

Development of AI: Productivity and distributive effects in Europe

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Sketch of the presentation

- Background
- Characteristics
- Challenges
- Evidence

Background

- AI is treated as the most revolutionary technology fuelling the 4IR (WIPO 2019)
- AI is adopted for raising worker productivity, improving production efficiency/reducing costs, and product/service development (McKinsey 2022)
- AI is blamed for compressing labor demand (task automation) but magnified for expanding production (task creation; (Acemoglu and Restrepo, 2020)

Characteristics

Artificial intelligence (AI): *"the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience"* (**source:** [Britannica](#))

- Intangible nature
- Cognitive task

Challenges

"Even if AI boosts productivity substantially, it is not clear that workers will necessarily share in the benefit in the form of higher employment and/or wages. This is because AI can facilitate automation, contributing to downward pressure on the demand for labour and a decoupling of productivity from labour market outcomes such as employment and wages. These forces may counteract the productivity effect, which might otherwise be expected to increase labour demand, employment and wages" (source: **OECD 2021**)

- Measurement
- Assessment

Measurement

- Adoption (Investment)
- Production (Development)

Measurement

- Adoption (Investment)

1. Thematic surveys

Pros: focused and rich information.

Cons: low comparability across space and time

2. AI experts hiring

Pros: high comparability across space

Cons: low comparability across time. Selection issue (online job postings). Assumed (fixed) complementarity between AI capital and AI labor. NO role for data needed to run AI systems

Measurement

- Production (Development)

1. Thematic surveys

2. Patents

Pros: high comparability across space and time

Cons: NO full coverage of AI patentable innovation (disclosure of algorithms; co-invention between developers and users). NO all AI innovation is patentable (missing requisites)

Assessment

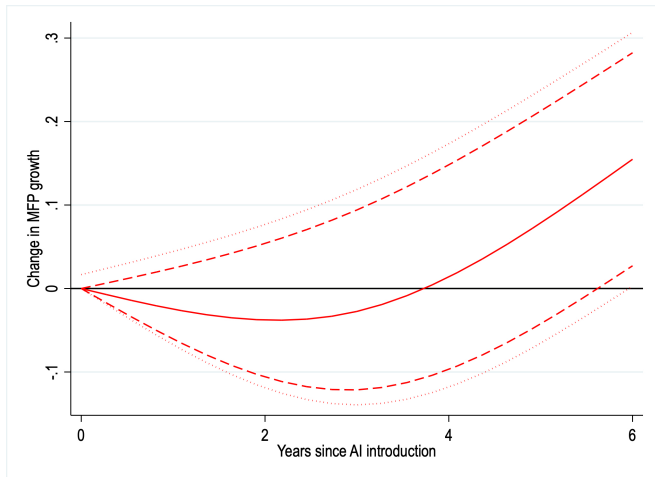
- Productivity effects of AI: Evidence from European firms
- Distributive effects of AI: Evidence from European regions

Productivity effects of AI: Evidence from European firms

- Search for **productivity** growth effect induced by **AI development**, comparing firms *with* AI (**treated**) and twin companies *without* AI (**untreated**)
- Understand whether productivity effects of AI differ between technologically advanced and backward firms, i.e. in relation to their **distance to the frontier**
- Build an original dataset of 813 thousand firms from 16 European countries between 2011 and 2019, from which identify AI innovating firms (**treated**) and twin (non-AI) companies (**untreated**)

This study is conducted for the European Commission (**H2020 Untangled Project**)

Figure: Change in MFP growth since the introduction of AI



Results

- Productivity growth of AI firms is **13.7%** higher than for the rest of companies (**AI promotes productivity growth**)
- An additional premium of **6.4%** as mean (5.2% as median) for companies falling behind the frontier (**AI promotes productivity convergence**)
- Productivity growth premium is **specific to AI**, not to Robotics and 3D (**AI is a breakthrough technology**)

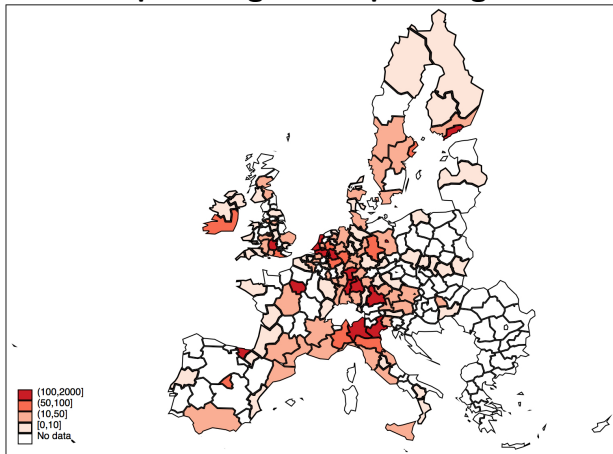
Distributive effects of AI: Evidence from EU regions

Key question

Does AI development affect income distribution among labour and capital? How?

1. **Distribution of innovation rents**: profits grow more than wage income, leading to a fall in the labor share (Aghion & al. 2019; Madsen & al. 2023)
2. **Reallocation effects**: larger market share away from labor intensive companies (Author & al. 2020)
3. **Business reconfiguration**: change in skill demand (high vs low-skilled; routinised vs non-routinised)

AI patenting in European regions



- Study the effect of AI development on the dynamics of the **labour share** on income using data for 232 European NUTS2 regions between 2000 and 2018
- Account for standard drivers of the labour share, such as tangible and intangible capital, and productivity, but also **other disruptive technologies** (ICT, 4IR, Robotics, etc.)
- Control for the effect of **spatial interdependence** and for the differentials in specialisation, demographics, but also public physical/digital/education infrastructures (road, broadband coverage, etc.) .

Results

- Labour share **declines by 8%** every doubling of regional stock of AI innovations (**AI reduces the labour share**)
- **High-skilled** labour is **unaffected** by AI (**AI reduces employment but raises wages?**)
- Labour share of **medium** skilled **decreases by 3%**, that of **low** skilled by **9%** (**AI promotes an uneven wage income distribution**)
- **15%** in regional differences in the labour share due to AI (**AI widens regional income disparities**)

Thanks for the attention