Digitalisierung und Arbeitsmärkte im Wettbewerb der Systeme

JENS SUEDEKUM
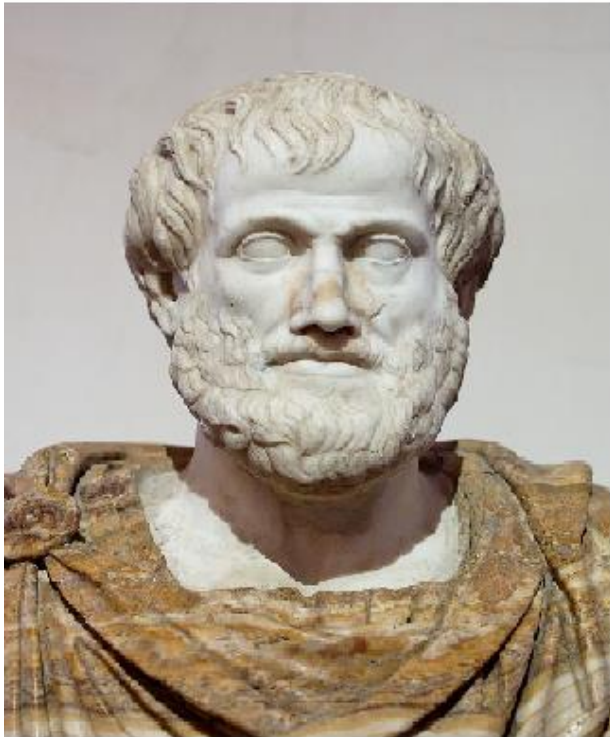
HEINRICH-HEINE-UNIVERSITÄT DÜSSELDORF

VERKEHRSÖKONOMIK UND -POLITIK − 23.5.2019

twitter

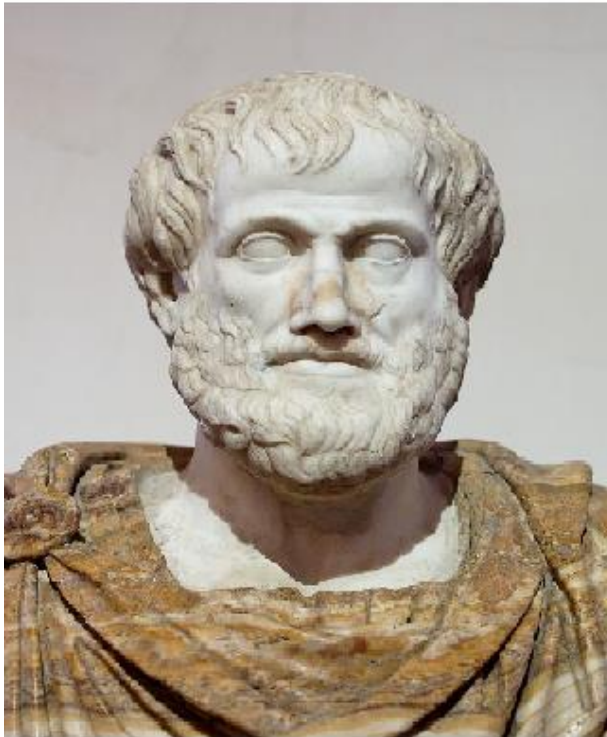@jsuedekum

„Robots are taking our jobs"

For, if each tool could perform its task on command or by anticipating instructions, and if like the statues of Daedalus or the tripods of Hephaestus . . . shuttles wove cloth by themselves, and picks played the lyre, a master craftsman would not need assistants, and masters would not need slaves. (Politika I.4, 1253b33–1254a8)

Aristotle (384 – 322 b.c.) on "artificial intelligence"

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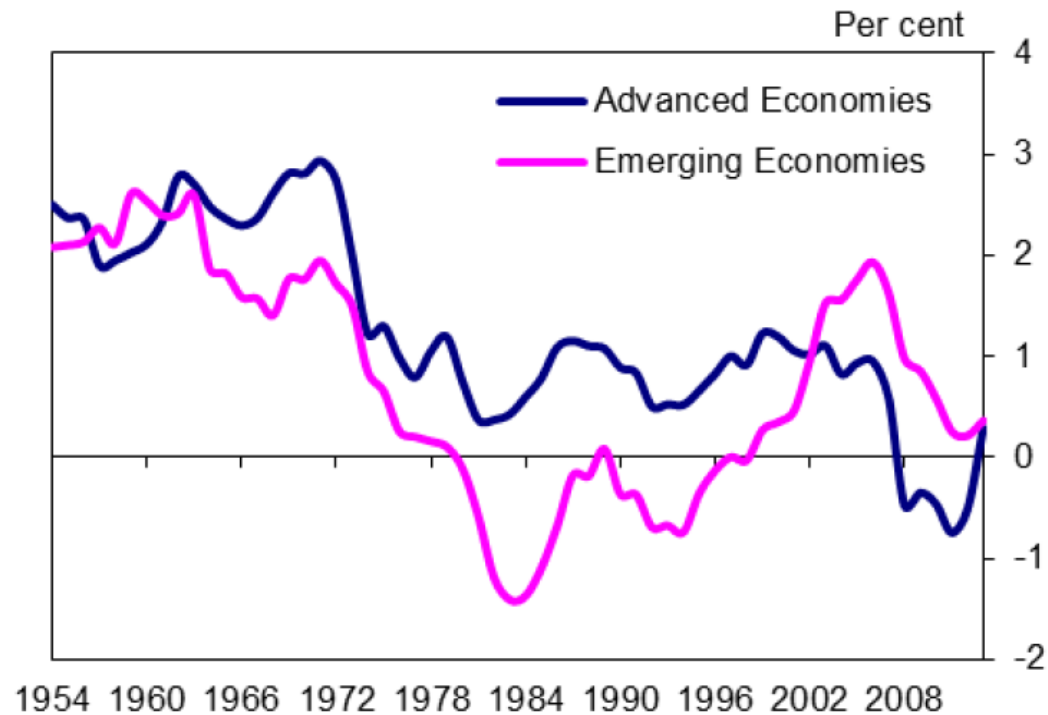
Aristotle (384 – 322 b.c.) on "artificial intelligence"

