Exposure of Industries and Occupations to Emerging Automation Technologies

Tommaso Ciarli, UNU-MERIT, United Nations University & SPRU, University of Sussex

Based on work with: Sugat Chaturvedi, Deyu Li, Önder Nomaler, Fabien Petit, Ekaterina Prytkova

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Representation of the Free State of Bavaria to the EU

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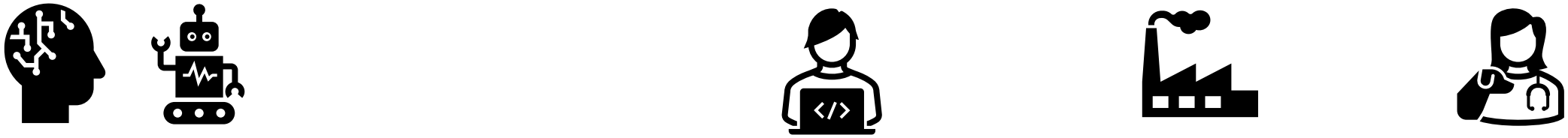
For societies to benefit from automation, we need timely information on industry and occupation exposure to emerging technologies

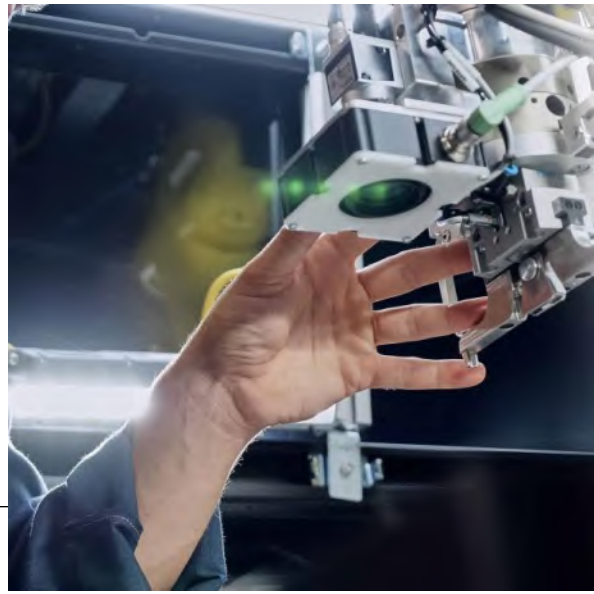
Automation technologies are designed to perform **tasks** in specific **industries (firms)** and **occupations**



Policies can influence labour market outcomes of automation

To be effective, **policies must anticipate technology developments**

- Which **automation technologies** are likely to **emerge** in the near future?
- Which **industries** and **occupations** are **exposed** to such technologies –
- Which **firms** (in which industries) are likely to **adopt** them, for which tasks



https://www.brightmachines.com

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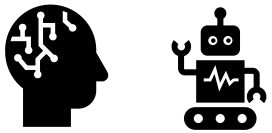
We combine machine and human intelligence to study the industry and occupation exposure to emerging technologies, and firm adoption

Emerging technologies



- Generative AI: Analyse the text of 1M+ patents and 4M+ scientific publications to **identify novel automation technologies** and their patterns of **emergence**
- Experts: asked 600k scientists, 20k inventors, 20k managers and 5k representative of civil society what **technologies** are most likely to be **used in 2030**, by industry

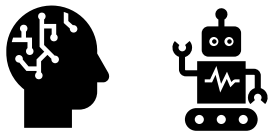
Exposure

- Generative AI: Analyse the text of **40 technologies**, to identify the **industries** (NACE) and **occupations** (ISCO) in in which they can be employed
- Experts: asked experts what **task** the selected technology will be able to perform, by industry

Adoption

- Generative AI: Analyse the technologies mentioned by **firms** in 9M+ online **job vacancies**

Emerging technologies



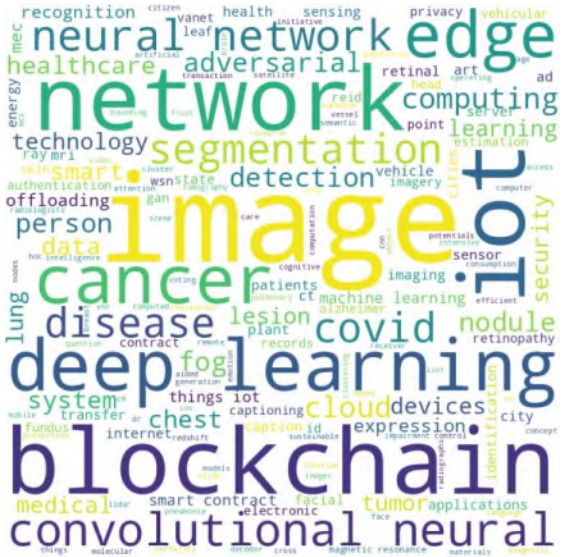
Exposure

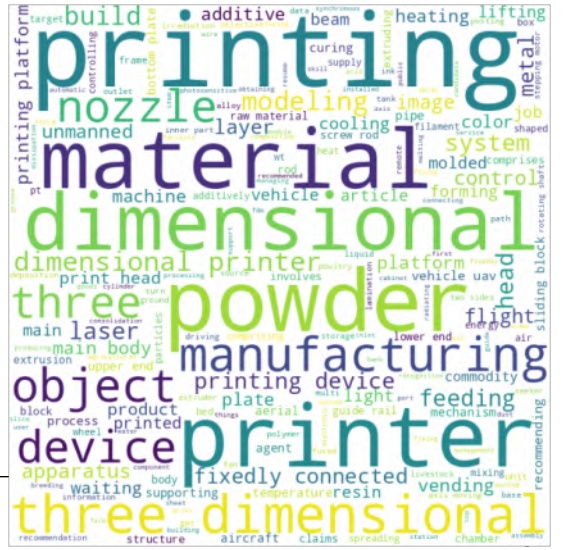
Adoption

Employment impacts

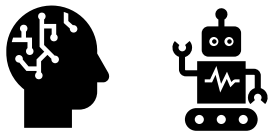
There is a wide variety of rapidly emerging digital automation applications, combining several technologies

- AI: mainly ML (Generative Models), followed by NLP, particularly LLM (35% of experts)
  - E.g. energy and waste management, recommendation systems, biometrics
- Robots are more mature and growing less rapidly, but experts point to future use of mobile robots and collaborative robots
- Networking technologies (IIoT and blockchain)
  - E.g. Intelligent agriculture, robot mobility, financial transactions, security, cryptocurrencies
- Cloud computing, driven by scientific developments (30% of experts)
- Additive manufacturing architectures and printers emerging as rapidly as AI, but still in development according to experts
- Data management technologies, User interfaces, Data Acquisition technologies, …





