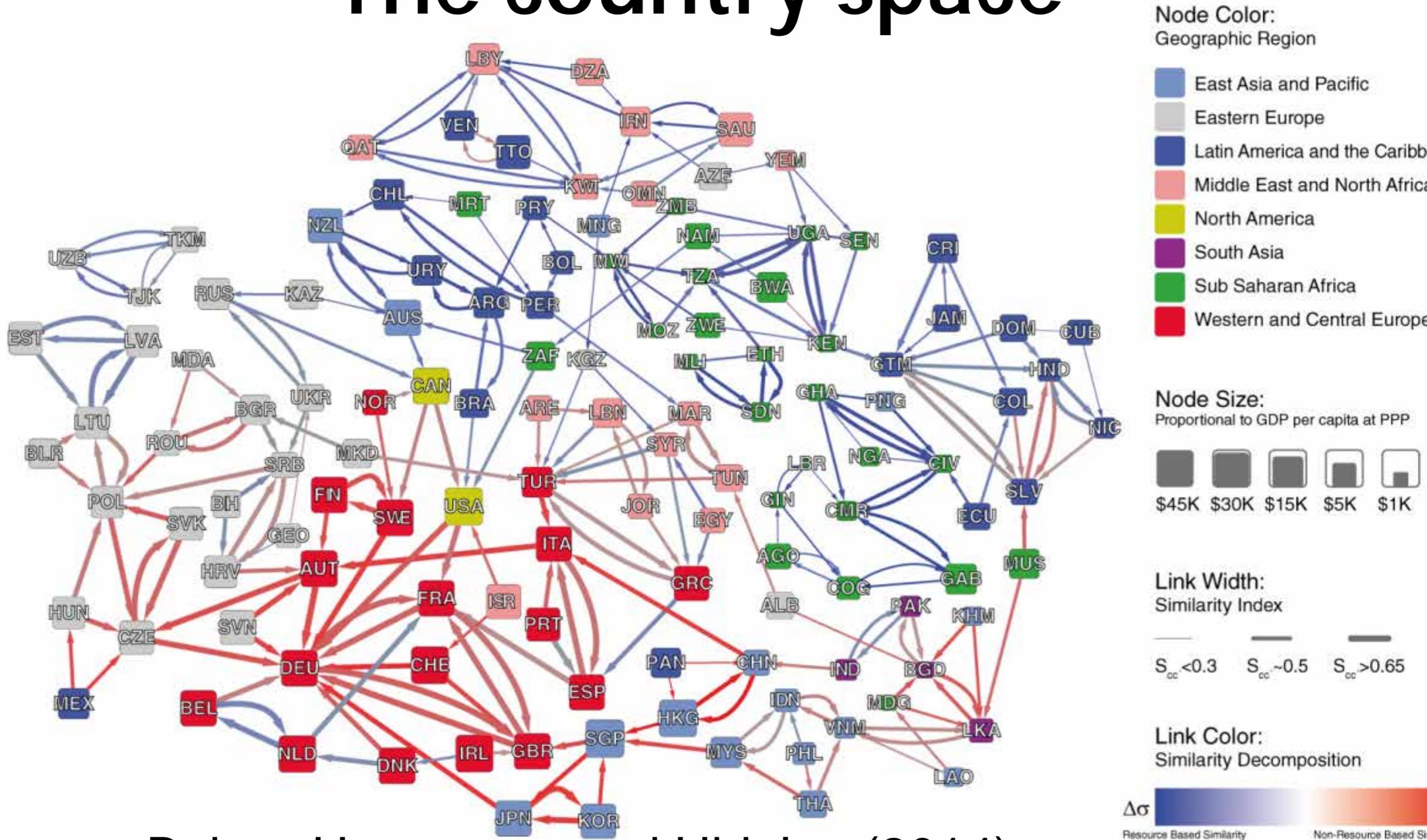
The second consequence of Scrabble

# Products diffuse through migrants



# Products diffuse to neighbors

# The country space

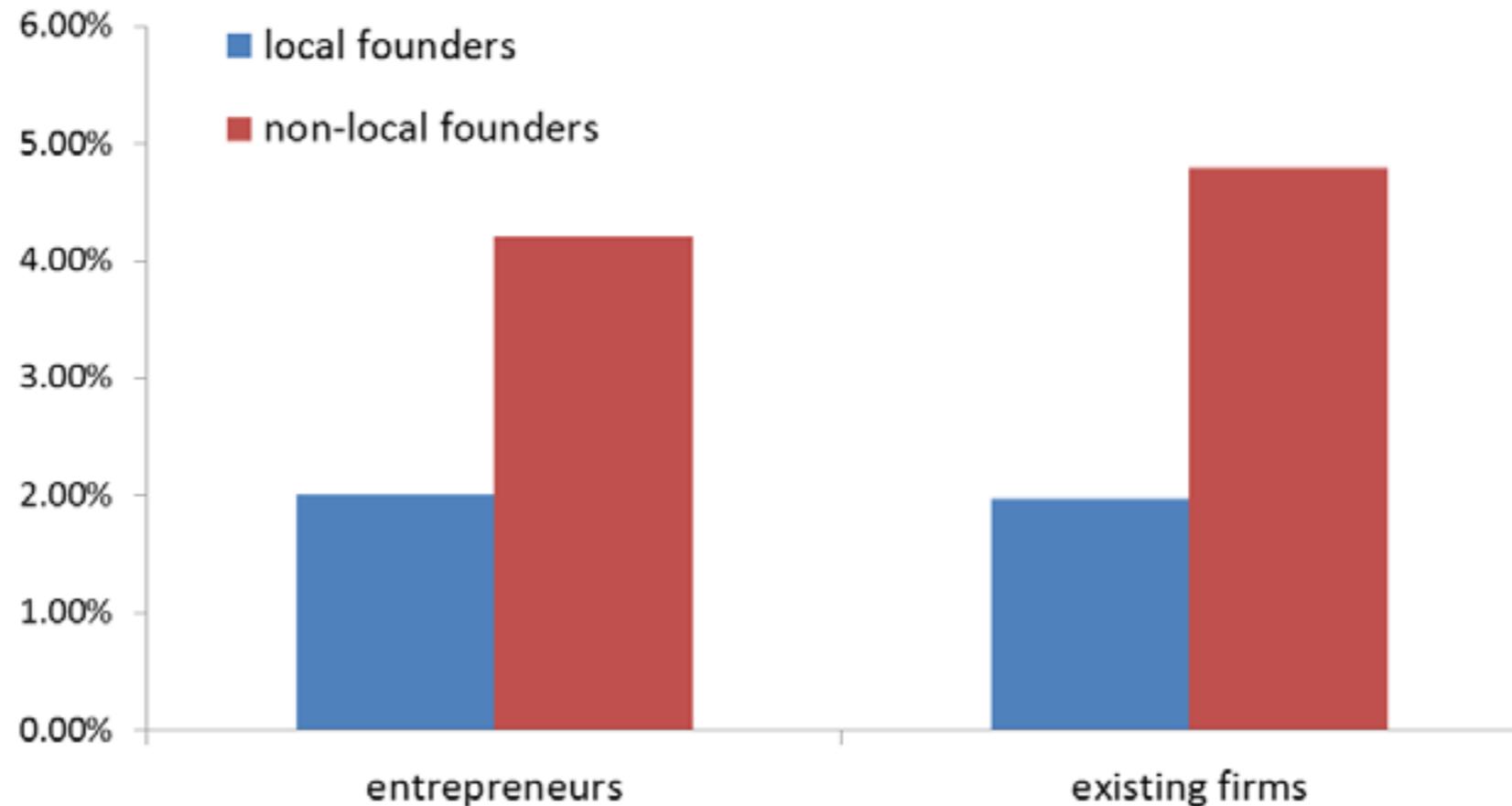