Two ways to read this quote

→ Unskilled workers become redundant, assistants are displaced

→ Skilled labor ("masters") become infinitely productive

The productivity paradox

Percentage change in median TFP growth (5 year moving average)

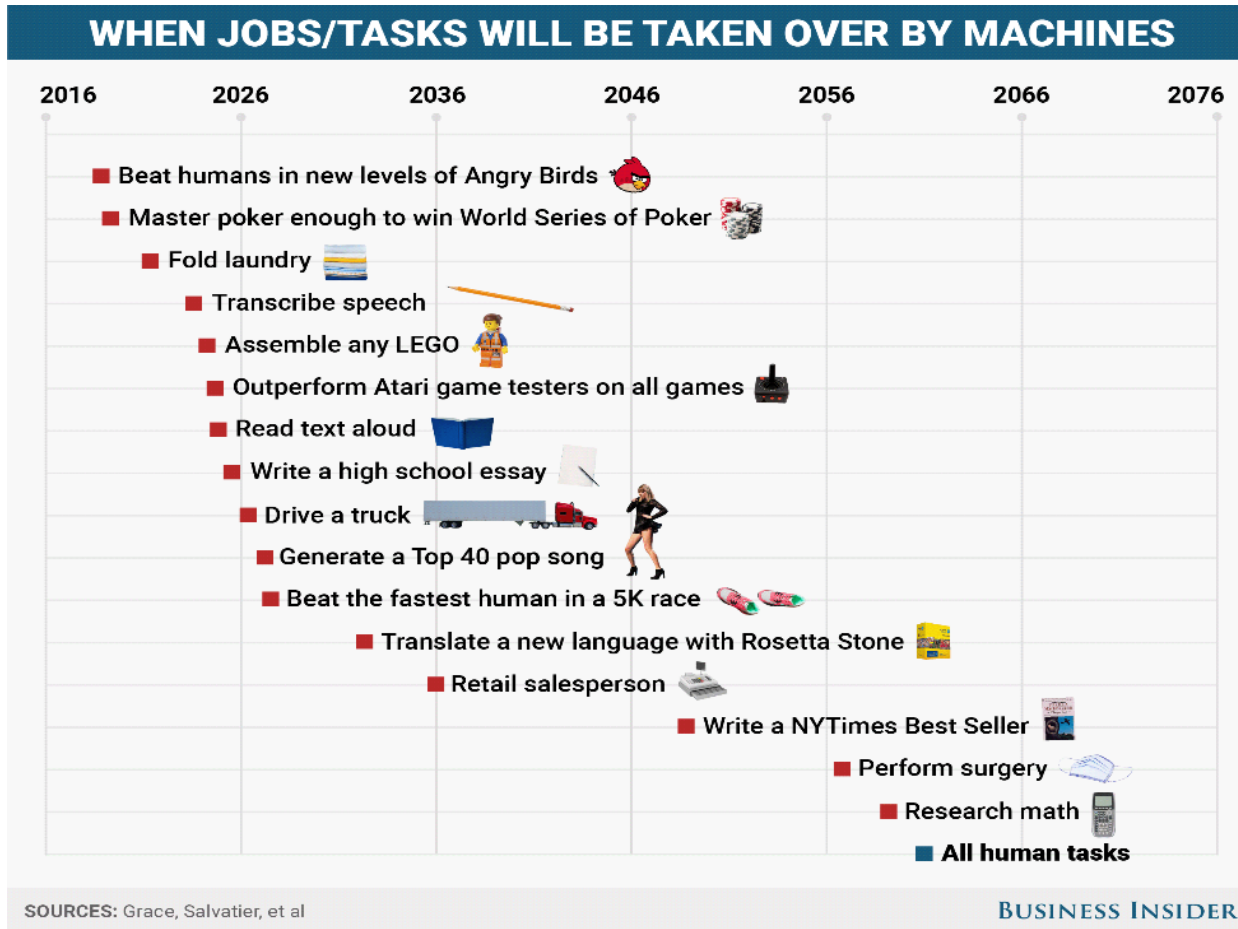Source: Penn World Tables database.

- **Thesis**

  Massive productivity growth with digitalization

- **Antithesis**

  Productivity slowdown in advanced economies

  - Similar trends across countries, incl. EU
  - Only partly accounted for by mis-measurement

Future productivity growth: Two hypotheses

WHEN JOBS/TASKS WILL BE TAKEN OVER BY MACHINES

2016 2026 2036 2046 2056 2066 2076

- Beat humans in new levels of Angry Birds
- Master poker enough to win World Series of Poker
- Fold laundry
- Transcribe speech
- Assemble any LEGO
- Outperform Atari game testers on all games
- Read text aloud
- Write a high school essay
- Drive a truck
- Generate a Top 40 pop song
- Beat the fastest human in a 5K race
- Translate a new language with Rosetta Stone
- Retail salesperson
- Write a NYTimes Best Seller
- Perform surgery
- Research math
- All human tasks

SOURCES: Grace, Salvatier, et al

BUSINESS INSIDER

Optimistic view (Thesis): It's coming!

- We're at the beginning of an exponential path!
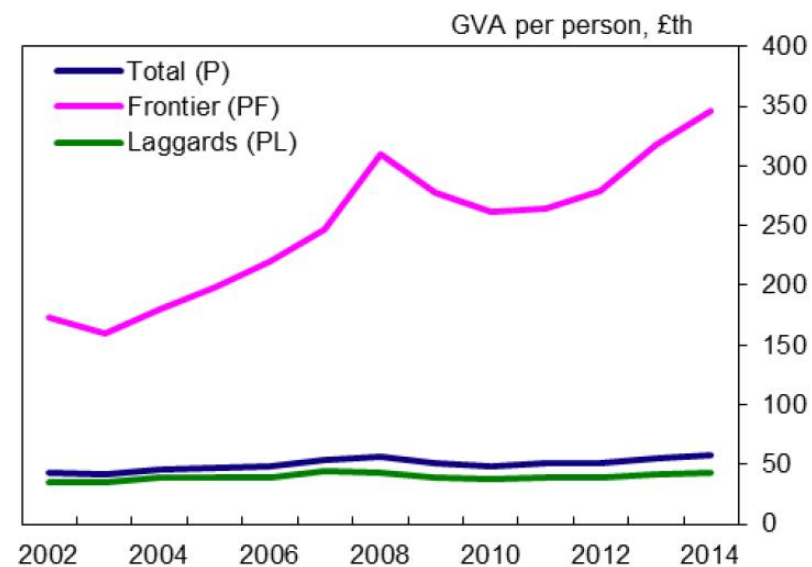
- By 2066, *all* human tasks performed by machines

