Productivity: Drivers and Levers

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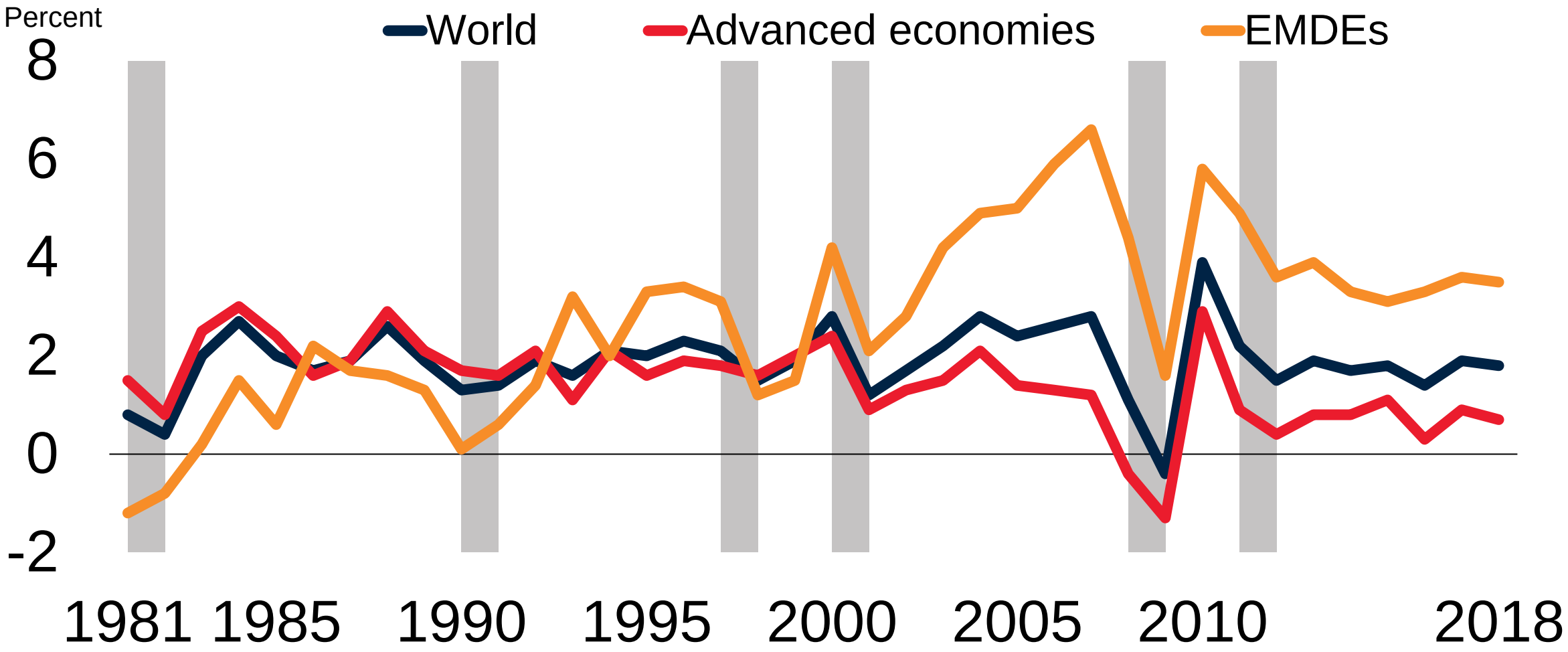
Creating Markets, Creating Opportunities