Emerging technologies

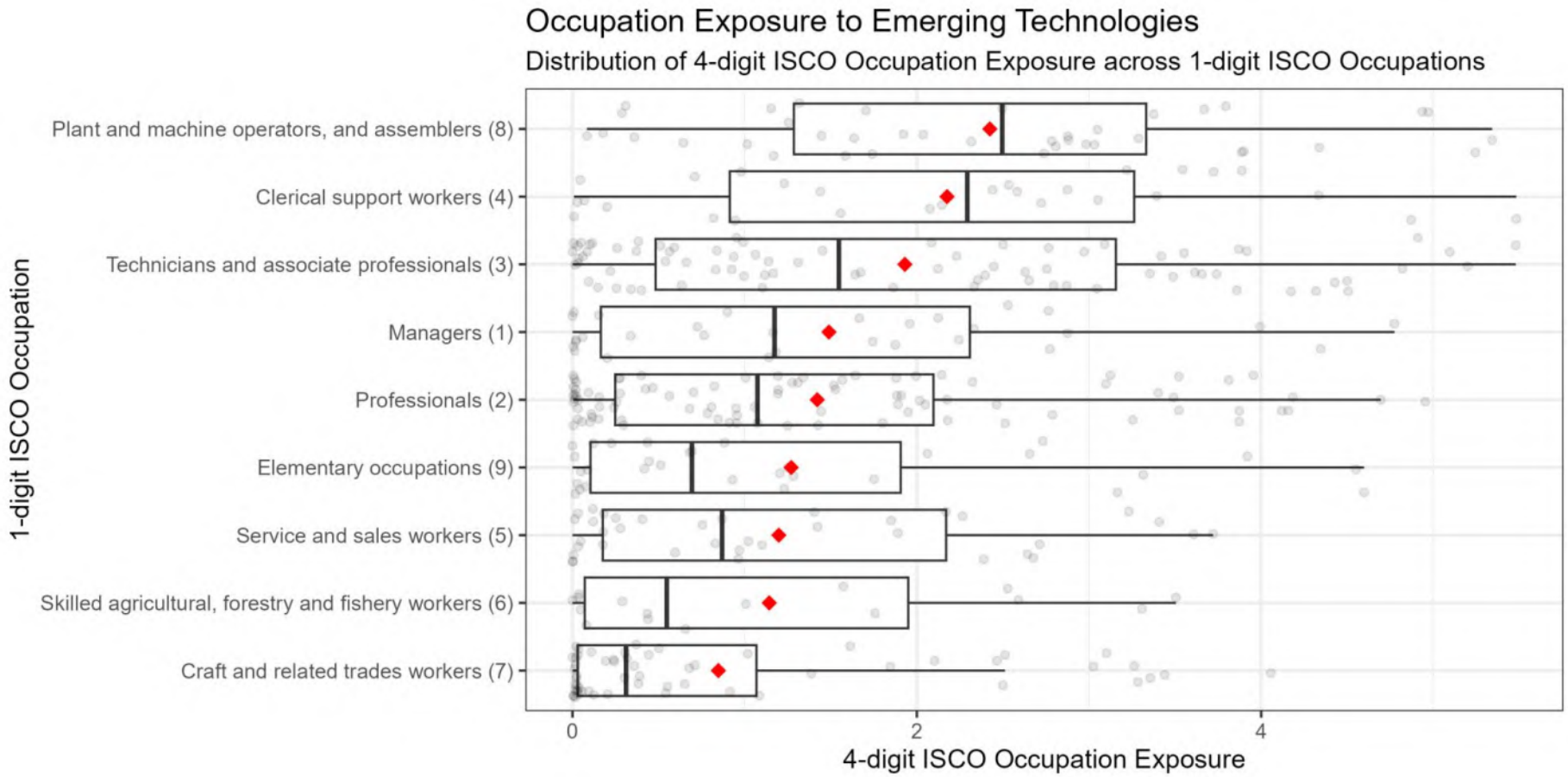


Exposure

Adoption

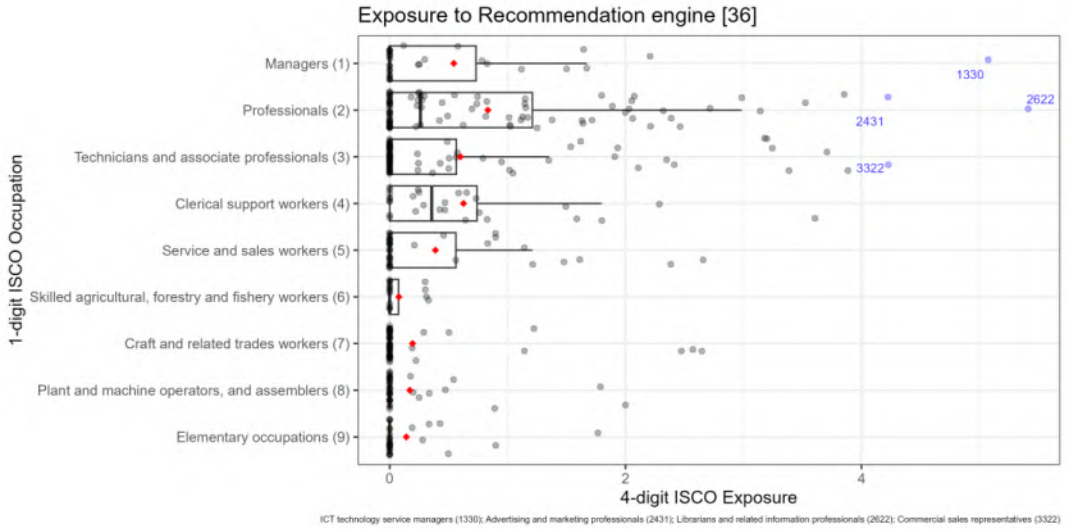
Employment impacts

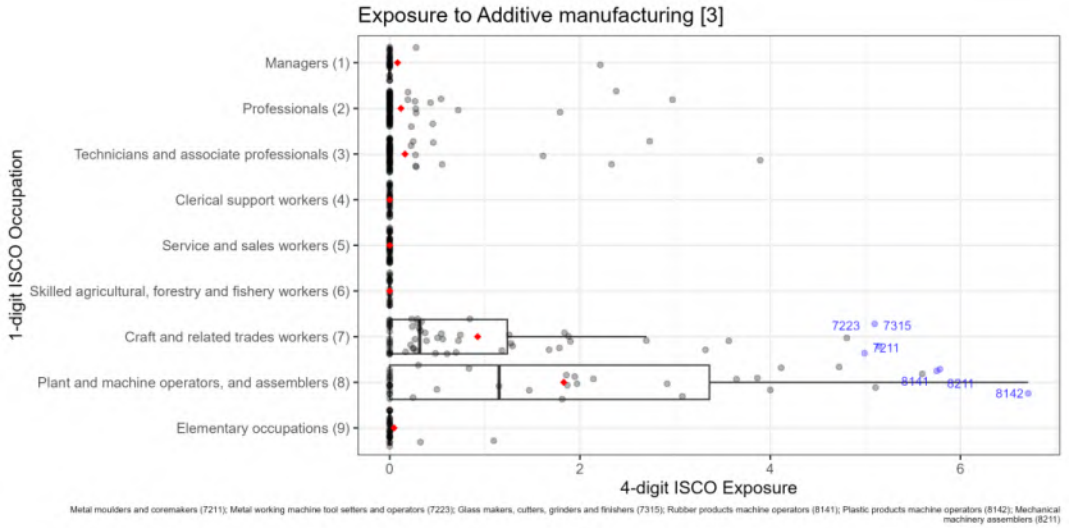
Clerical support workers, Technicians, Managers and Professionals are becoming increasingly exposed to emerging automation technologies



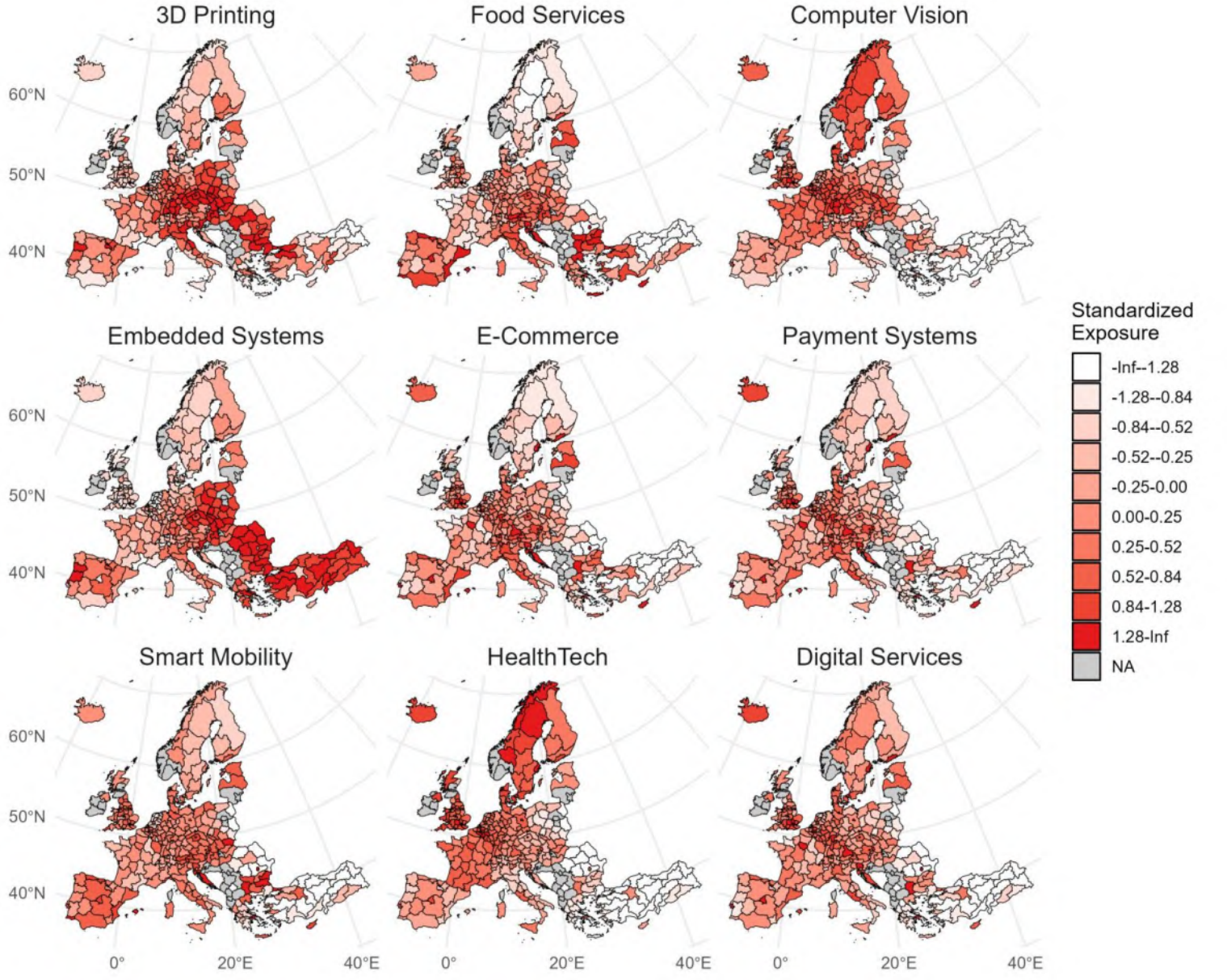
Devil in the detail: different occupations are exposed to different technologies

- Professionals and managers most exposed to intangible technologies
  - E.g. ML and VR, digital services and platforms
- Technologies can be specific to occupations
  - E.g. AM, computer vision, digital healthcare
- Or relate to most occupations
  - E.g. IoT, Smart mobility and logistics, Digital services and platforms

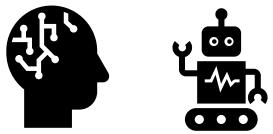




Devil in the detail: different industries and regions are exposed to different emerging technologies