Pessimistic view (Antithesis): Secular stagnation

- Claims about digitalization vastly overblown

- Not as fundamental as electricity, light bulbs, …
  (Robert Gordon)

Dialectic view: Synthesis
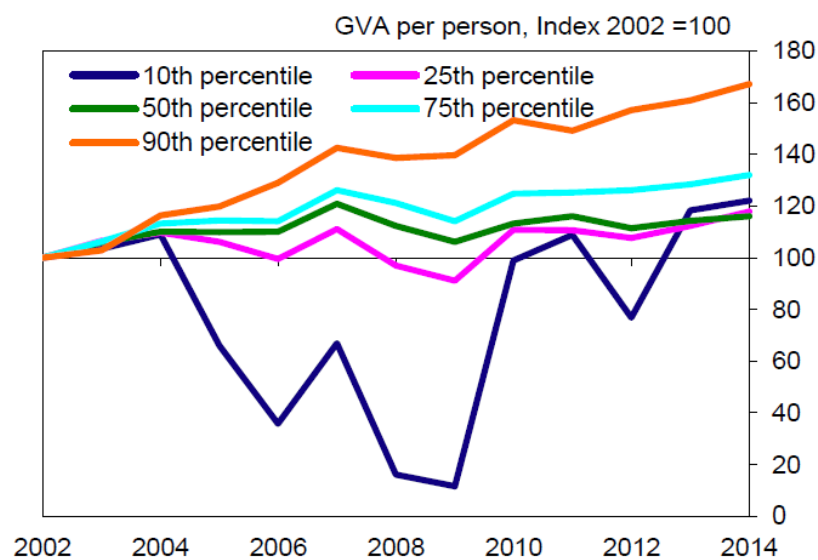
Source: Haldane (2017)

Notes: Frontier defined as top 5% of firms by GVA per worker in a given year and sector as defined by 2-digit SIC 2007

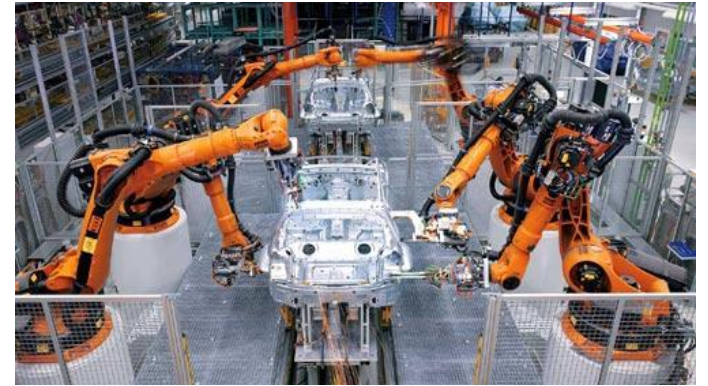Secular stagnation among normal firms, massive productivity growth among superstars

The "**superstar phenomenon**": Rising dispersion of productivity & concentration of market power in top firms