ECA Productivity Conference 2024

Slowdown in aggregate productivity across countries

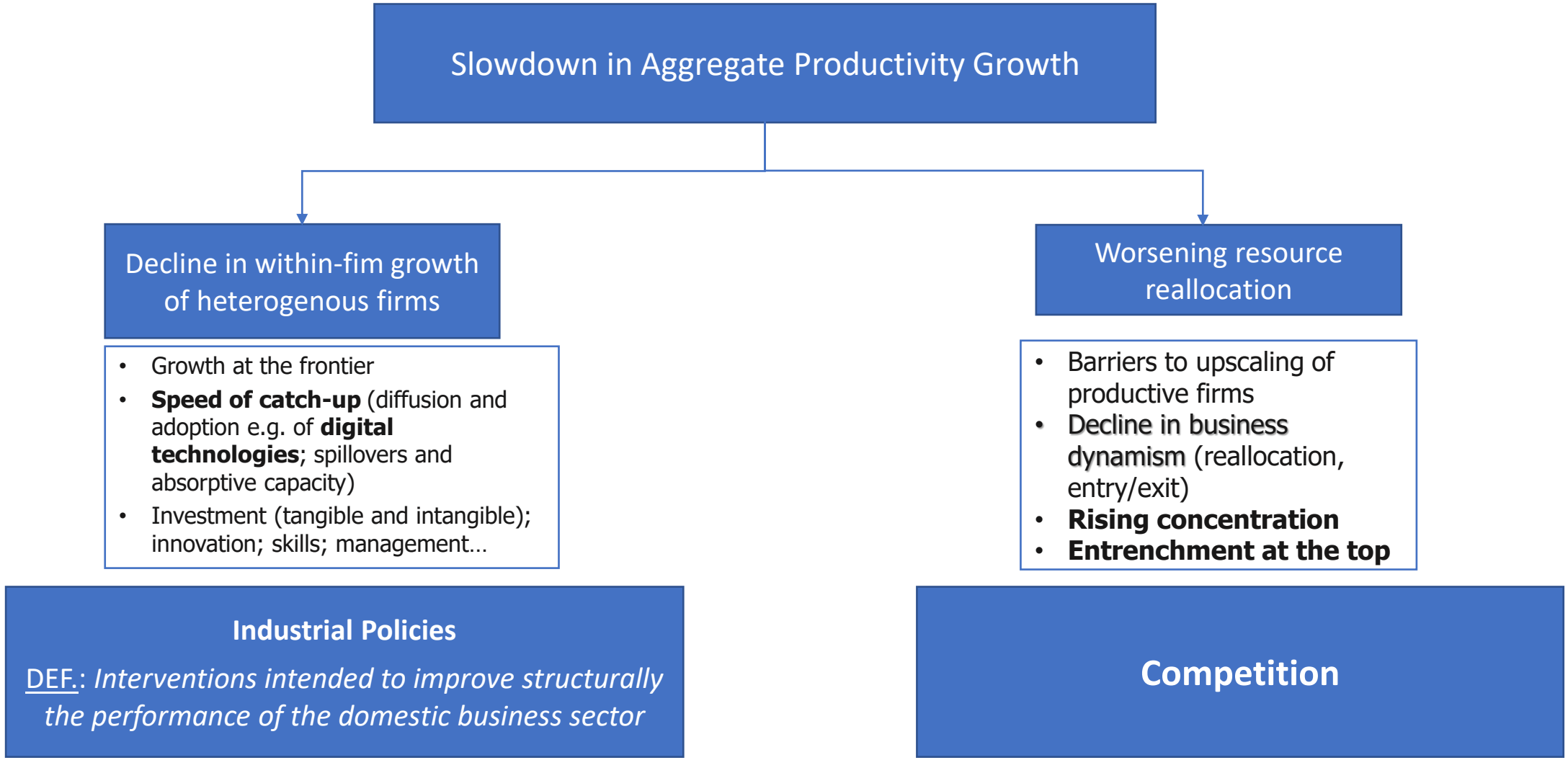


Source: Global Productivity, Trends , Drivers and Policies, World Bank 2021

Outlook not “rosy” with many challenges and with additional goals to achieve…

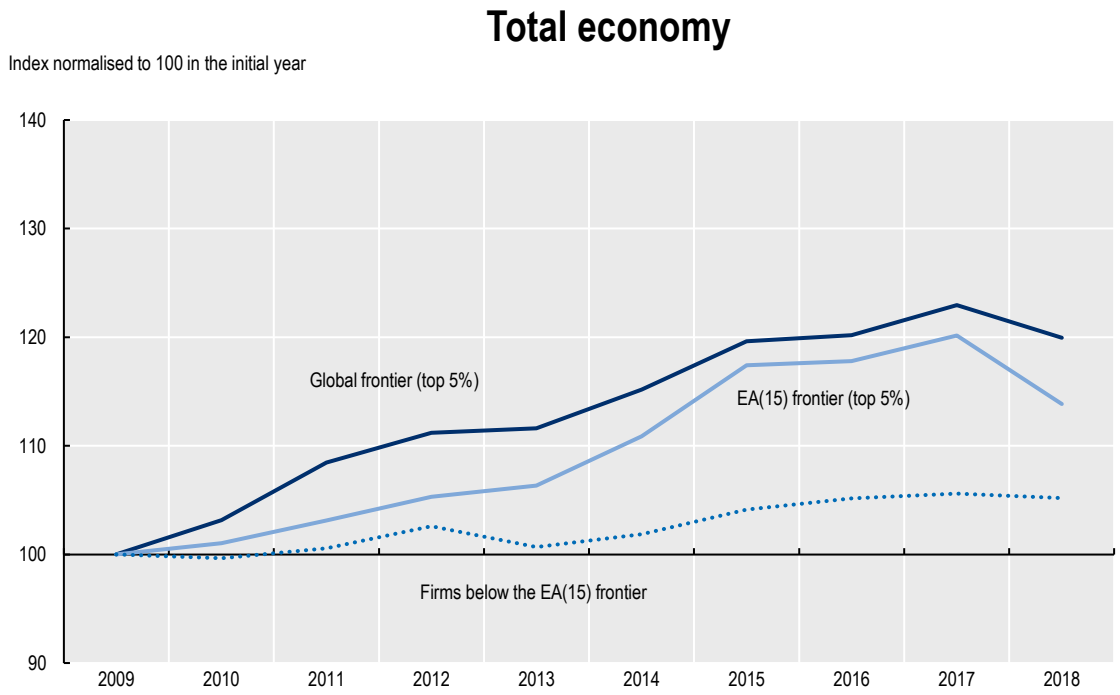
- Additional headwinds: world of “Polycrises” (energy prices; green transition; geopolitical situation and GVC restructuring; inequality; skills shortages; ageing…)
- New sources of growth: Digital technologies, in particular AI, intangibles etc…