Emerging technologies

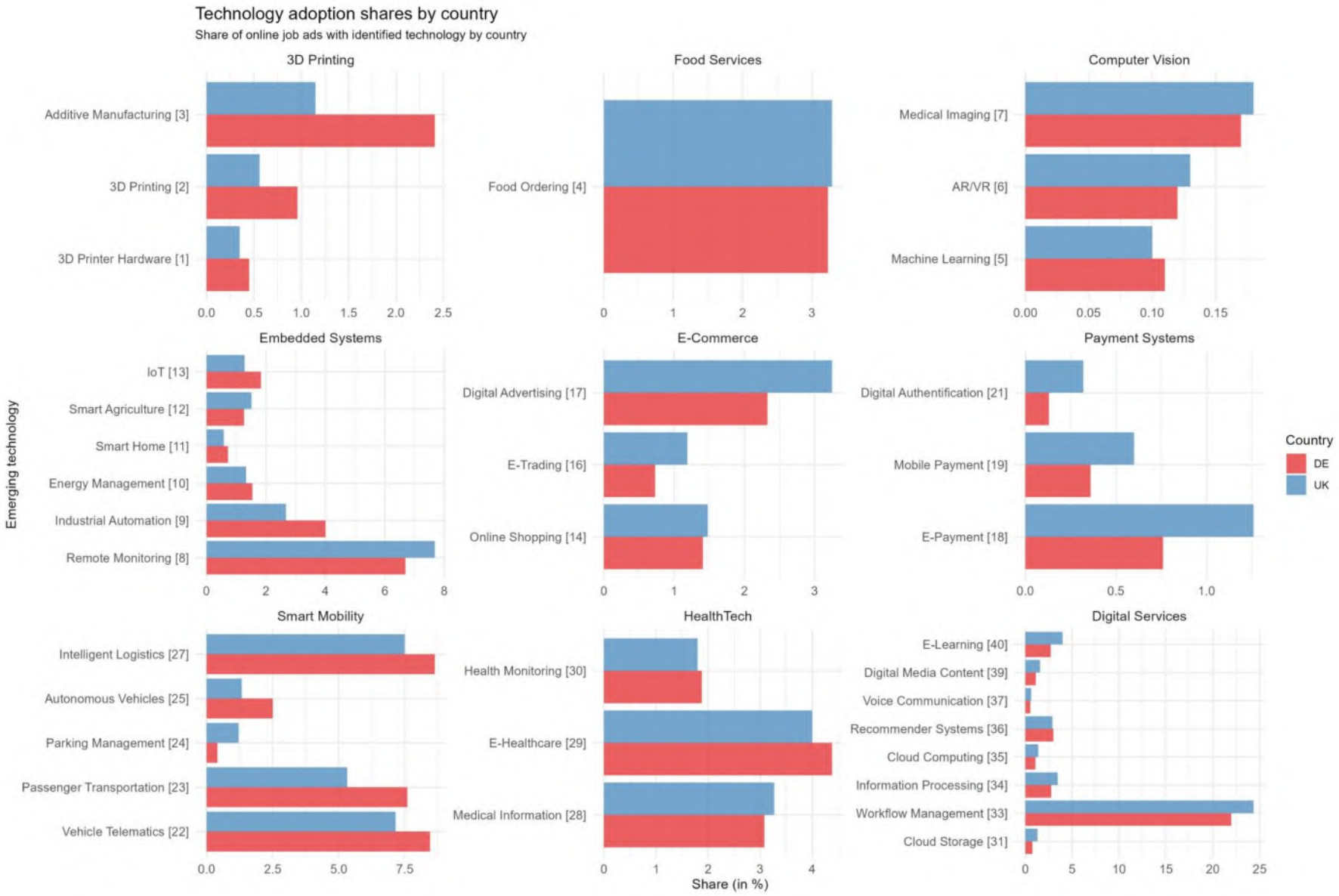


Exposure

Adoption

Employment impacts

Experts are optimistic about future adoption, although job vacancies suggest more limited rate of adoption