Industrial robots in Europe
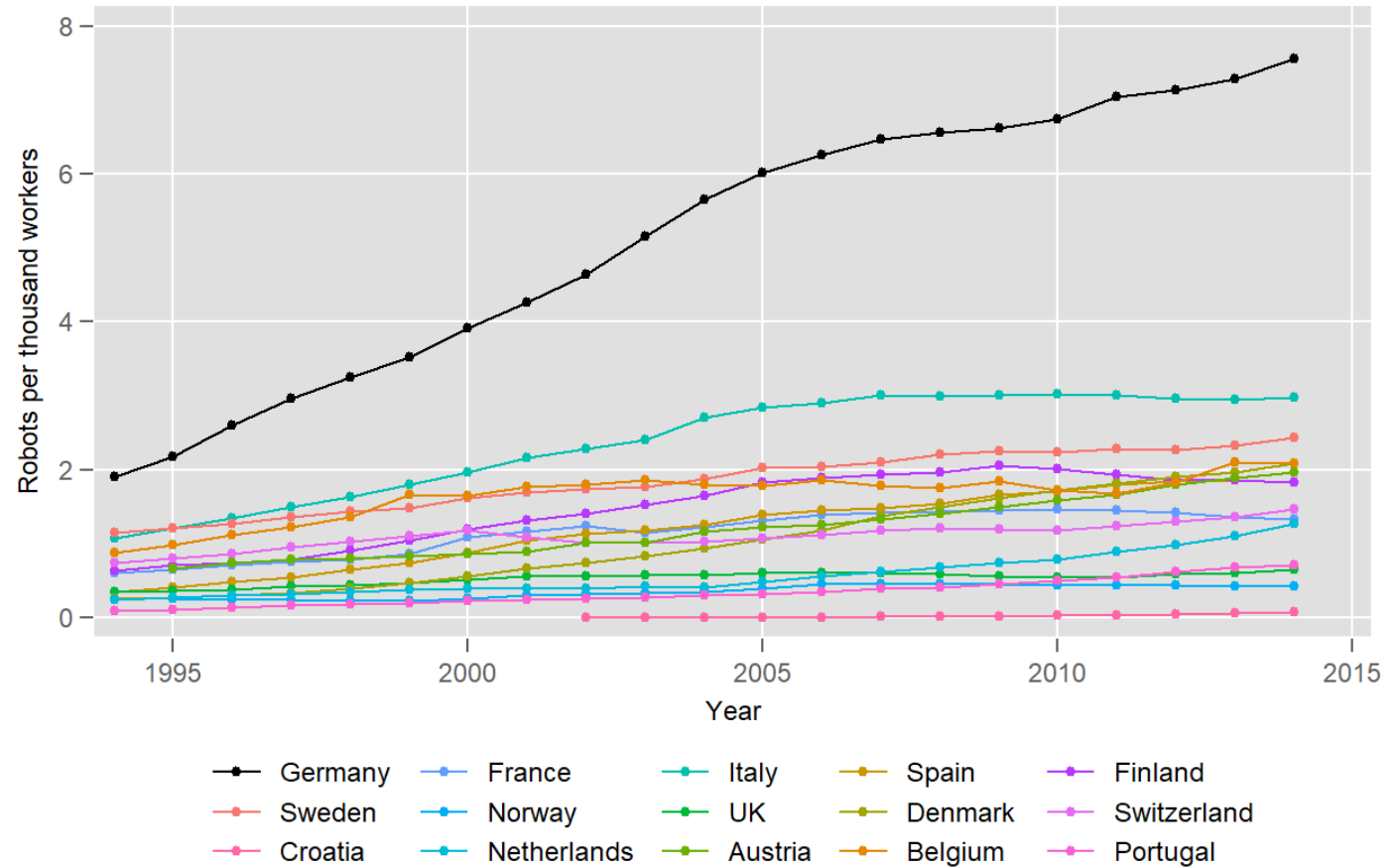
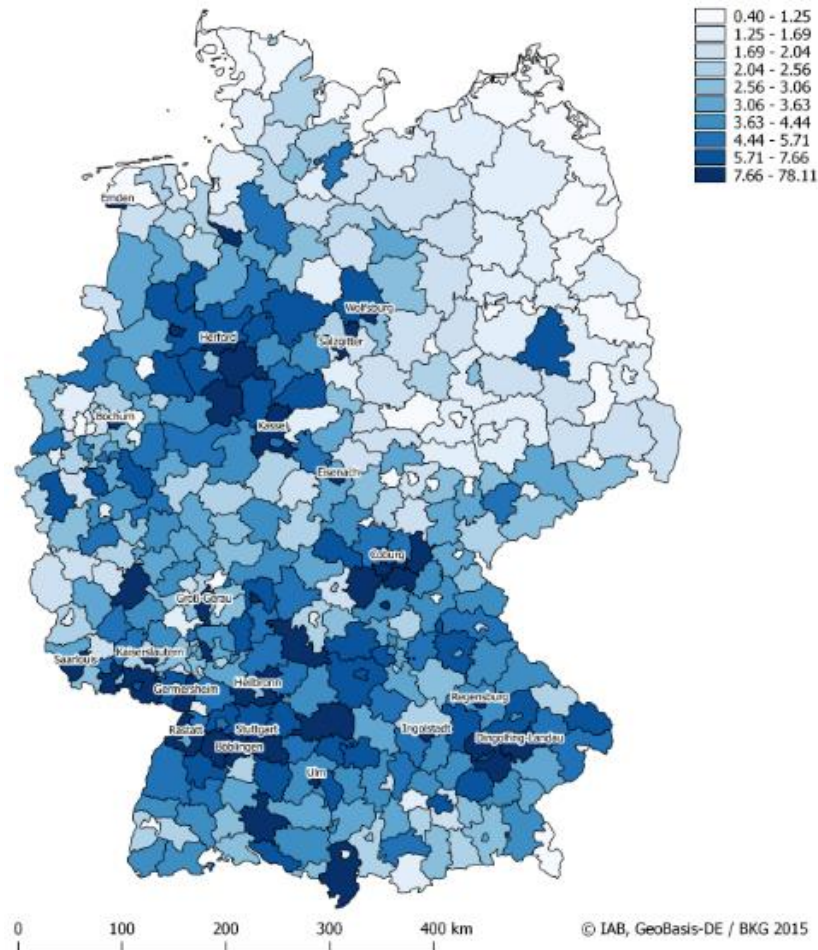# Labor market effects in Germany: No job losses!

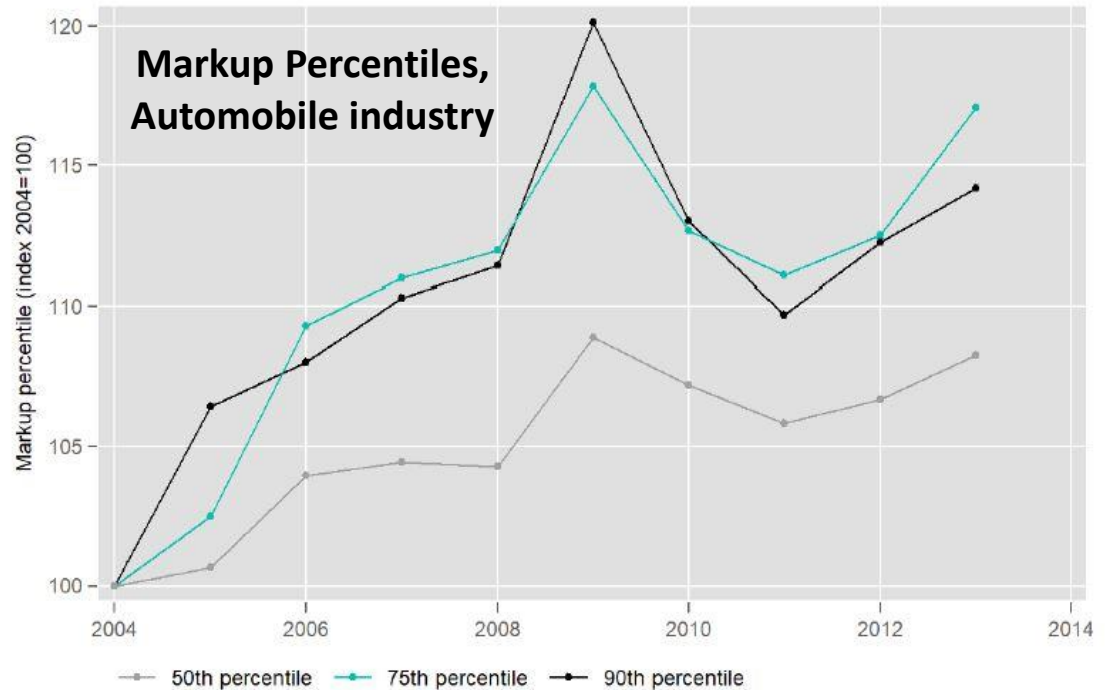© IAB, GeoBasis-DE / BKG 2015

- Gross impact 1994-2014:
  Loss of 280.000 manufacturing jobs (~2 per robot)

