A PORTRAIT OF AI ADOPTERS ACROSS COUNTRIES

Firm characteristics, assets' complementarities and productivity

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BETTER POLICIES FOR BETTER LIVES

AI has strong potential, but international evidence about its diffusion is still limited

Artificial intelligence (AI) is rapidly transforming the economic landscape

- AI is often considered a **general-purpose technology** whose applications can improve the productivity of adopters
- Little empirical work has comprehensively analysed patterns of AI diffusion across firms at the **international level**

This paper:

- ***Aim***: draw a portrait of AI adopters across countries
- ***How*****:** pioneering a **distributed microdata approach (*AI diffuse*)** based on a common statistical code
- ***Coverage***: **11 countries**

Key findings

The use of AI is more widespread across **large** – and to some extent across **young** – firms and is prevalent in **ICT and Professional** services

Complementary assets are key for AI use

- ICT skills and training, firm-level digital capabilities, digital infrastructure

AI users tend to be **more productive,** especially the largest ones, although **these premia do not seem to reflect the use of AI alone**

Complementary assets appear to play a key role**,** with productivity advantages likely related, in most cases, to the **selection** of more digital and competitive firms into AI use

EXISTING EVIDENCE ON AI USE BY FIRMS

A brief overview of the literature, based on different data sources

Firm-level surveys

- USA (Zolas et al., 2020; Acemoglu et al., 2022; McElheran et al., 2023); DEU (Rammer et al., 2022; Czarnitzki et al., 2022); KOR (Cho et al., 2022)

Online job postings

- USA (Babina et al., 2020; Alekseeva et al., 2021; Acemoglu et al., 2022); FIN (Bäck et al., 2022); cross-country (Squicciarini and Nachtigall, 2021; Borgonovi et al. 2023)

IPRs

- USA (Alderucci et al., 2020); FRA (Di Biaggio et al., 2022); cross-country (Damioli et al., 2021; Dernis et al., 2021; 2023; Baruffaldi et al., 2020); exposure to occupations (Webb, 2019)

Other / multiple data sources

- Import (Domini et al., 2021; 2022; Aghion et al., 2020); Online websites (Dernis et al., 2023); Combining sources (Calvino et al., 2022)

Positive association between AI use and size

More ambiguous findings on the links between AI and productivity

- Lack of relation can be due to J-curve dynamics (Brynjolfsson, Rock and Syverson, 2021)
- … despite emerging evidence on generative AI (and AI exposure)

DATA AND METHODOLOGY

Official firm-level surveys across countries

Official data from NSOs in 11 countries

- Belgium, Denmark, France, Germany, (Ireland), Israel, Italy, Japan, Korea, Portugal, Switzerland

Information available on

- Firm characteristics (sector, age, size, turnover, labour productivity)
- Technology use (dummy variables)
- Complementary assets (digital infrastructure, ICT skills / training, other digital technologies)

Main features

- Representative (of the 10+ firm population); weights available for most countries
- Country-specific coverage (between 2017 and 2021)
- Definitions can vary across countries (Eurostat harmonization)

A distributed microdata approach: *AI diffuse*

Distributed microdata approach

- Statistical code developed by the OECD and run by experts that have access to confidential data
- Separate analysis for each country using a harmonised methodology
- Consistency checks and metadata validation in collaboration with experts
- Building upon the experience of other OECD distributed microdata projects (e.g., DynEmp, MultiProd, MicroBeRD)

Main *AI diffuse* outputs

- Summary statistics (shares of adoption, summary, co-occurrences)
- Distributed regressions (adoption regressions, productivity regressions)