Bahar, Hausmann and Hidalgo (2014)

# Diffusion of industries by entrepreneurs

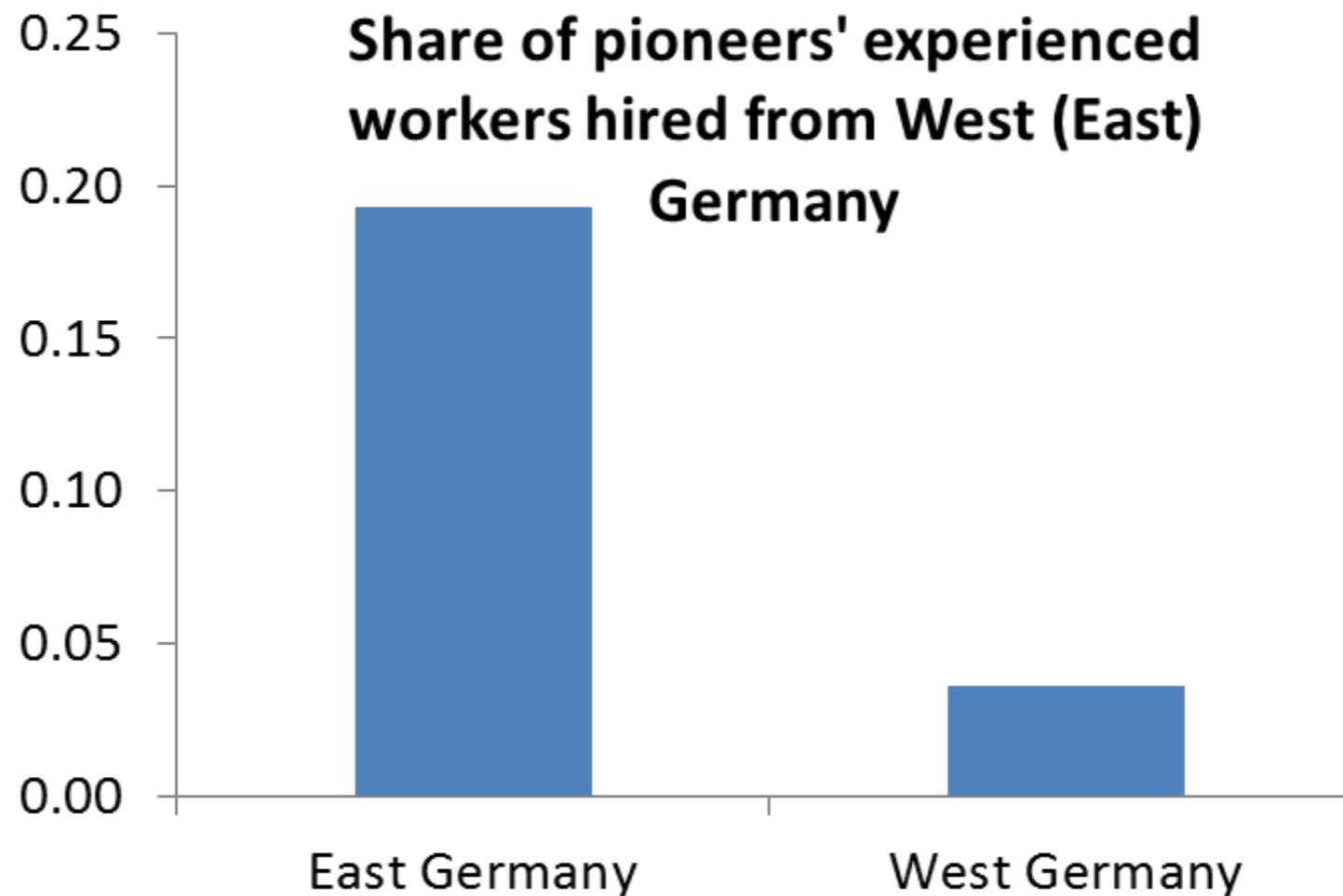
Evidence from Sweden

Share of new establishments that pioneer a local industry  
(by founder type)