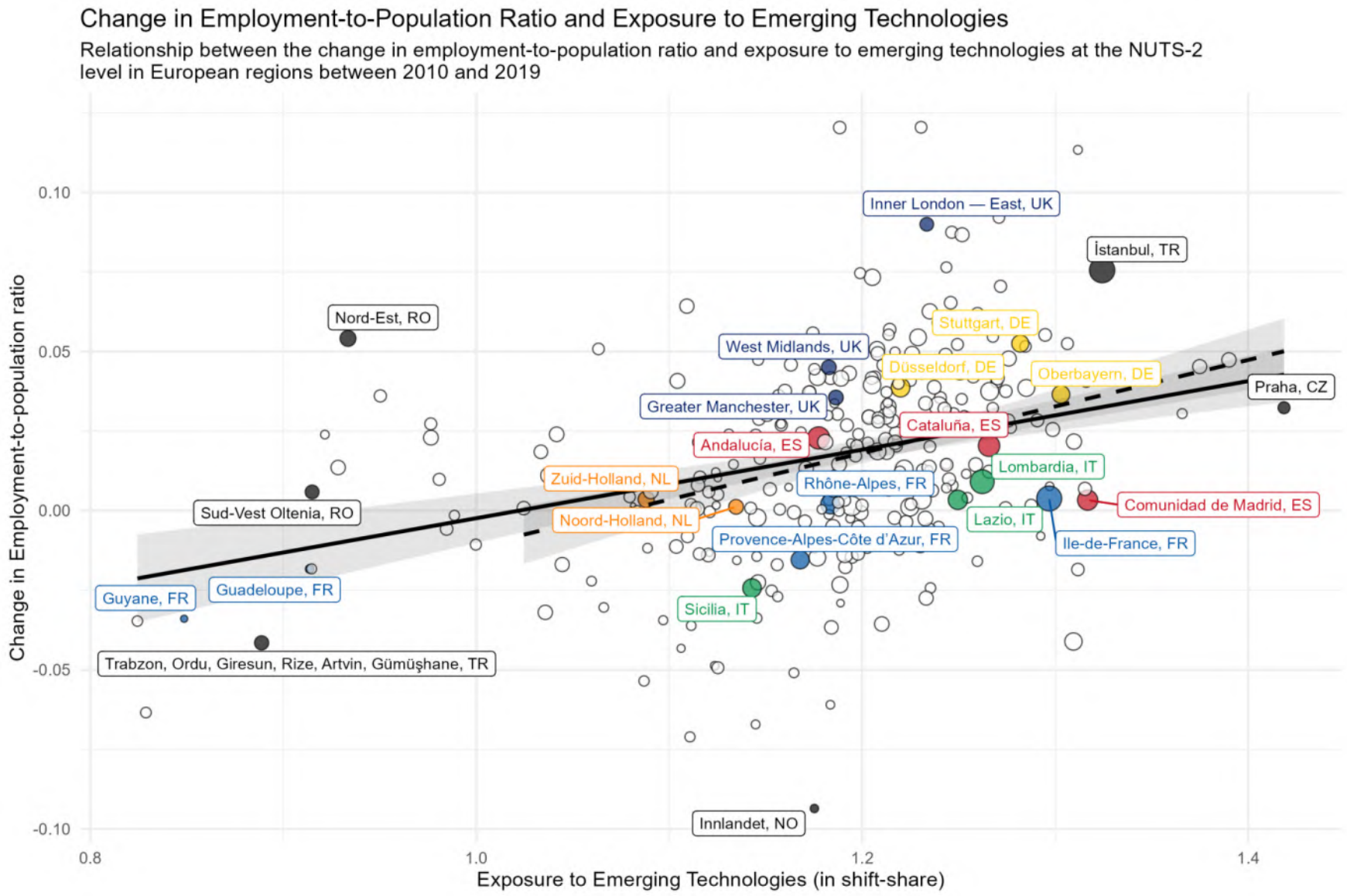
Emerging technologies

Exposure

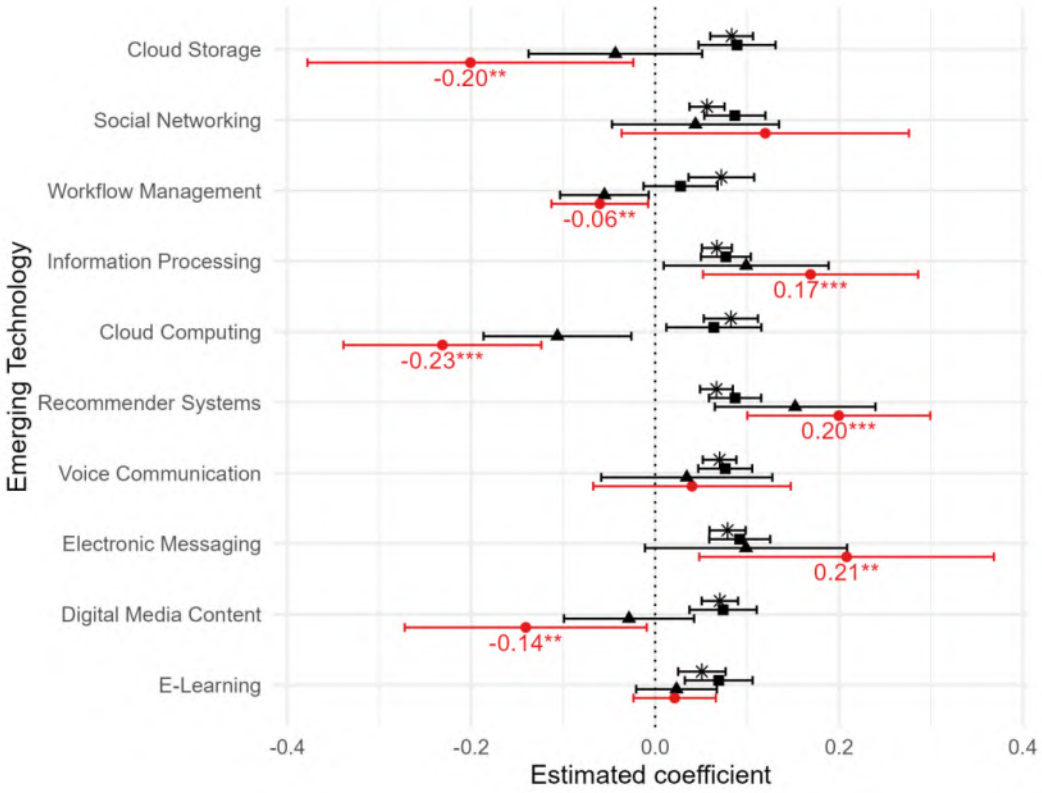
Adoption

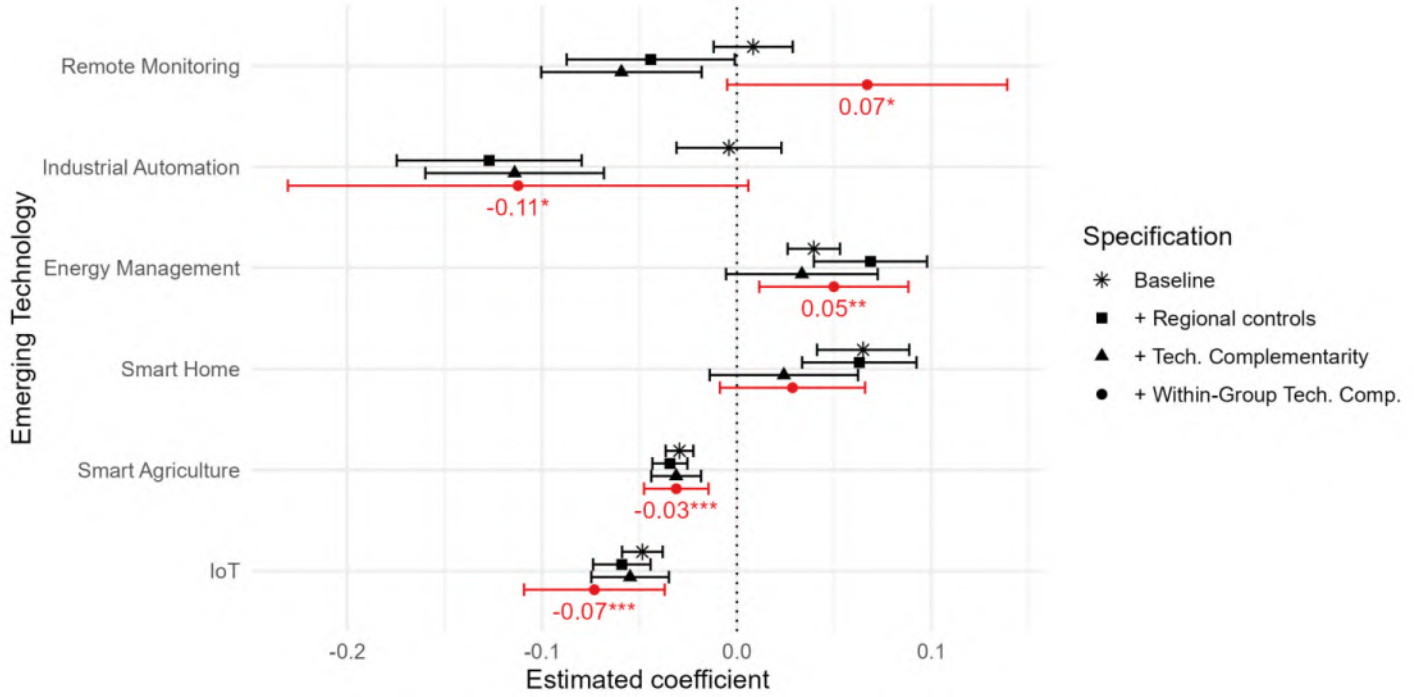
Employment impacts

The overall impact of emerging automation technologies on EU regions employment is positive