A PORTRAIT OF AI ADOPTERS

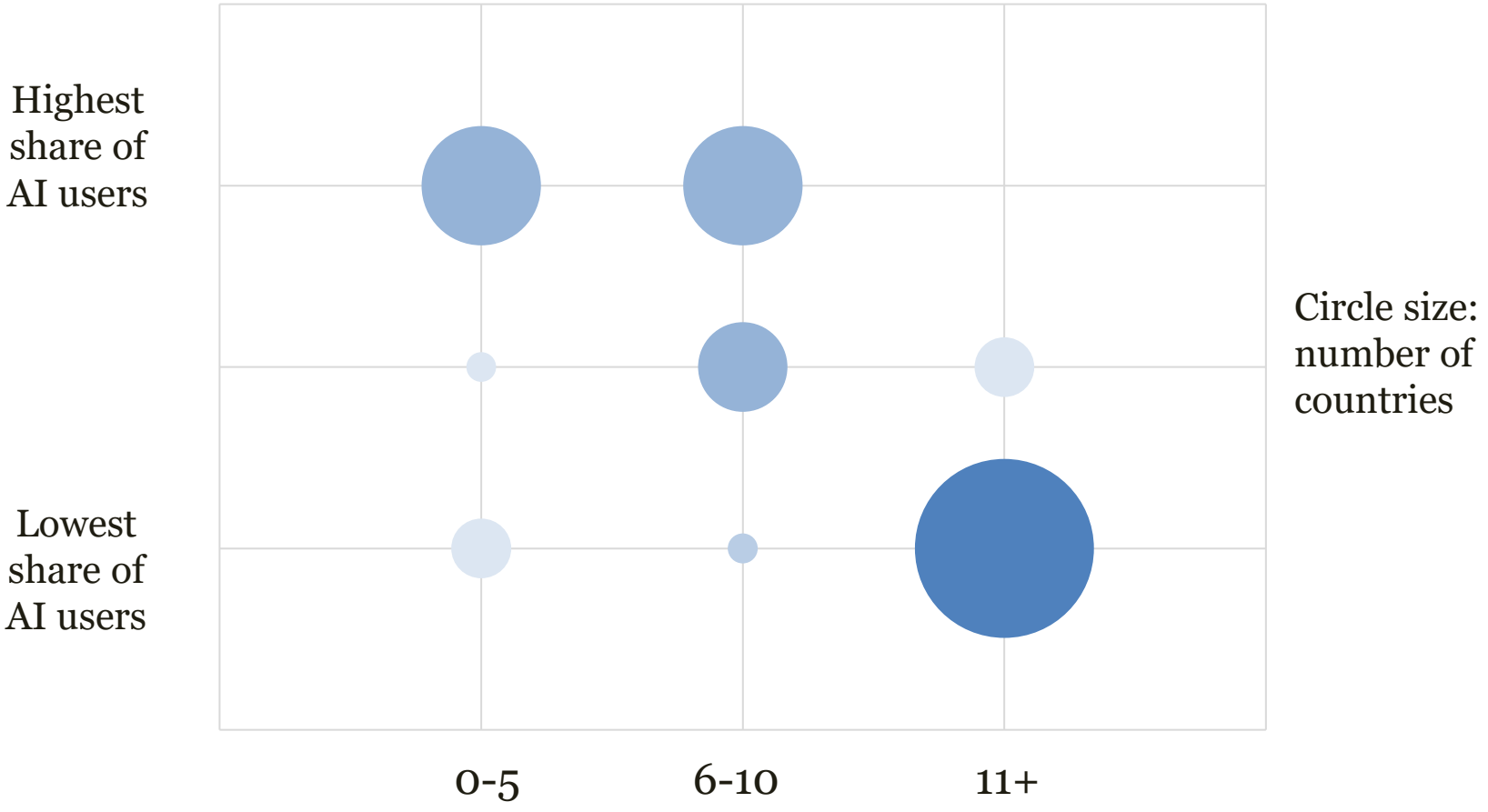
AI is more widely used across large firms...

Share of AI users by firm size class: cross-country findings

Notes: based on 10 countries (Belgium, Denmark, France, Germany, Israel, Italy, Japan, Korea, Portugal, and Switzerland). The *y*-axis shows the ranking for shares of AI users. Circles' size is proportional to the number of countries for which the relation holds. For Korea, the size-class 10-19 is not available (not reported, the 20-49 class is assumed to be the second lowest).
Source: elaborations based on Calvino and Fontanelli (2023). See the paper for full list of sources.