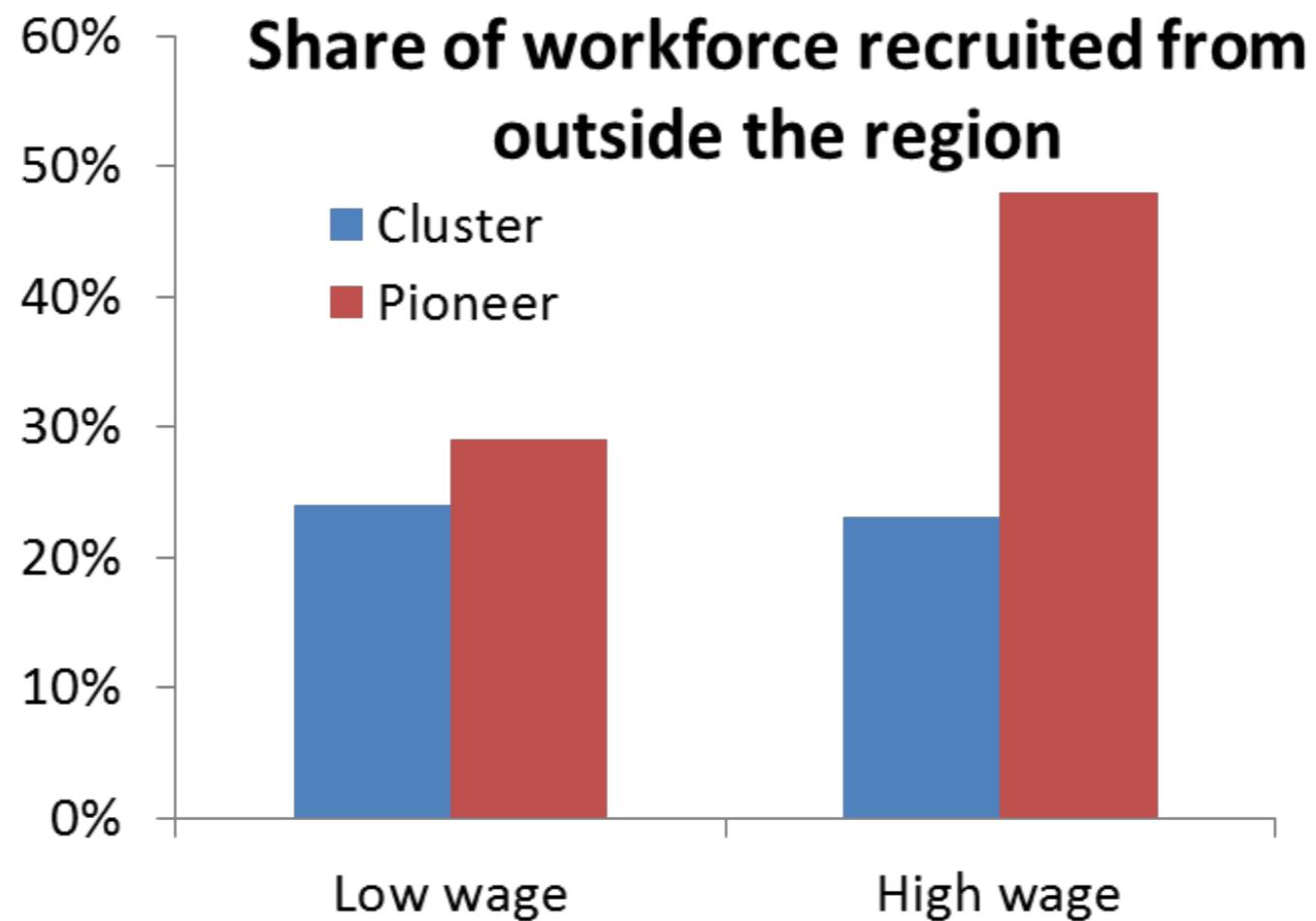
# The diffusion of industries: workers

Setting up new industries in East Germany depends on finding experienced workers in West Germany.



# Colombia

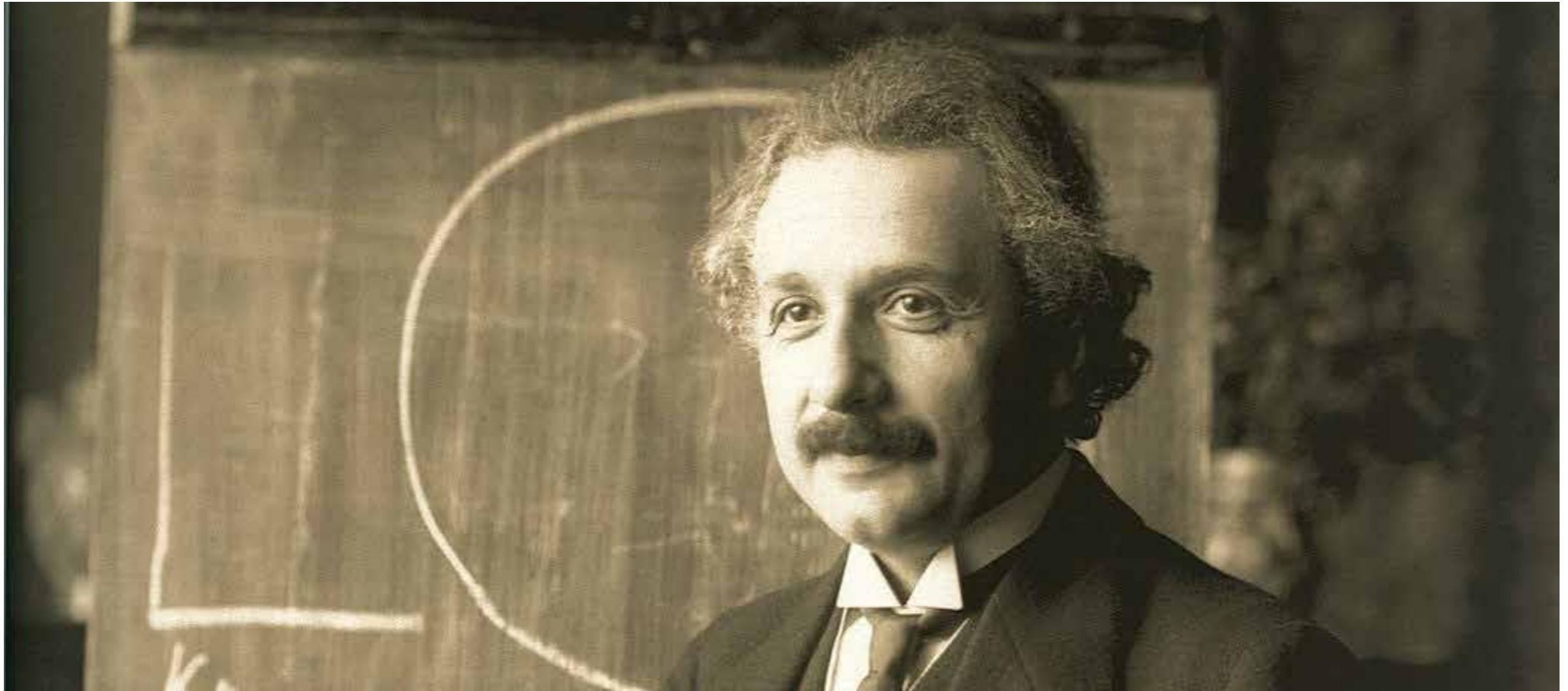
Matté Hartog: n Colombia  
pioneering requires mobility of experts



# Our own research: Albania (Ljubica Nedelkoska)

Return migration to Albania after collapse of Greek economy: For every percentage point increase in return migrants, local wage growth went up 3.1% (2.6% for low skilled, 4% for high skilled)

# German émigrés and the rise of U.S. science



# Moser, Voena and Waldinger (AER 2014)

German Jewish émigrés revolutionized  
U.S. science and innovation: U.S. invention increased by  
almost a third after 1933 in the field of the émigrés vis a vis fields that did not  
benefit directly from émigrés.

# Brain drain?

Or brain circulation?