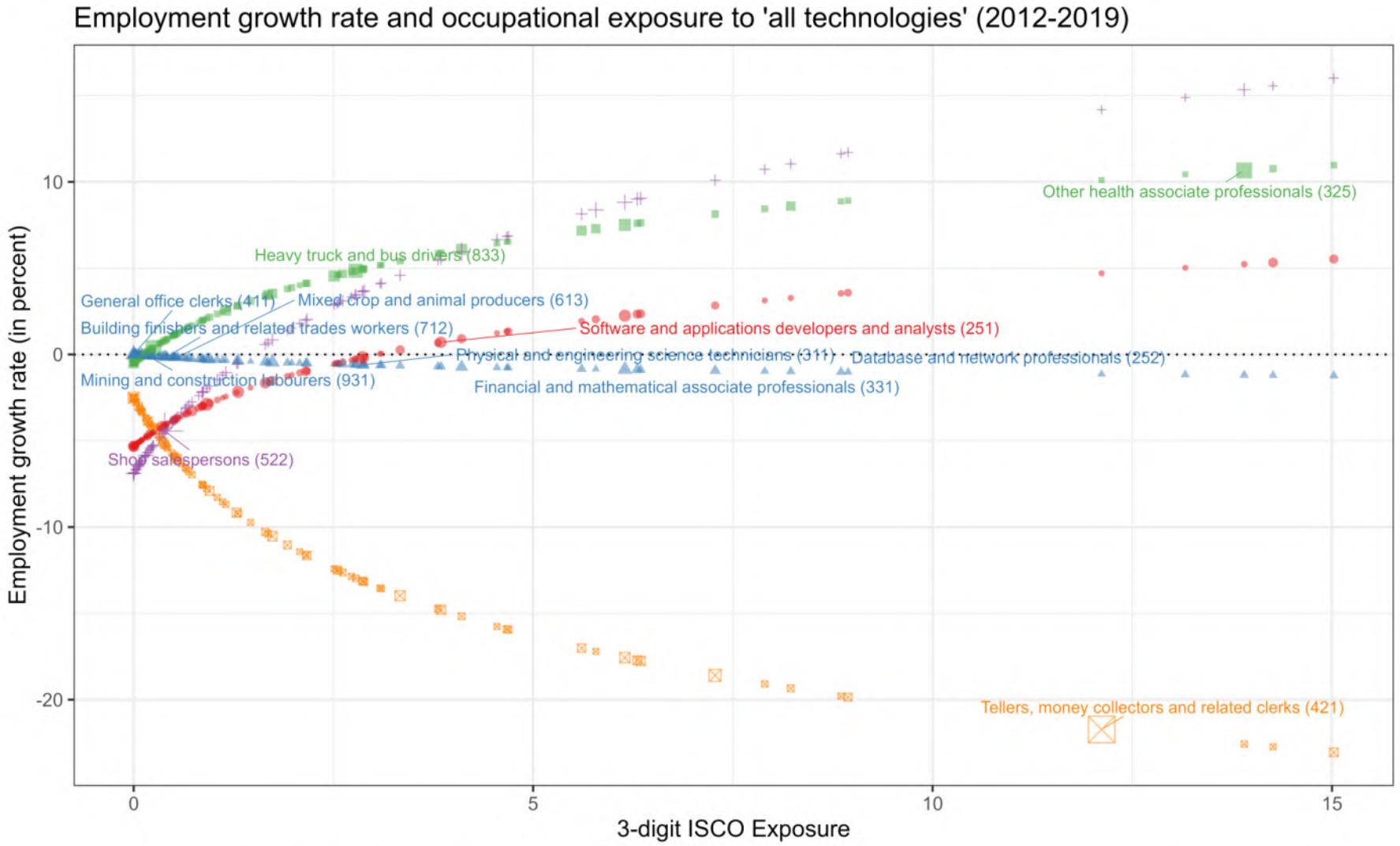


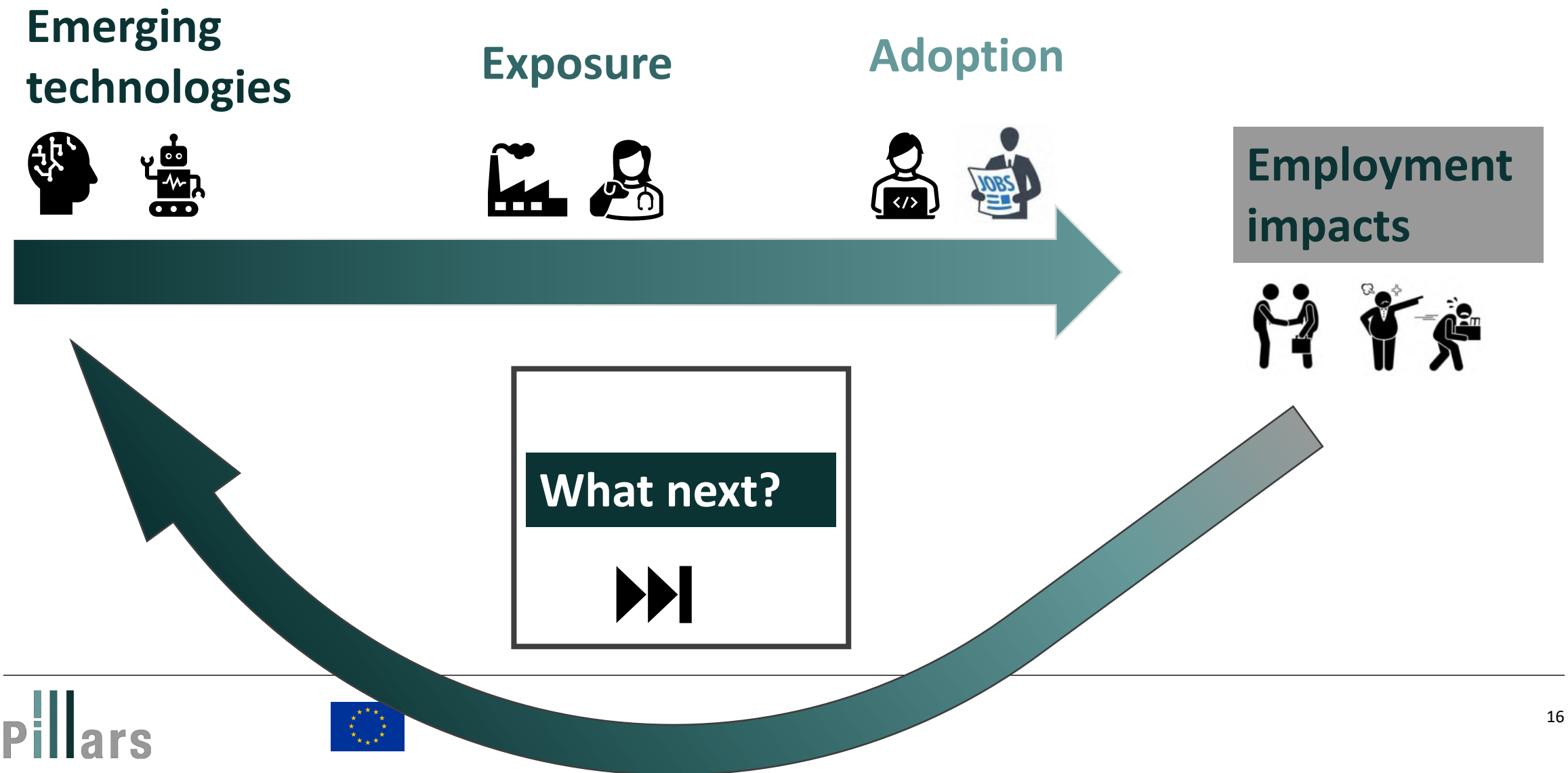
But impact varies by technology: negative for tangible technologies (manual operators); positive for digital platforms (urban professionals)





EU employment increases for highly exposed occupations in industries producing emerging technologies, but reduces in industries using them




Emerging technologies
Exposure
Adoption
JOBS
Employment impacts
What next?