...and to some extent across younger ones

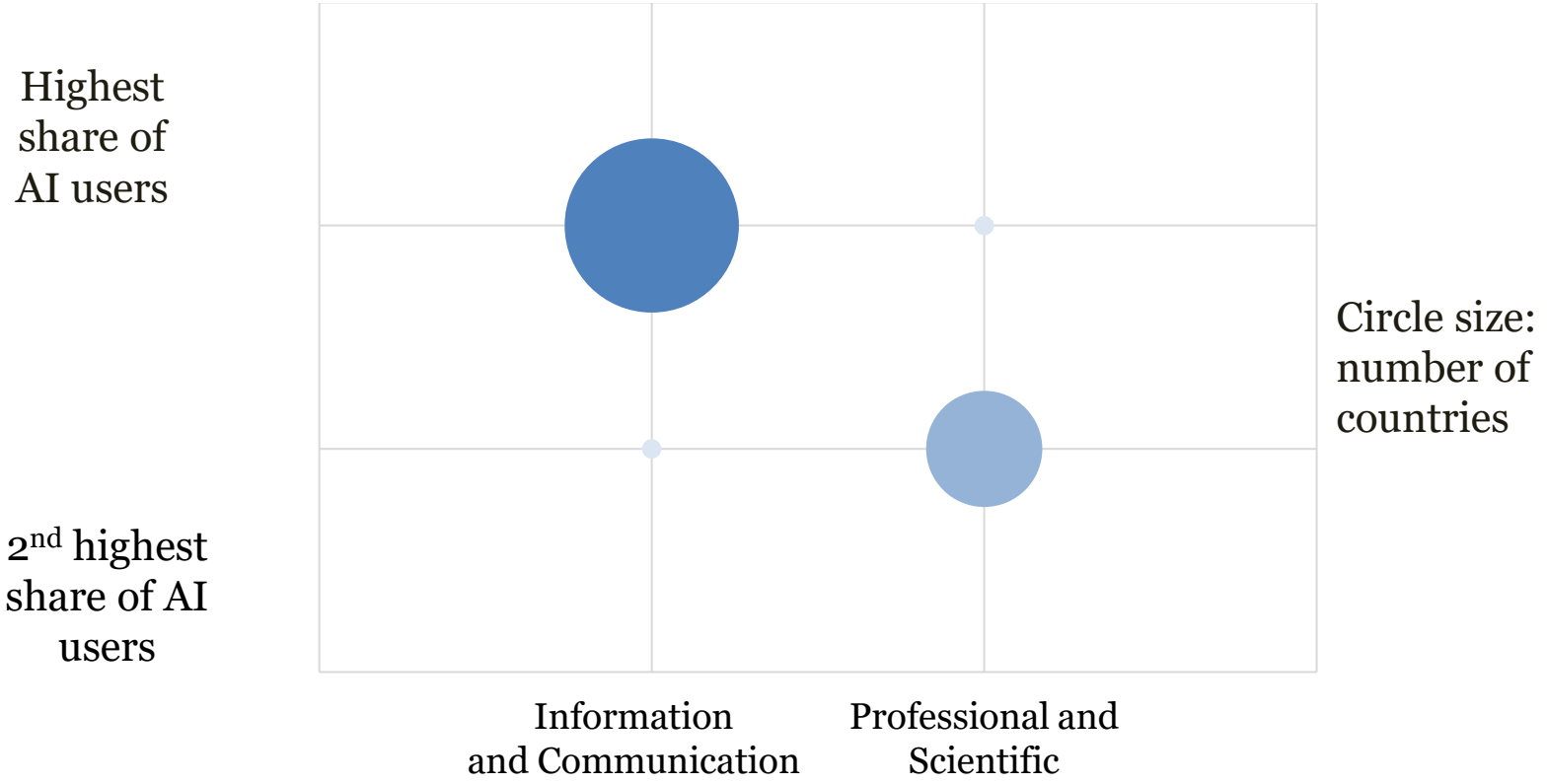
Share of AI users by firm age class: cross-country findings



Notes: based on 8 countries (Belgium, Denmark, France, Israel, Japan, Korea, Portugal, and Switzerland). The *y*-axis shows the ranking for shares of AI users. Circles' size is proportional to the number of countries for which the relation holds. For Switzerland, the age-class 0-5 is not available (not reported, assumed to be 2nd in the ranking).
Source: elaborations based on Calvino and Fontanelli (2023). See the paper for full list of sources.