# Mexican return migrants (Dario Diodato)

Doubling the number of return migrants with industry experience in US raises growth rate of local industries by about 6%

# Complementarity

From letters to words



**Specificities lead to  
strong interdependence  
among experts**



# It takes a village



**In-air hospitality**



**Airplane mechanics**



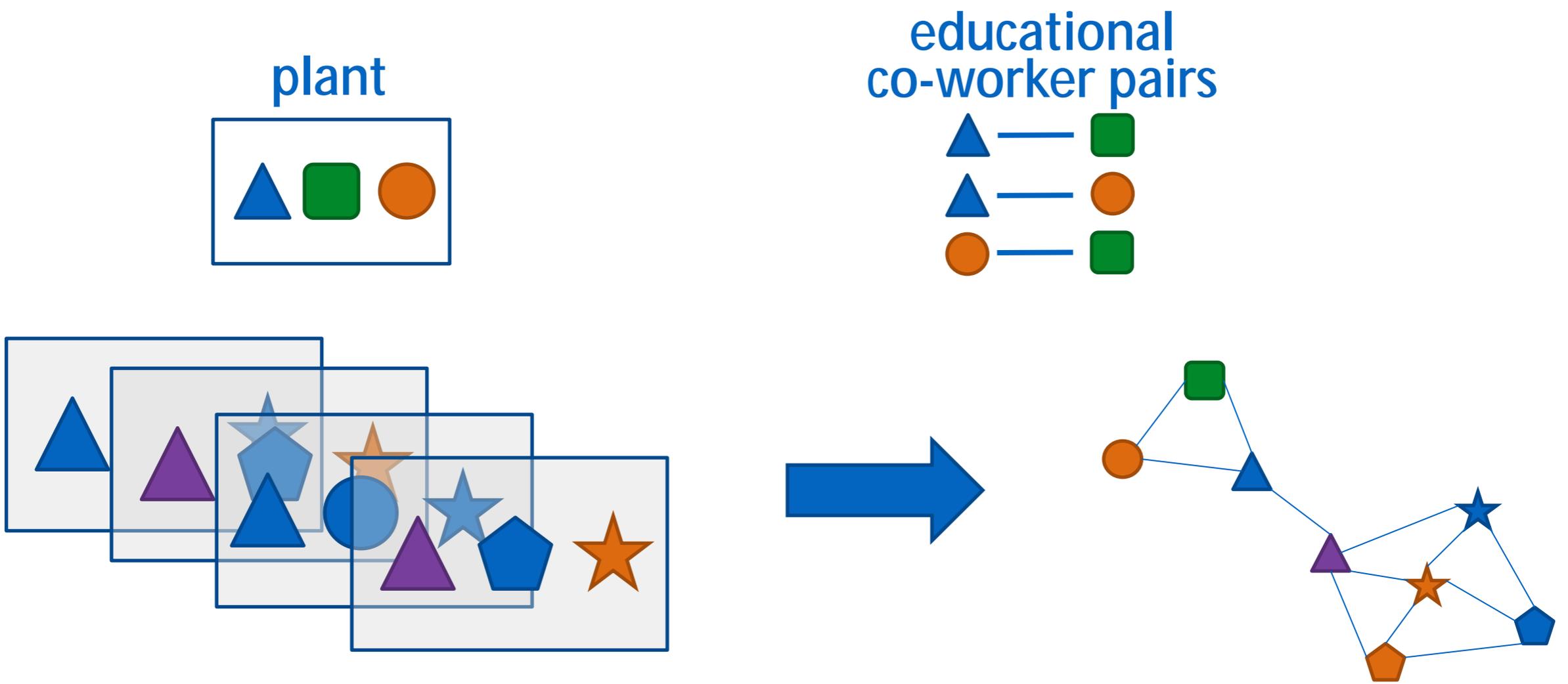