Policy implications for the future of work

- **An eye to the future**: More and more detailed **foresight** exercises on (i) **technological trajectories**; (ii) **tasks** performed by automation technologies; (iii) which **occupations/industries** are **exposed**

- **Beyond the media hypes**: mare careful about the **portfolio of technologies** been developed, and how they **complement**

- **An eye to the present**: in the **short run** emerging automation technologies **impact employment and wages** (a wider spectrum of occupations)

- **More attention to distribution outcome**: target **different combinations** of **technologies–industries–regions–occupations** to address **growing divides** among individuals and regions

Thank you for your attention

Tommaso Ciarli
ciarli@merit.unu.edu

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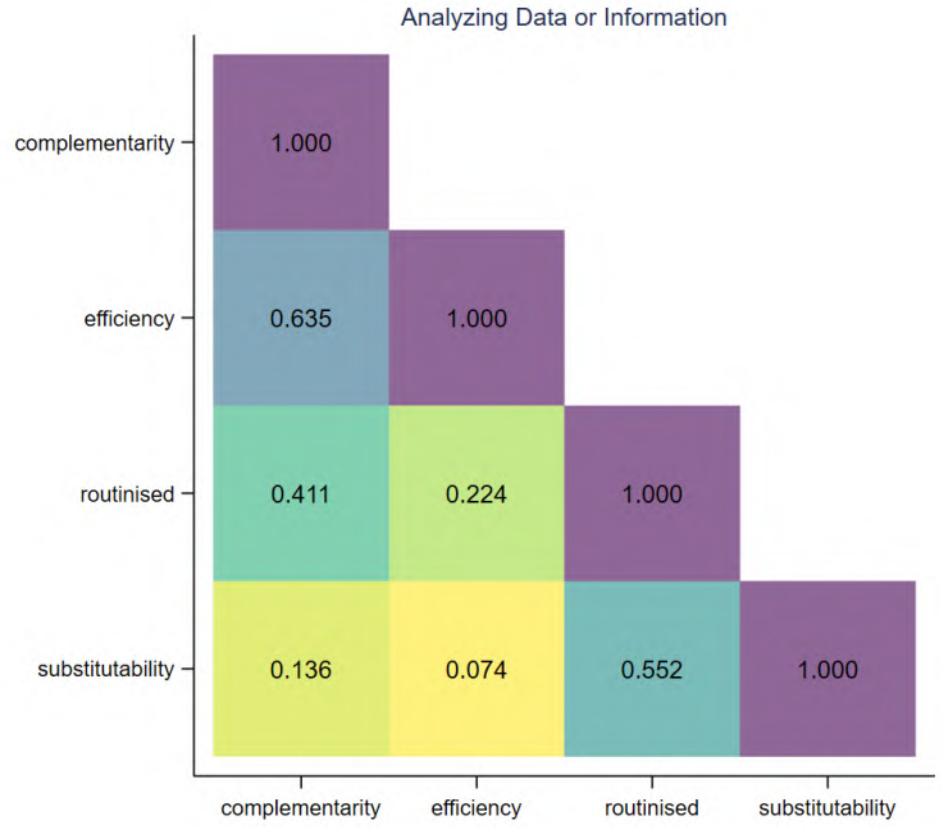
Emerging technologies cannot yet perform activities that require interpersonal skills

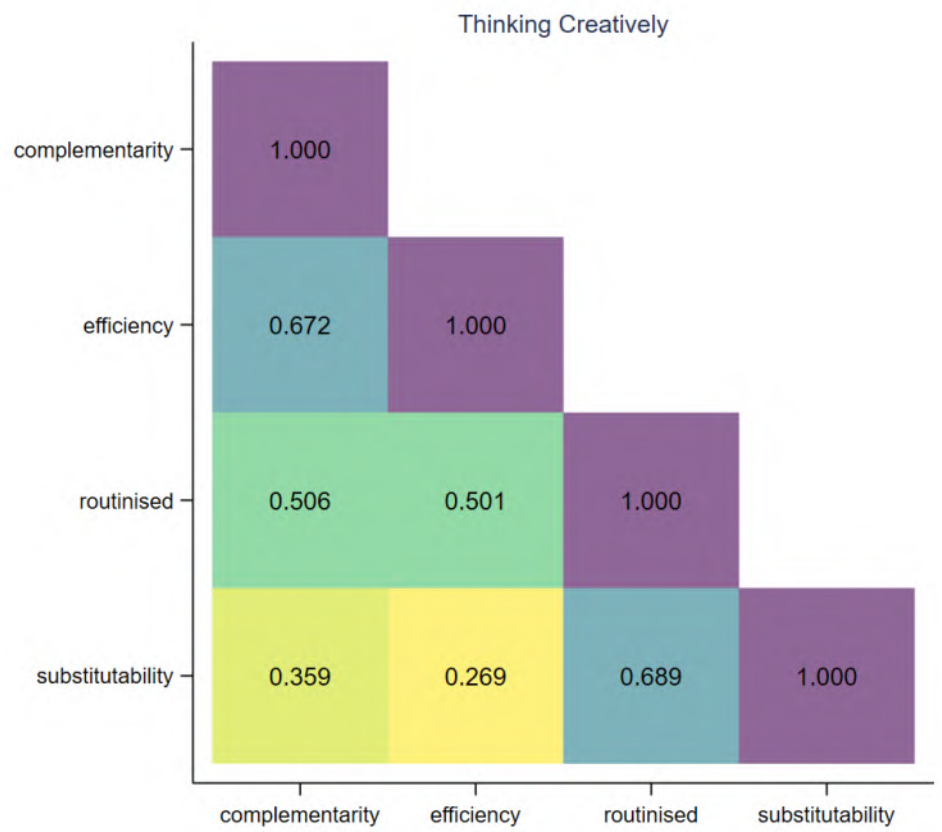
Most frequent general work activities
O*NET Description
Analysing Data or Information (6%)
Identifying the underlying principles, reasons, or facts of information by breaking down information or data into separate parts.
Processing Information (5.1%)
Compiling, coding, categorizing, calculating, tabulating, auditing, or verifying information or data.
Making Decisions and Solving problems (4.2%)
Analyzing information and evaluating results to choose the best solution and solve problems.
Judging the Qualities of Objects, Services, or People (4.1%)
Assessing the value, importance, or quality of things or people.