Shares of AI use are higher in ICT and in Professional and Scientific Services…

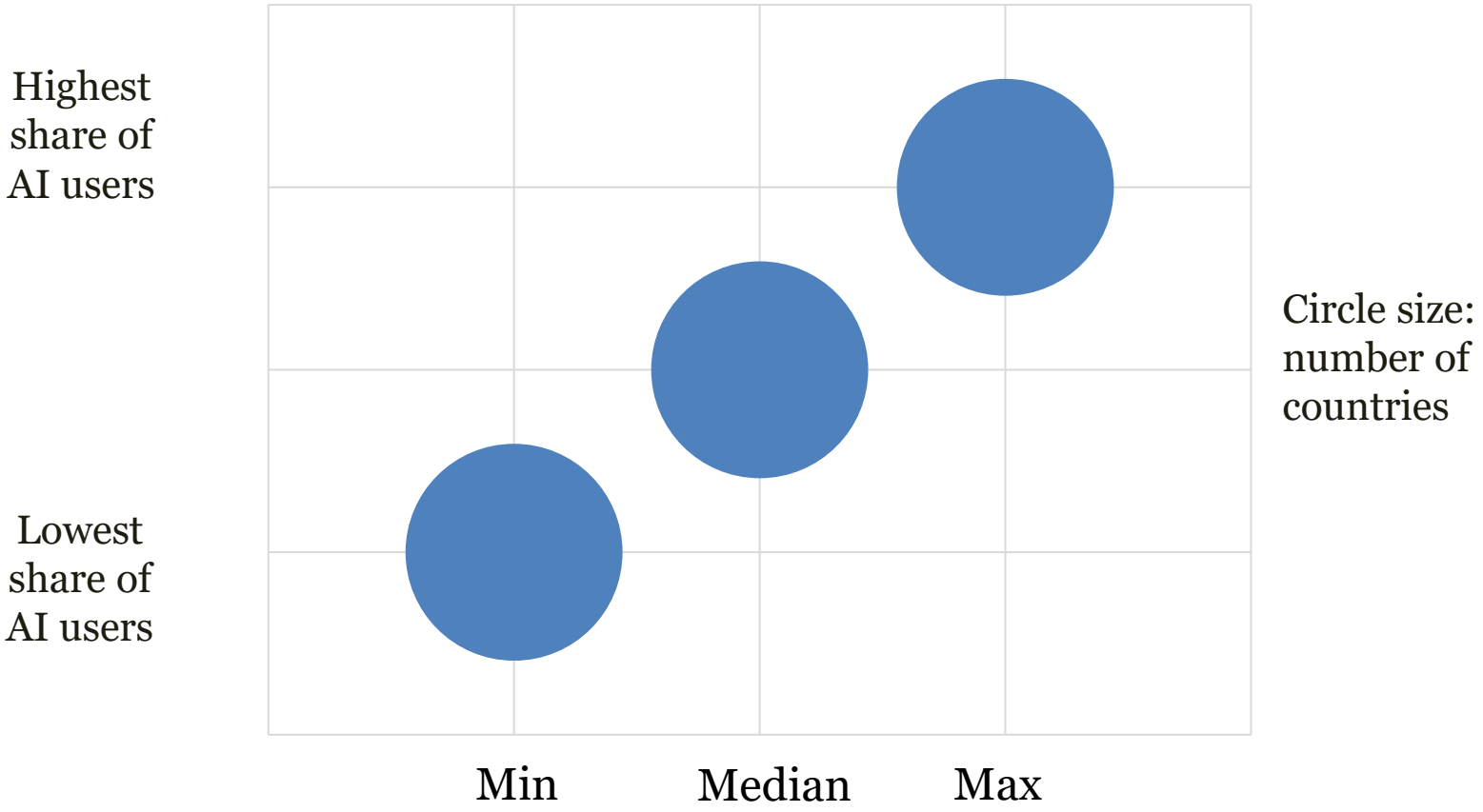
Share of AI users by firm broad sector: cross-country findings for ICT and Professional and Scientific Services



Notes: based on 10 countries (Belgium, Denmark, France, Germany, Israel, Italy, Japan, Korea, Portugal, and Switzerland). The *y*-axis shows the ranking for the two highest relative shares of AI adoption, by two sectors (ICT and Professional and Scientific Services). Circles' size is proportional to the number of countries for which the relation holds. The Accommodation and Food sector is the second highest share for Switzerland (not reported). Manufacturing & Utilities is the second highest share for Israel (not reported). Administrative and Real Estate is the second highest share for Portugal (not reported).
Source: elaborations based on Calvino and Fontanelli (2023). See the paper for full list of sources.