**Flight control**

Complements

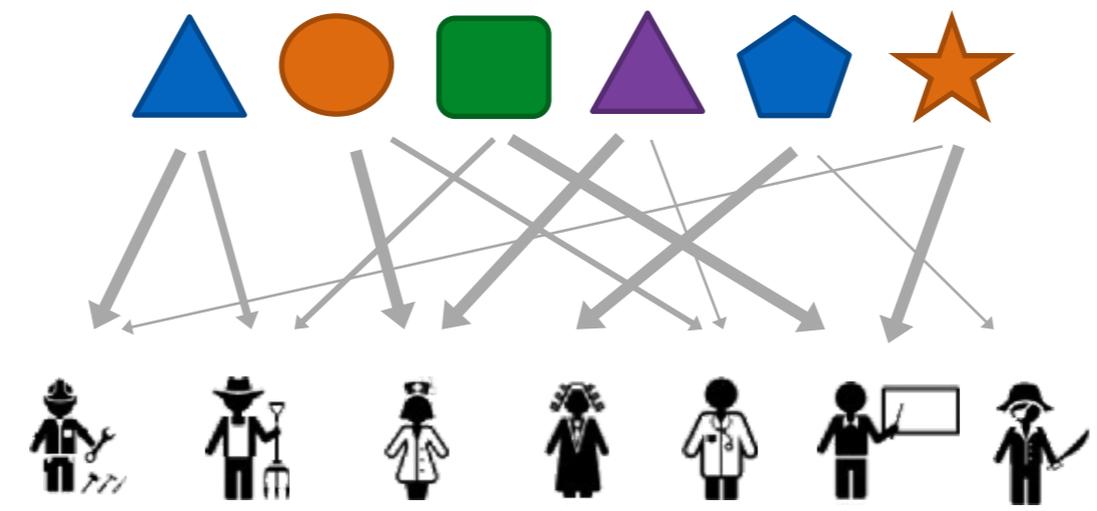


Substitutes

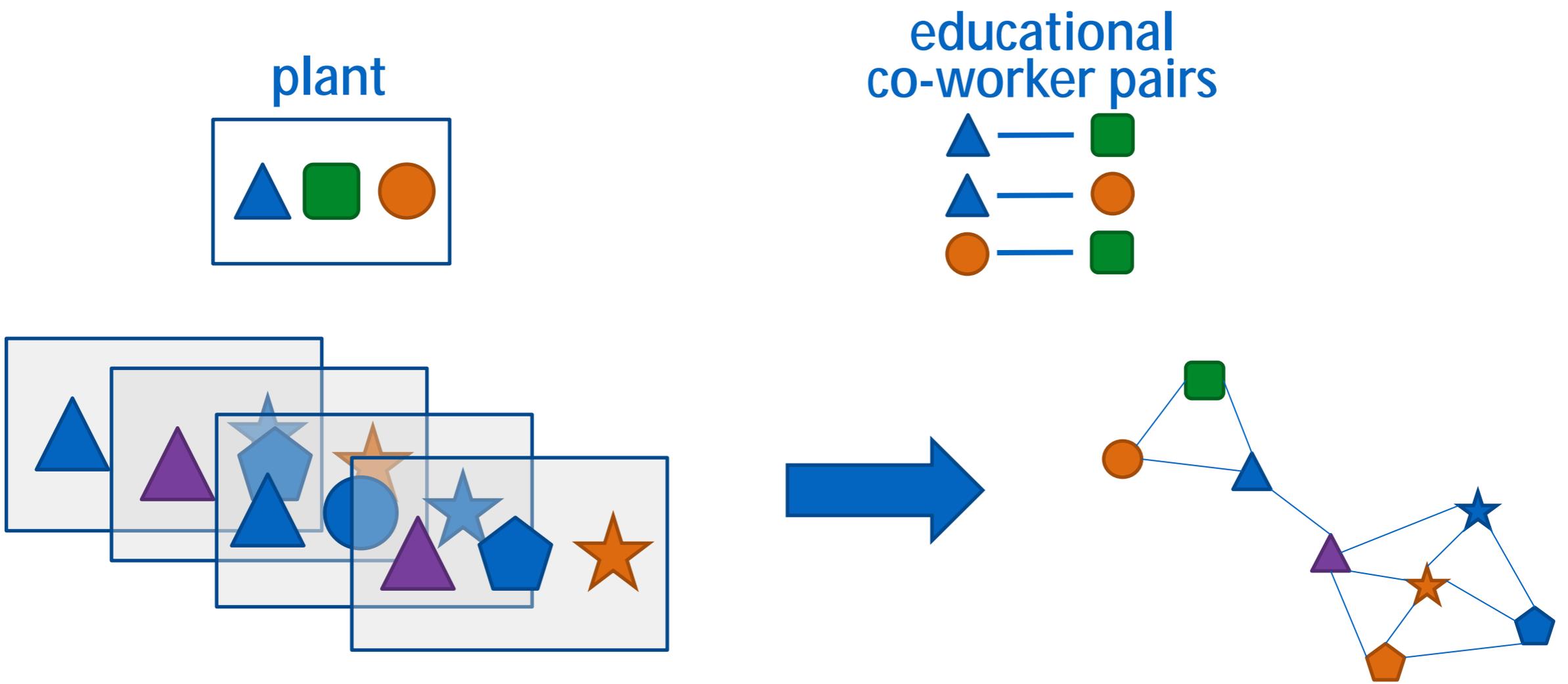
# COMPLEMENTARITY: which educations often work together?



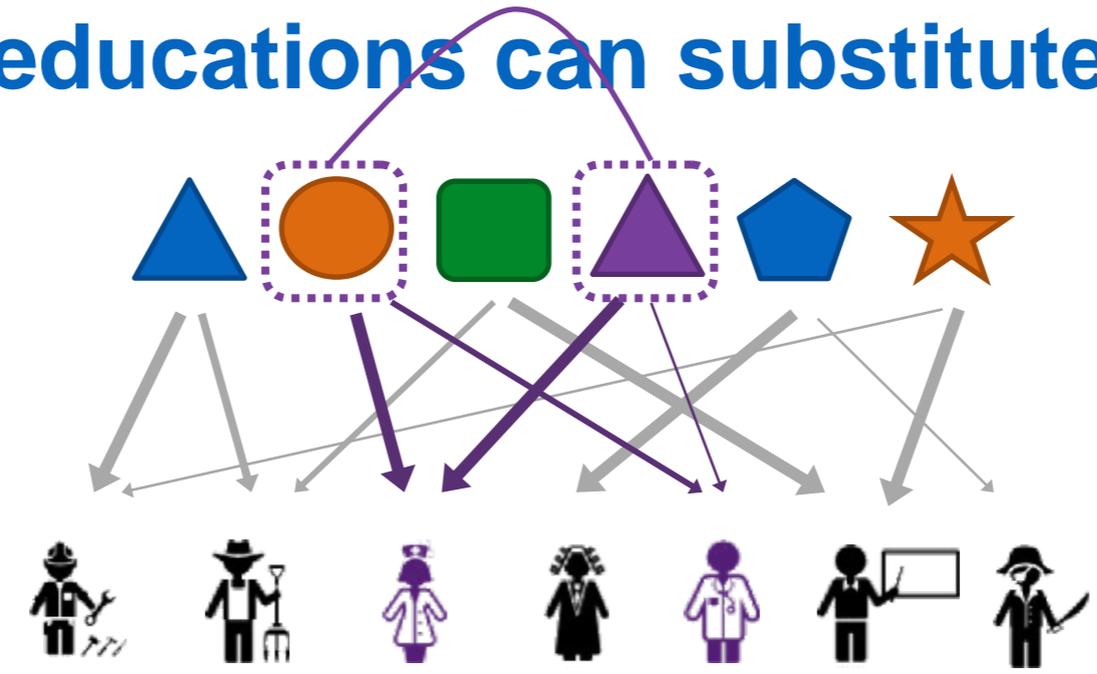
# SIMILARITY: which educations can substitute for one another?

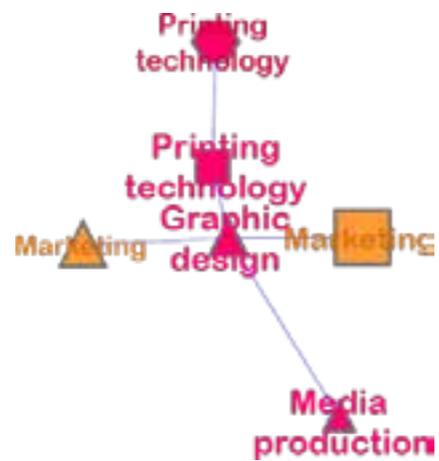
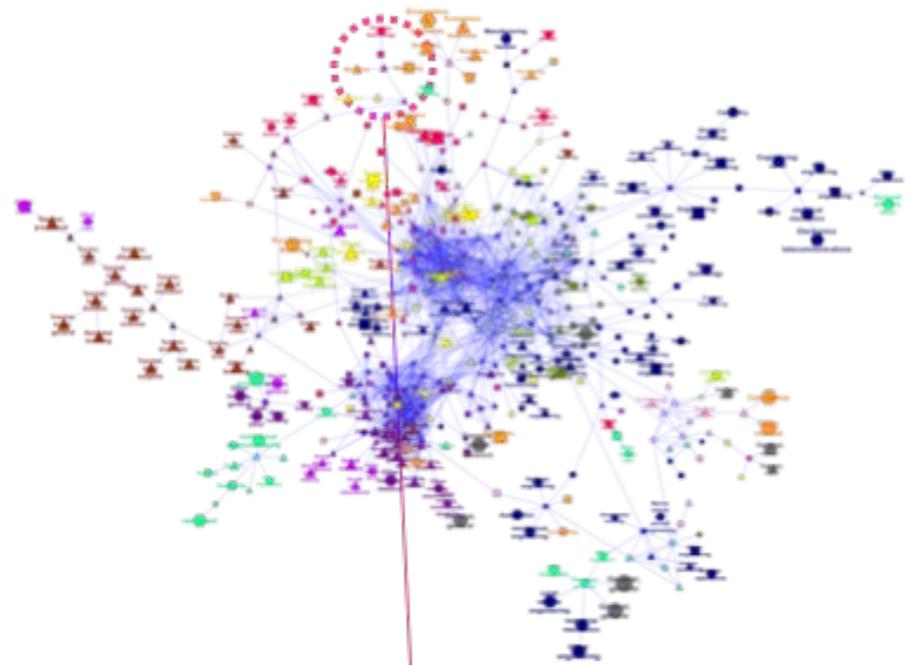