- No disruptive displacements: Workers moved to different tasks & occupations at the same workplace

- Fewer new manufacturing jobs for labor market entrants

- They started their career directly in (business) services

- Net impact of robots on the number of jobs: **0**

Bad news: Falling labour share, more wage inequality

Wage effects by skill group

Changes in labour shares in G20 countries
Advanced economies 1970-2014
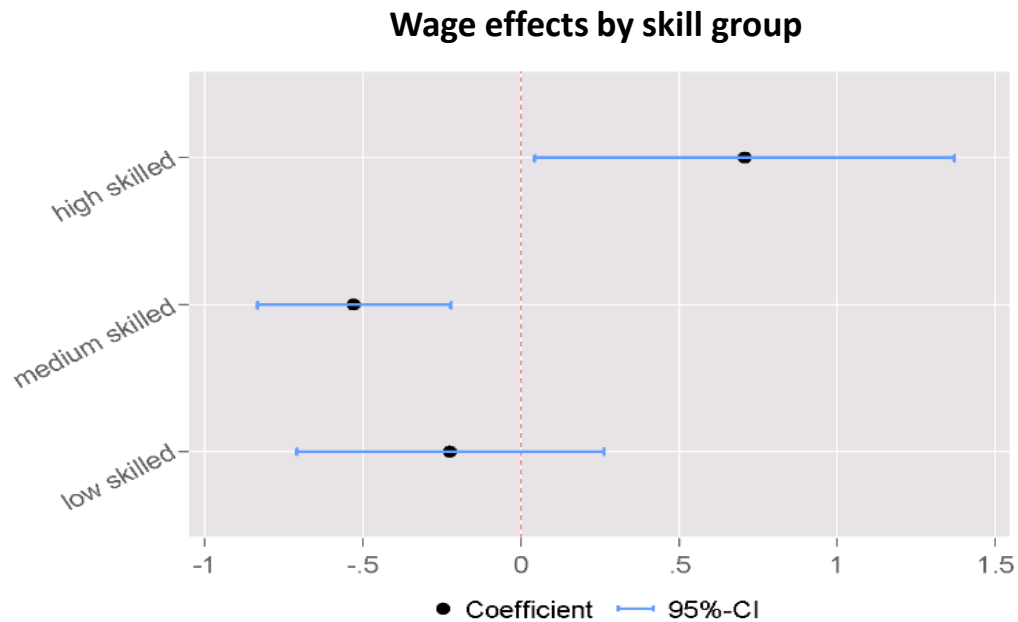
- Strong increase in average labour productivity, but not average wages
- High-skilled workers gain, real wage losses in the middle of the wage distribution
- Decreasing labour share of income, rents go to capital and firm owners

Robots and firm-level profit margins

Average markups by industry

Legend:
- Food products, beverages, tobacco
- Textiles, leather, wearing apparel
- Wood and wood products
- Paper and paper products
- Other chemical products
- Pharmaceuticals, cosmetics
- Rubber and plastic products
- Other non-metallic mineral products
- Basic metals
- Fabricated metals
- Electronics
- Industrial machinery
- Motor vehicles
- Other transport equipment

Markup Percentiles, Automobile industry

Legend:
- 50th percentile
- 75th percentile
- 90th percentile

- Productivity & markup estimation for 6 European countries: Rising average markups in most industries
- Markups strongly rise at the top, not at the bottom of the firm-level distribution
- Trend is stronger in more robotized industries: Robots drive "superstar phenomenon" in European manufacturing