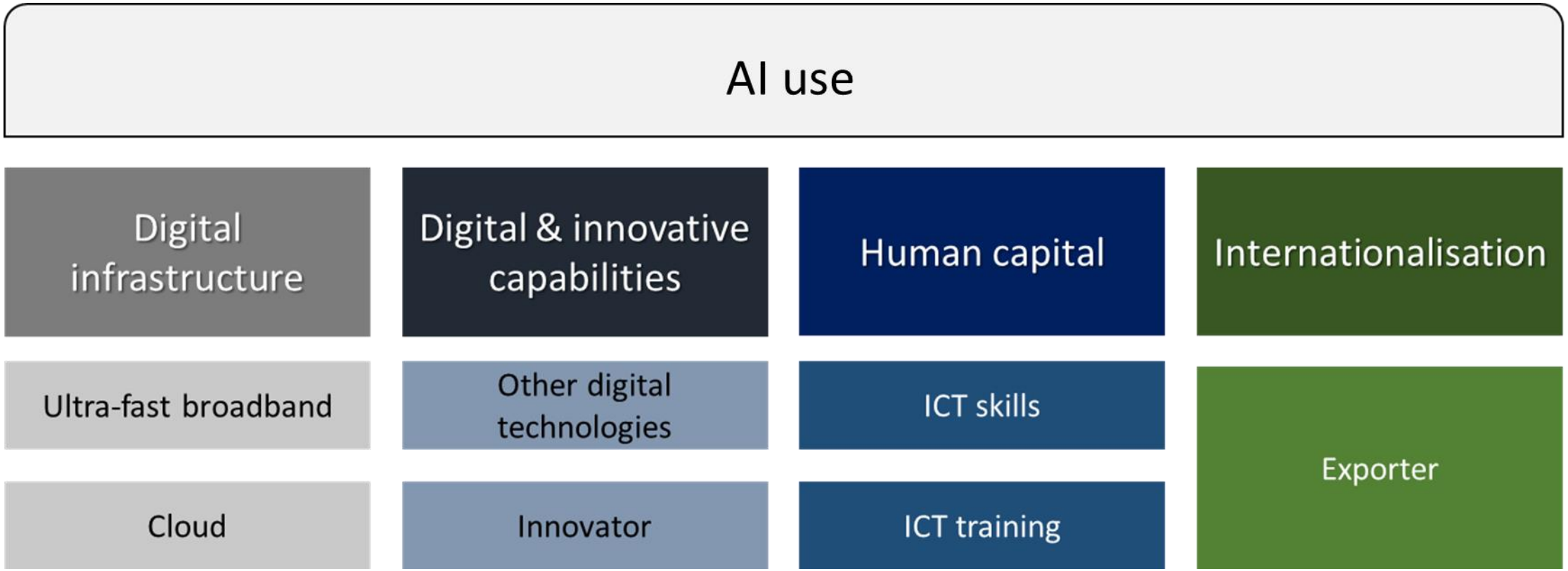
…and among firms with higher digital capabilities

Share of AI users by number of technologies: cross-country findings



Notes: based on 9 countries (Belgium, Denmark, France, Israel, Italy, Japan, Korea, Portugal, and Switzerland). The *y*-axis shows the ranking for shares of AI users. Circles' size is proportional to the number of countries for which the relation holds.
Source: elaborations based on Calvino and Fontanelli (2023). See the paper for full list of sources.

Complementary assets play a key role for AI use



AI users tend to be more productive, but productivity premia do not seem to reflect the use of AI alone

Link with productivity	*before* accounting for complementary assets	*after* accounting for complementary assets	
	AI use	AI use	Complementary Assets
Belgium	++	+	+
Denmark	++	+	+
France	++	×	+
Germany	++	×	+
Israel	×	×	+
Italy	++	×	+
Japan	×	×	+
Korea	++	×	+
Switzerland	×	×	+

Note: the table is based on OLS regressions of labour productivity on AI use, controlling for size class, age class, sector and, upon availability, year fixed effects, while further including proxies of different complementary assets as additional explanatory variables in the right panels. Cells in green (++) in the left panel indicate a positive and significant (at 1%, 5%, or 10% level) relationship with firm labour productivity. Cells in green for AI use in the right panel (+) indicate a weaker relationship (lower magnitude and lower significance, shifting from 1% to 5% level) than in the left panel. Cells in grey (X) indicate that the relationship between AI use and firm labour productivity is not statistically different from zero.
Source: elaboration based on Calvino and Fontanelli (2023).

- **Complementary assets** appear to play a key role: productivity premia significantly reduce when accounting for those
- Productivity advantages likely related to the **selection** of more digital and competitive firms into AI use
- Initial evidence of more direct effects of AI on productivity for **developers**

CONCLUDING REMARKS

Policy makers can play a key role to foster an inclusive digital transformation in the age of AI

- A role of AI strengthening the advantages of larger and more productive firms may imply widening **gaps between leading and other firms**
- A broad policy mix affecting incentives and capabilities may allow AI use and its returns to be **more widespread** across firms and sectors

Human capital

- Boosting ICT skills and high-quality STEM education
- Improving managerial capabilities and other soft skills

Digital capabilities

- Incentivising digitalisation
- Easing the financing of intangibles
- Supporting research and innovation

Digital infrastructure

- Reducing digital and connectivity gaps

Framework conditions

- Reducing barriers to entry and growth
- Fostering competition
- Addressing regulatory challenges

THANK YOU

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