# COMPLEMENTARITY: which educations often work together?



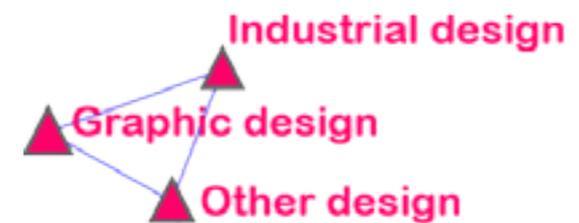
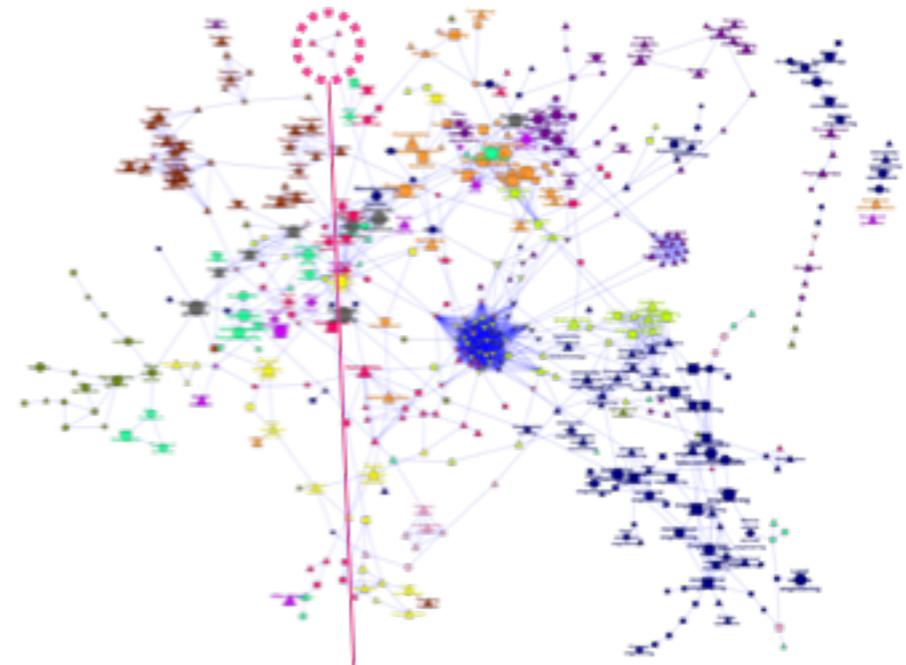
# SIMILARITY: which educations can substitute for one another?





## Complementarity

Who are your complements?

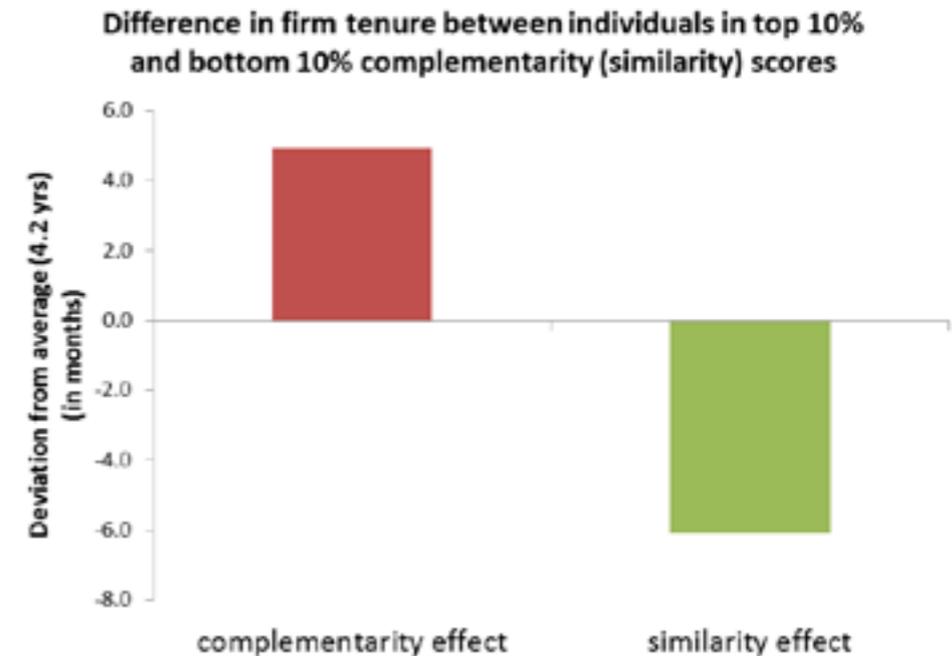


## Similarity

Who are your substitutes?

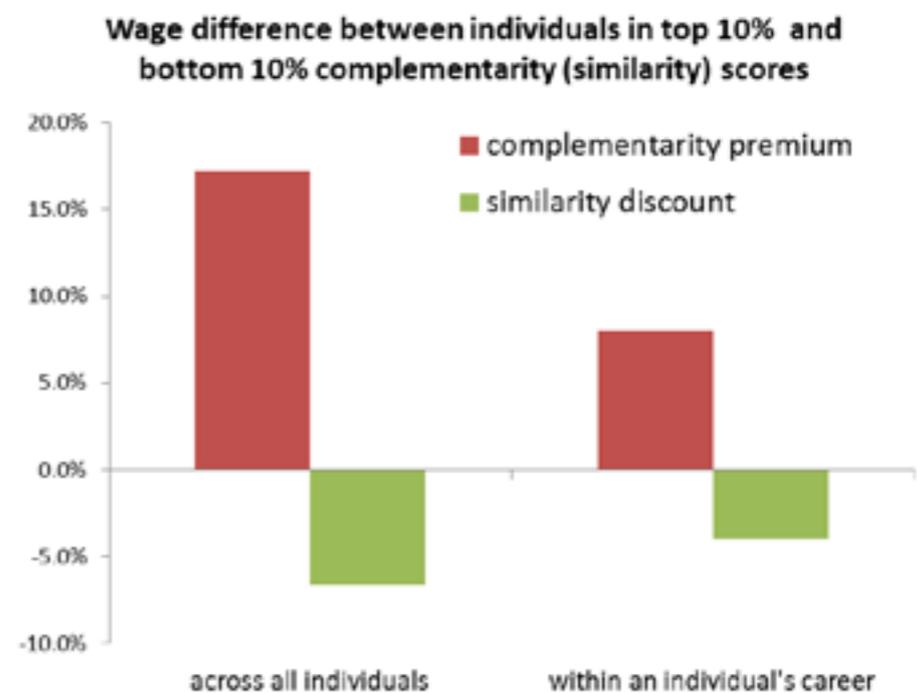
# Tenure

How much longer do people stay with the same employer?