Least frequent general work activities
O*NET Description
Guiding, Directing, and Motivating Subordinates (1.4%)
Providing guidance and direction to subordinates, including setting performance standards and monitoring performance. **Resolving Conflicts and Negotiating with Others (1.3%)**
Handling complaints, settling disputes, and resolving grievances and conflicts, or otherwise negotiating with others. **Staffing Organizational Units (1.2%)**
Recruiting, interviewing, selecting, hiring, and promoting employees in an organization.

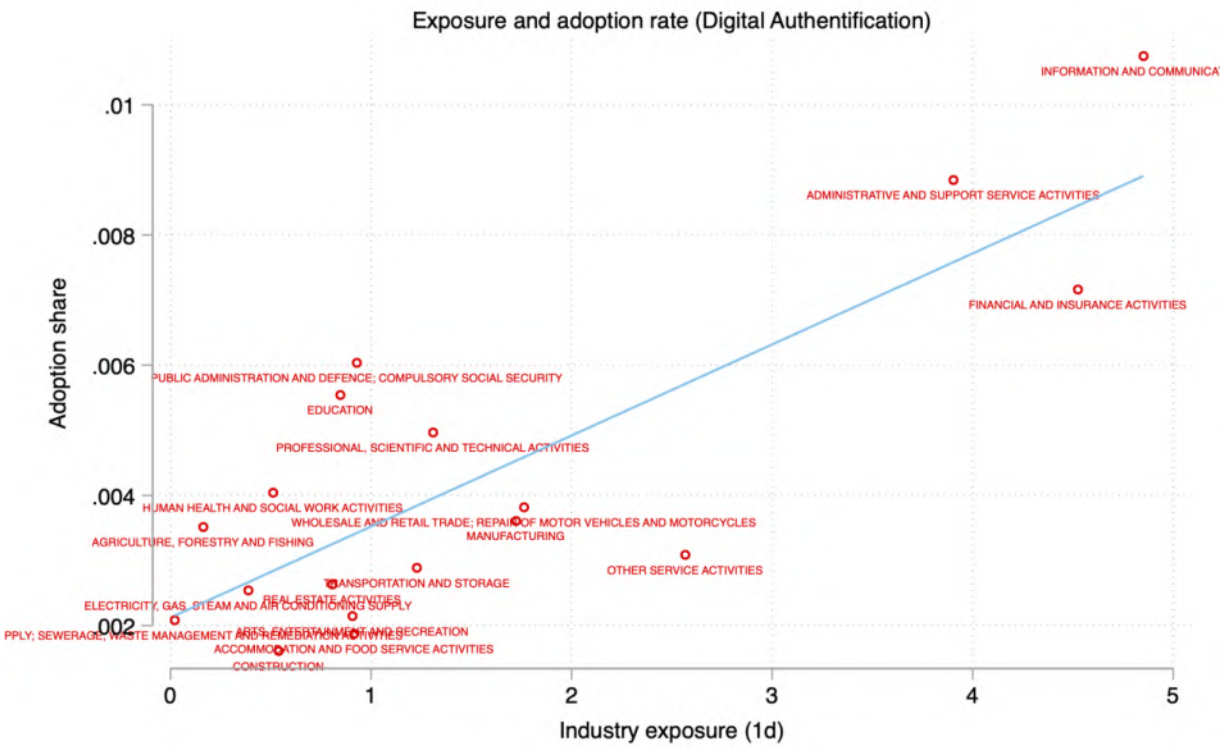
Substituting humans workers depends on technologies ability to routinize specific tasks

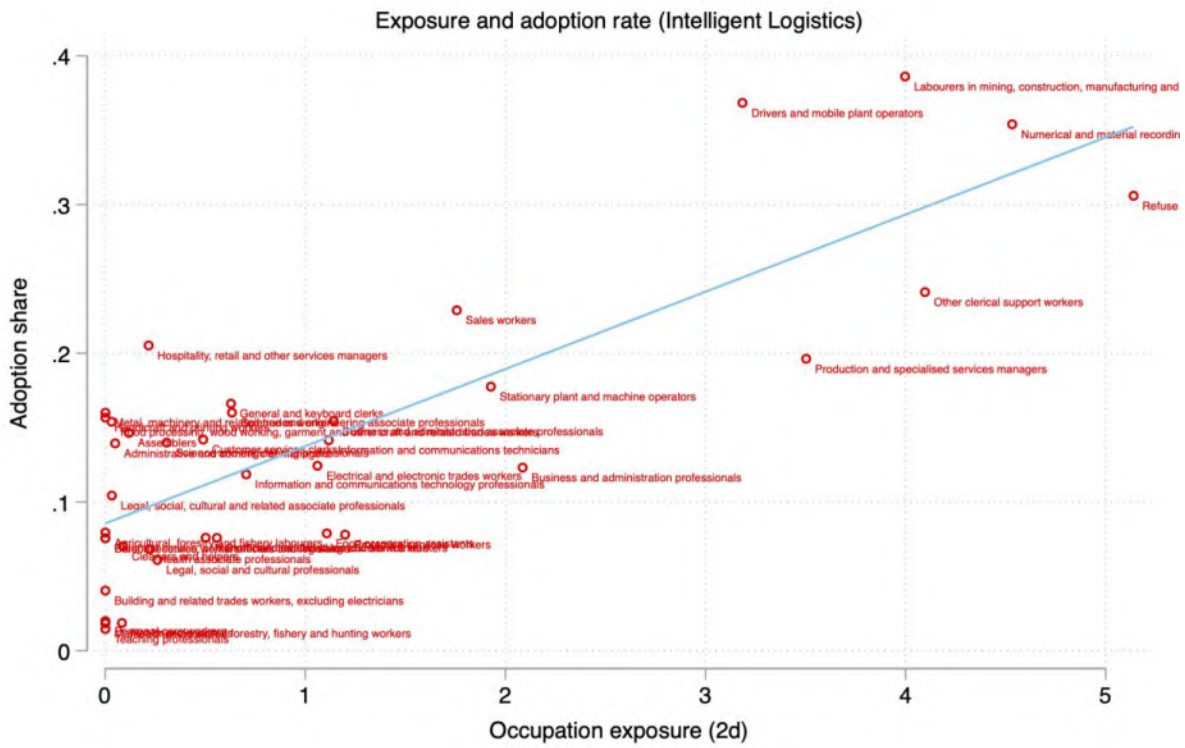
- Technologies that routinize tasks are expected to replace humans (including thinking creatively);
- Technologies increasing efficiency complement humans





Share of adoption reflects ability of technologies in undertaking tasks in industries and occupations





Wage premia in the UK also differ by emerging technology adopted