I. WHAT HAPPENED SO FAR?
SOME GOOD AND SOME BAD NEWS

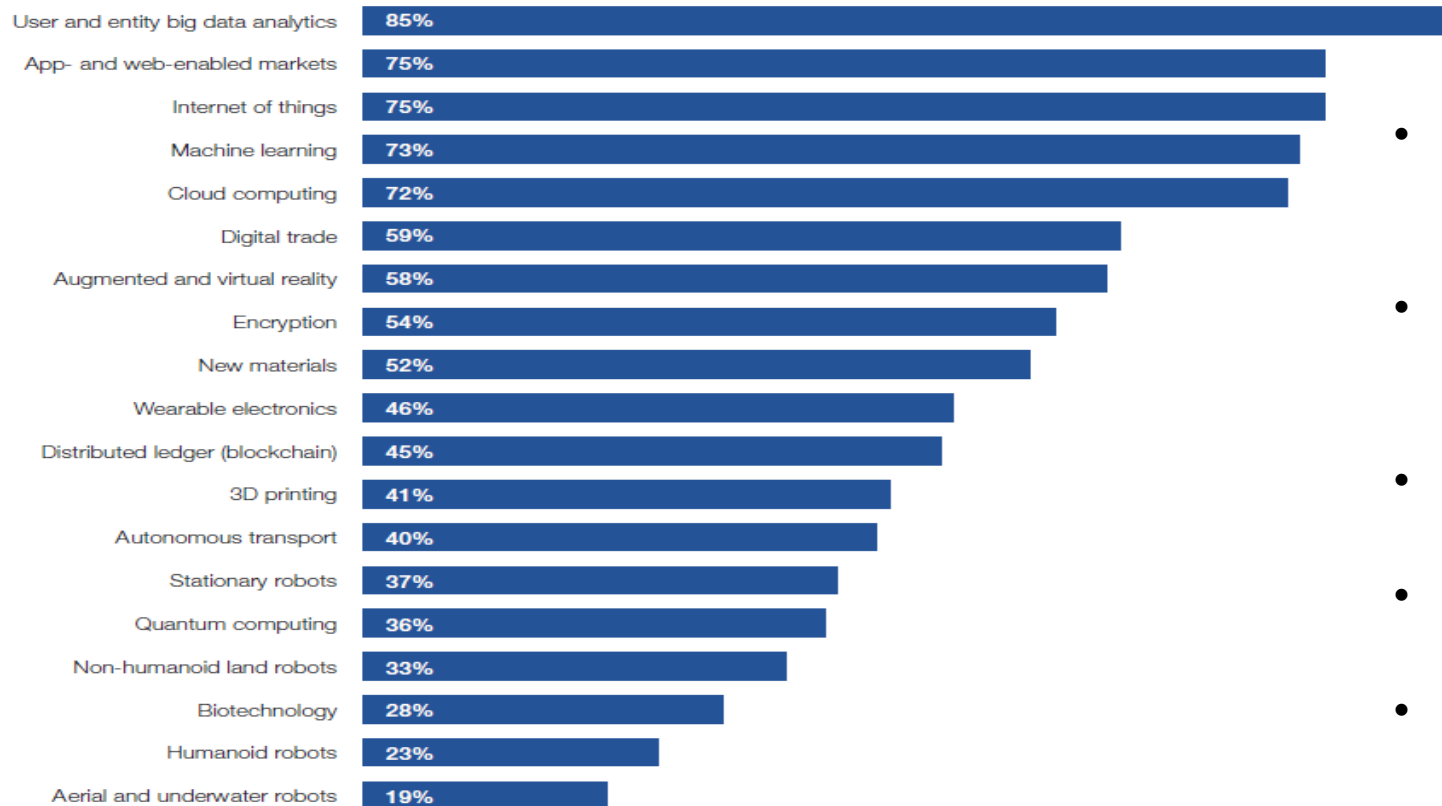II. **WHAT MAY HAPPEN TOMORROW?**

III. WHAT SHOULD WE DO ABOUT IT?
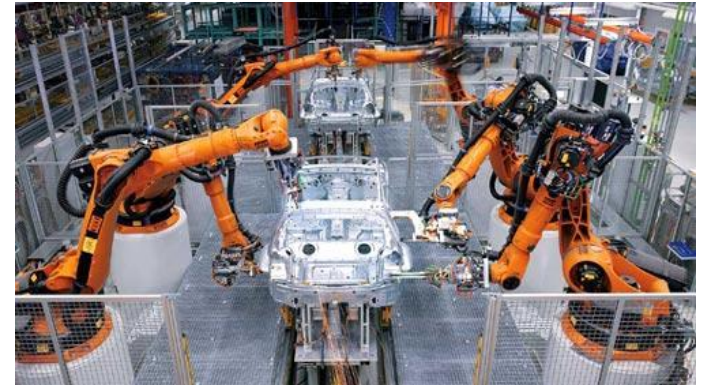
The next wave: AI, machine learning, and all that

Technologies by proportion of companies likely to adopt them by 2022 (projected)

Technology	%
User and entity big data analytics	85%
App- and web-enabled markets	75%
Internet of things	75%
Machine learning	73%
Cloud computing	72%
Digital trade	59%
Augmented and virtual reality	58%
Encryption	54%
New materials	52%
Wearable electronics	46%
Distributed ledger (blockchain)	45%
3D printing	41%
Autonomous transport	40%
Stationary robots	37%
Quantum computing	36%
Non-humanoid land robots	33%
Biotechnology	28%
Humanoid robots	23%
Aerial and underwater robots	19%

Source: Future of Jobs Survey 2018, World Economic Forum.

- WEF „*Future of Jobs*" report:
  Survey of 313 global firms with 15m employees

- Vast majority will adopt/expand big data analytics, machine learning, autonomous transport, …

- A problem for accountants, clearks, truck drivers,…

- Maybe also for radiologists, musicians, …. ?

- Overall projection:
  ```
  -  75 Mio. displaced jobs
  + 133 Mio. new jobs
  ```

Implications for the labour market

Source: Future of Jobs Report 2018, World Economic Forum
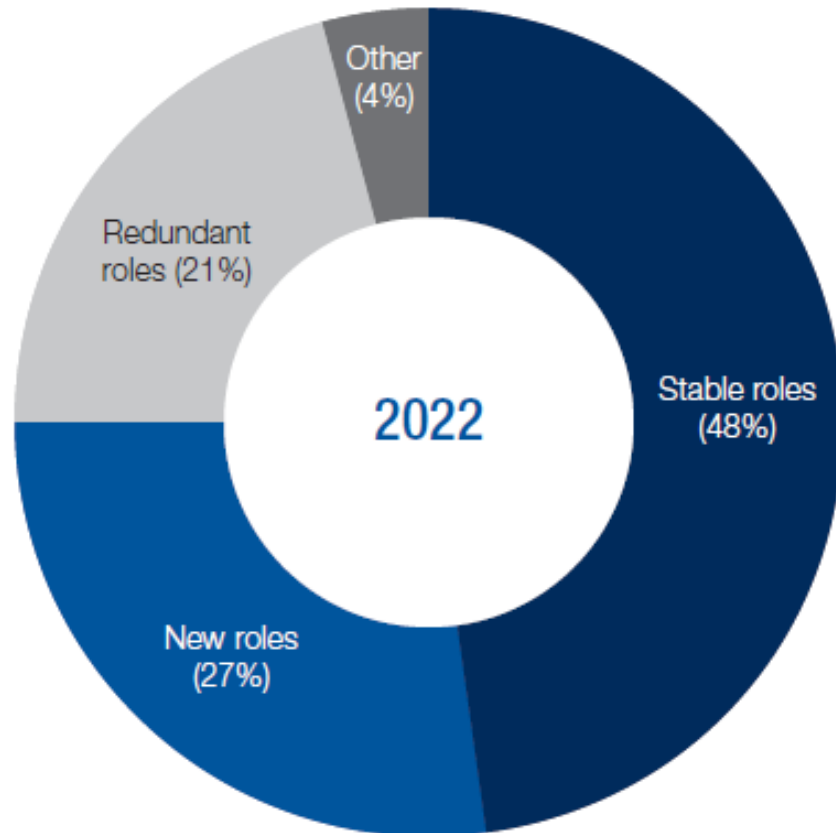
"In summary, while overall job losses are predicted to be offset by job gains, there will be a significant shift in the quality, location, format and permanency of new roles."

- <u>At risk:</u> Data entry clerks, secretaries, assembly workers, ...