# Wages

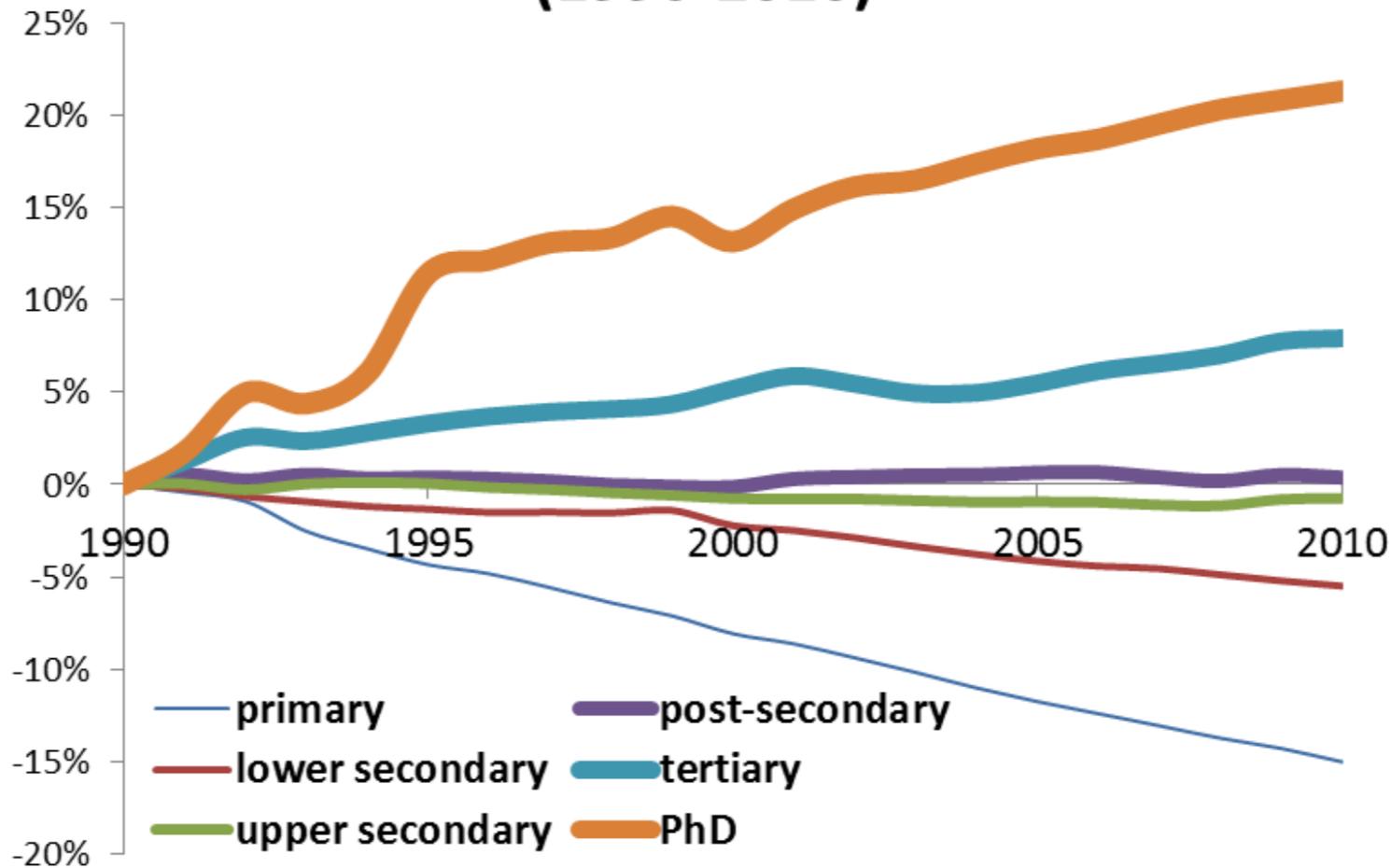
How much more do people earn?



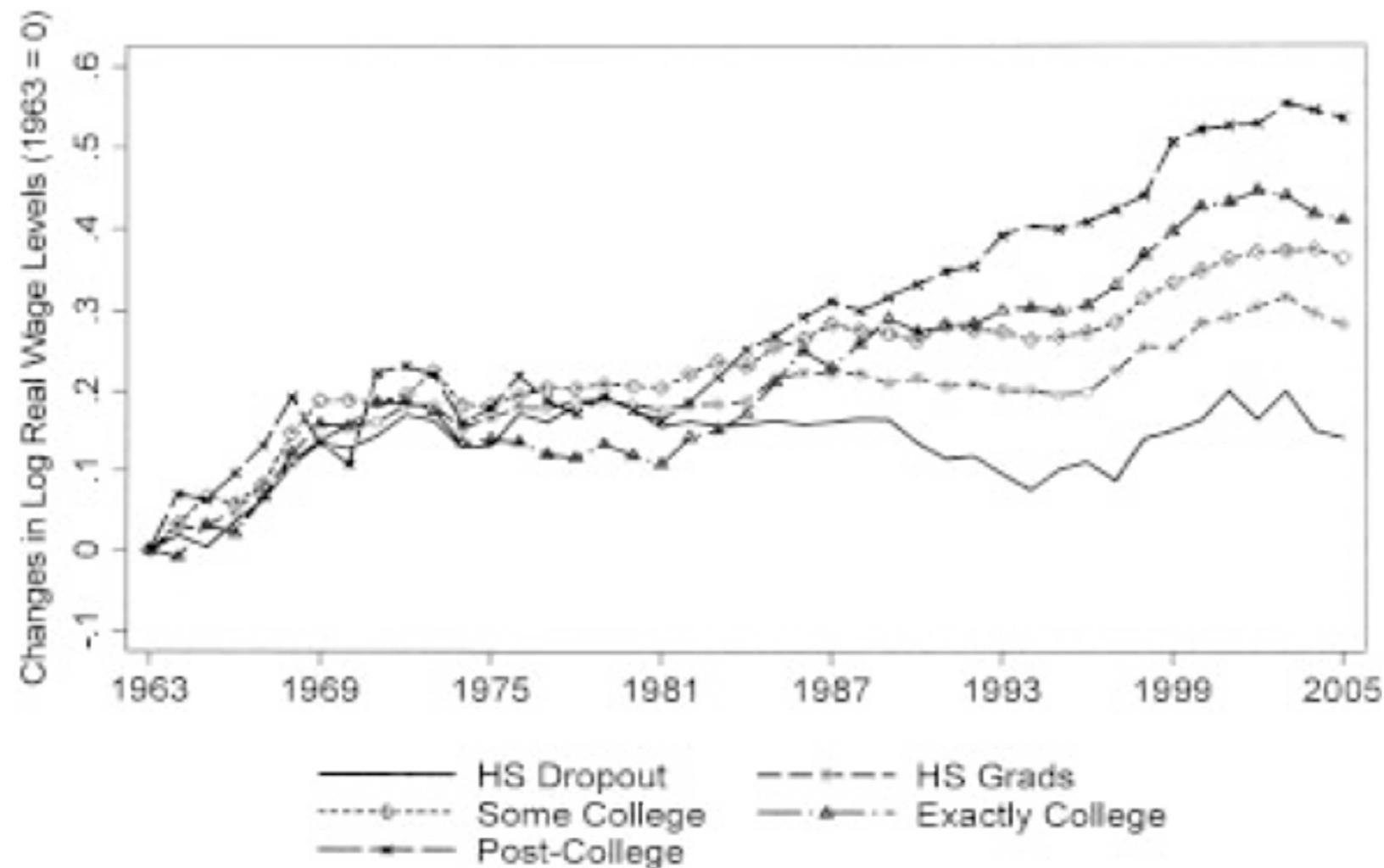
# Complementarities are up

But not for everyone

## Changes in co-worker complementarity (1990-2010)



# Rise of the college wage premium



A<sub>1</sub>

C<sub>3</sub>

C<sub>3</sub>

E<sub>1</sub>

S<sub>1</sub>

S<sub>1</sub>

# Accessing the kilo-personbyte economy of Bogotá





# Going to work is a pain



# Even with good infrastructure



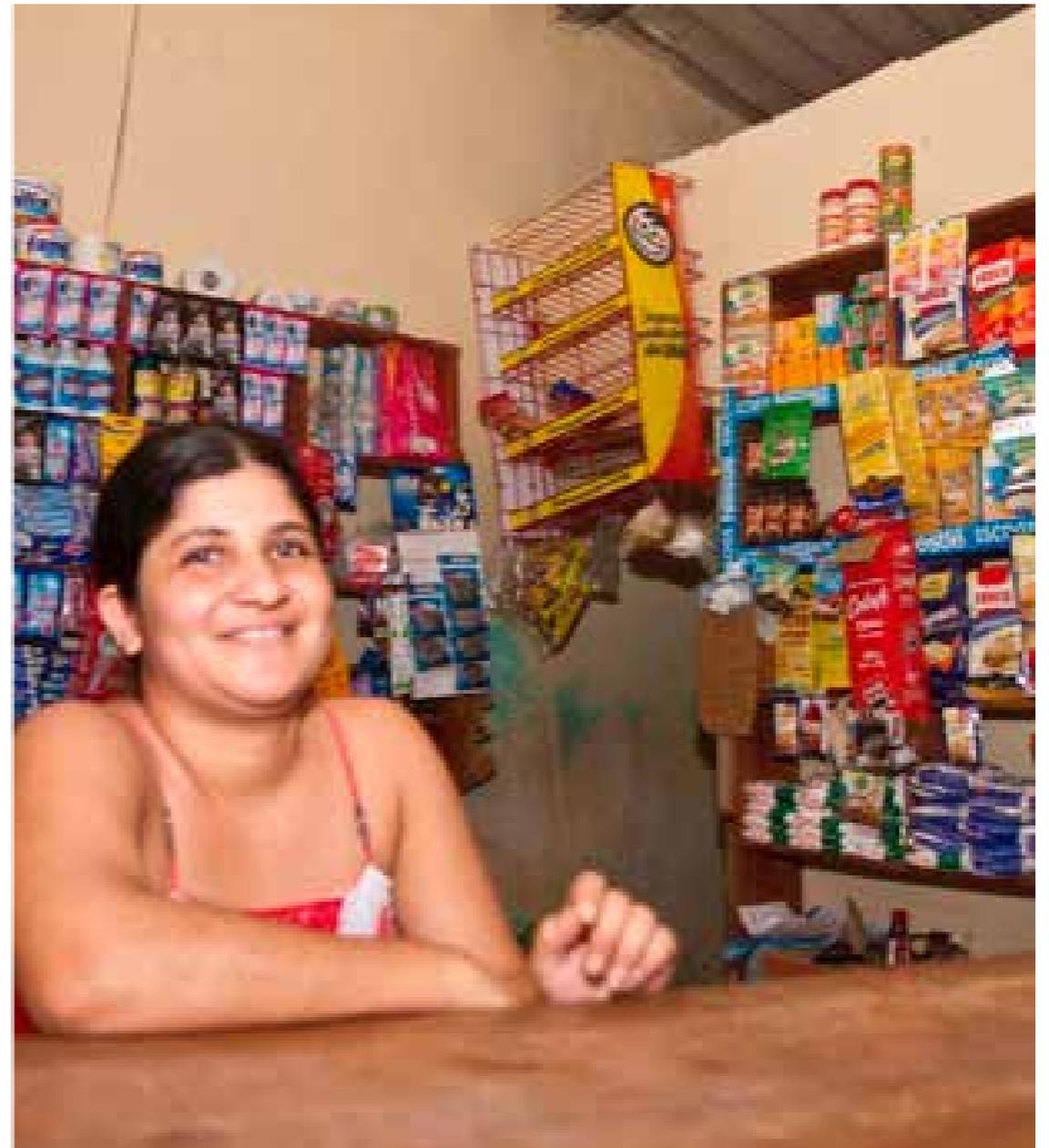
# Bogotá has tried to improve



If going to work is too costly in  
time and money...



People end up in the  
low-productivity,  
1-personbyte economy



# Business travel as a way to access the kilo-personbyte economy of the world

# International Departures

TERMINAL 3



International  
Departures  
TERMINAL 3



**MasterCard**®

# Policy Implications

# Policy implications

- Education vs. vocational training: Germany
  - On the job training: Subsidized internships: South Africa
  - External immigration
    - Venezuela '80: 6% of population, 50% of entrepreneurs
  - Diasporas – Israel, Joinville - Brazil, Albania?
  - Backward regions and Internal migration: Chiapas
  - Brain circulation: India, Taiwan, Bangladesh, Mexico
  - Business travel and fairs
  - Foreign direct investment and ex pats
  - National conglomerates and joint ventures
  - Government procurement
-

T H A N K  
Y O U

TRIPLE  
LETTER  
SCORE

DOUBLE  
LETTER  
SCORE

DOUBLE  
LETTER  
SCORE

DOUBLE  
LETTER  
SCORE

DOUBLE  
LETTER  
SCORE

TRIPLE  
LETTER  
SCORE

TRIPLE  
LETTER  
SCORE

DOUBLE  
LETTER  
SCORE