- <u>In demand</u>: Data analysts, IT specialists, ... customer services, „people and culture specialists"

- Warning sign with a consistent message:

  Mass unemployment not the major problem, but job polarization and labor market mismatch

Why is labor not becoming redundant?

Abb.: Voraussichtliche Entwicklung des Erwerbspersonenpotenzials in Deutschland, 2000 bis 2060
Erwerbspotenzial in Millionen

Quelle: IAB-Forschungsbericht 10/2016

Erwerbspersonenpotenzial[1] (Mittelwert)   66% Konfidenzintervalle[2]
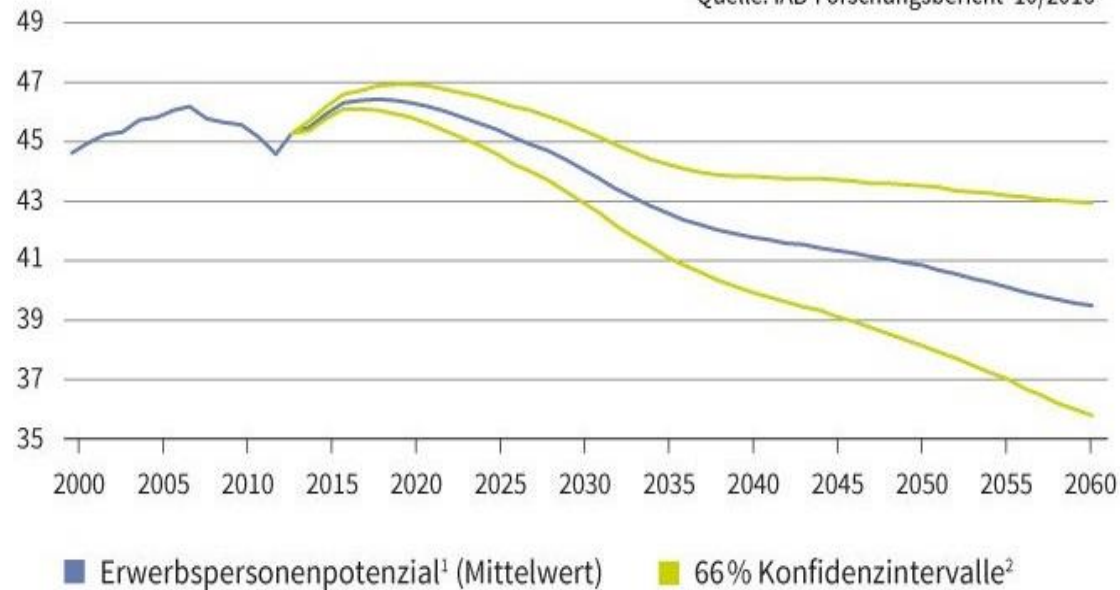
1. Algorithms & robots displace **task**, not entire **jobs**

2. New tasks, new jobs!

   "Interface designers" unknown even in 2013

3. New technologies → lower costs → lower prices → higher product demand → higher labour demand

   (esp. in top firms adopting the latest technologies)

4. Main opponent in many European countries: **DEMOGRAPHY**!

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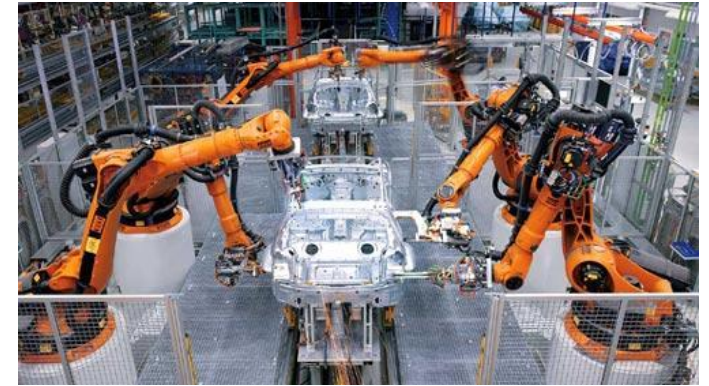
Key policy challenges

1. **Mismatch in the labour market**

   Co-existence of displacements and labour shortages, structural changes in the labour market

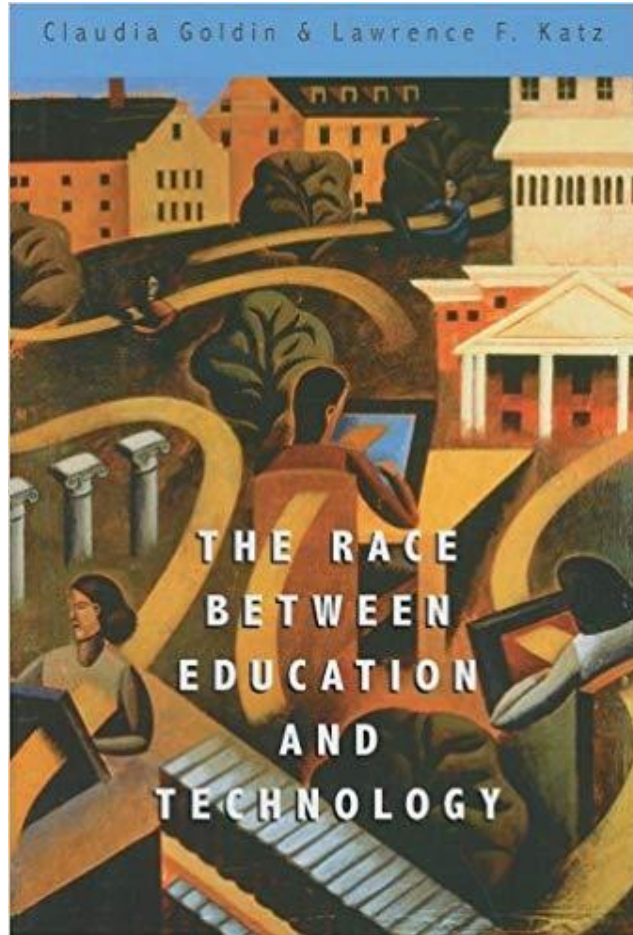2. **Rising concentration of market power & profits in superstar firms**

   Low productivity growth, especially in "normal" (non-frontier) firms

3. **Distributional consequences of digitalization**

   Falling labour share of income, rising capital & profit earnings, polarization of job qualities
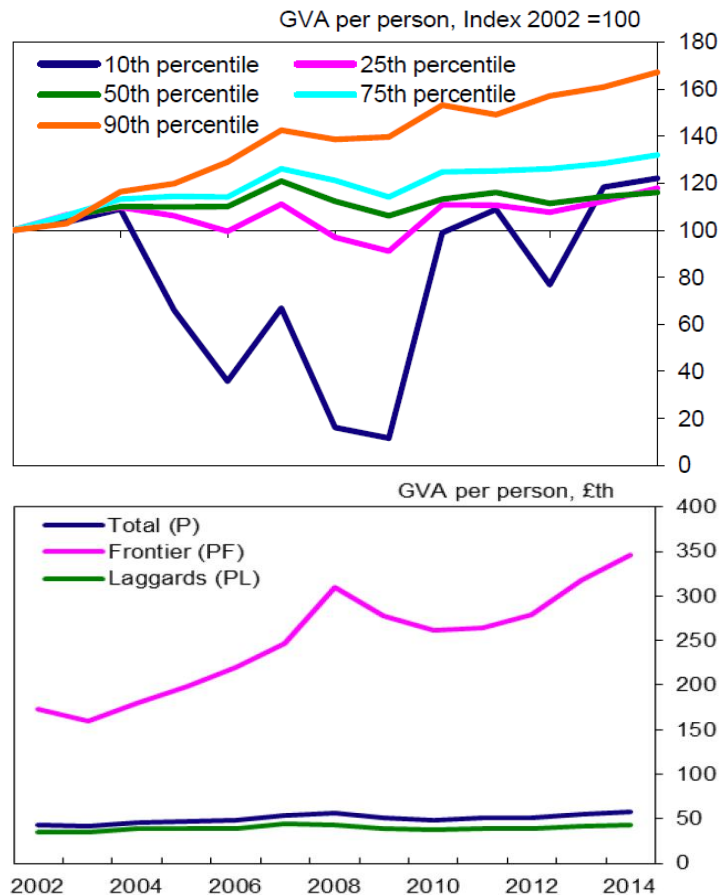
Challenge 1 : Mismatch in the labour market

- Life-long learning, on-the-job worker training of *general* skills

- <u>Key question</u>: Who pays for it?

- Learning in schools should facilitate later occupational mobility

- German apprenticeship system a role model
  Reason why it digested the "robot shock" better than the US

- Further aspect: new jobs more flexible and mobile
  → New arrangements for the organization of work

Challenge 2 : Concentration in superstar firms

GVA per person, Index 2002 =100
- 10th percentile
- 25th percentile
- 50th percentile
- 75th percentile
- 90th percentile

GVA per person, £th
- Total (P)
- Frontier (PF)
- Laggards (PL)

- New technologies not harmful in those firms that adopt, but in those that *don't* adopt them

- Similar principle for national labour markets:
  fewer worries for countries at the technological frontier

- <u>Case for urgency</u>: Productivity growth in Europe

- Shifting out the knowledge frontier in top firms

  Innovation policy and basic research, top universities in Europe

- Diffusion of knowledge from "superstars" to "normal firms"

  Structural and regional policies, solid colleges in the periphery

Challenge 3: Bad answers to distributional consequences
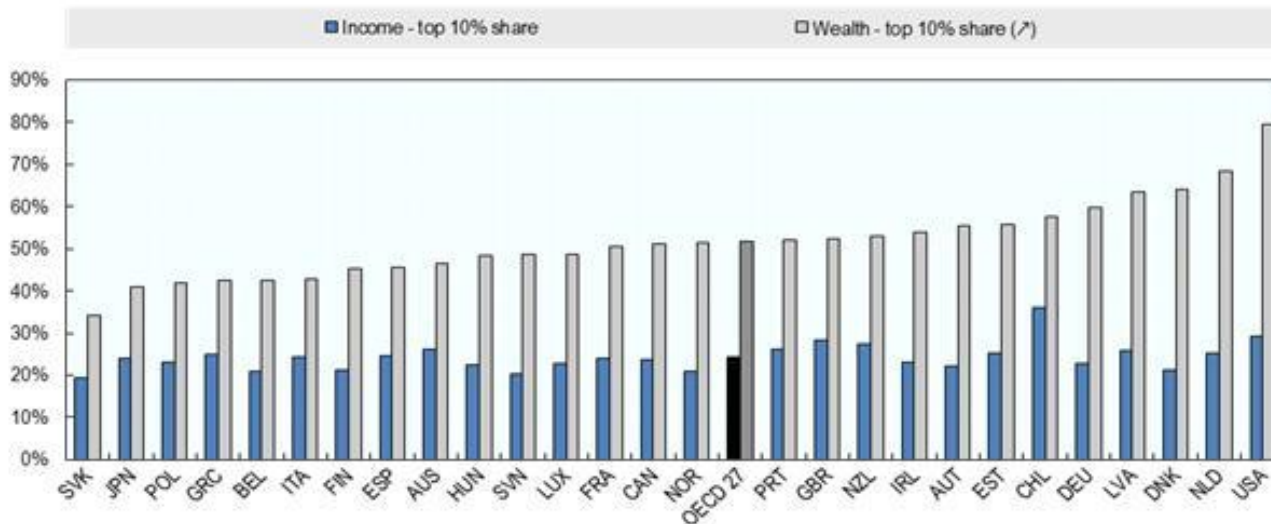
Robots taxes

Universal basic income

Better answer: Disperse asset ownership & profit earnings

Shares of household income and wealth held by units in the top 10% of the distribution

2014 or latest available year

Source: OECD Wealth Distribution Database, http://stats.oecd.org/Index.aspx?DataSetCode=WEALTH, and OECD Income Distribution Database, http://stats.oecd.org/Index.aspx?DataSetCode=IDD.

- Rising profit share of income + strong concentration of asset ownership → rising wealth & earnings inequality

- Encourage asset ownership: employee stock options, profit sharing arrangements

- But bottom 50% hardly save : Sovereign wealth funds (?)

THANK YOU FOR YOUR ATTENTION!

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