  - That come with their own challenges
- Not only about growth and competitiveness : Climate neutrality goals
- Many different margins /levers that may appear in contrast with each other, e.g. fostering a competitive environment vs more interventionist approach of “new” industrial policies.
  - **if well designed these two levers (Competition and Industrial Policies) are complementary but design and whole-of-government approach key**
  - **Productivity might not be sufficient but (still!) necessary**

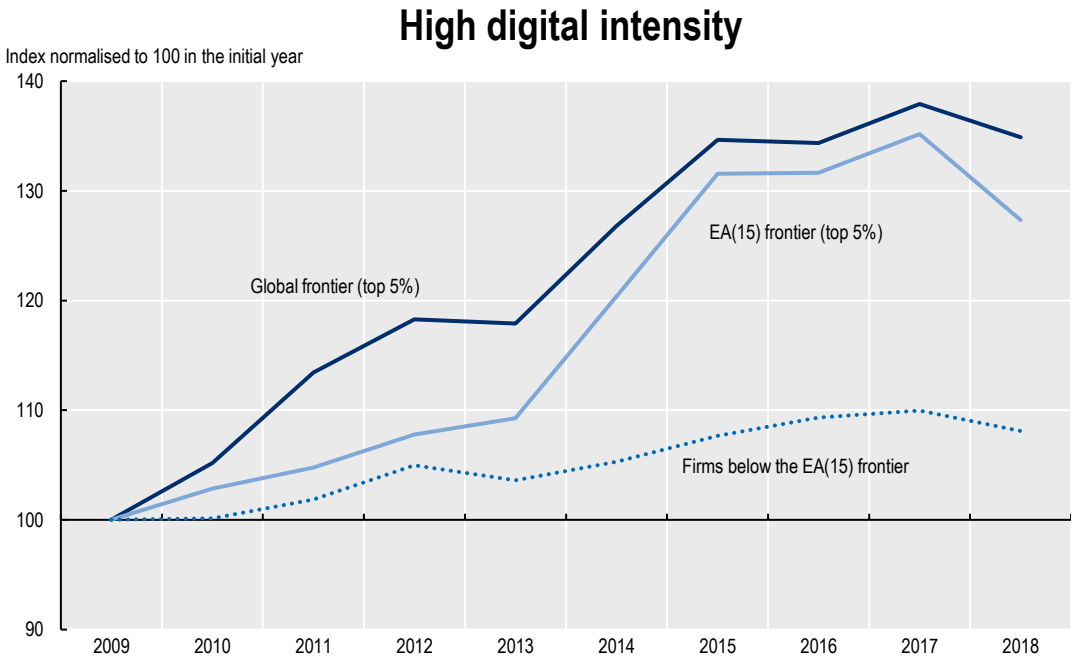
Decomposing Aggregate productivity growth: drivers and levers



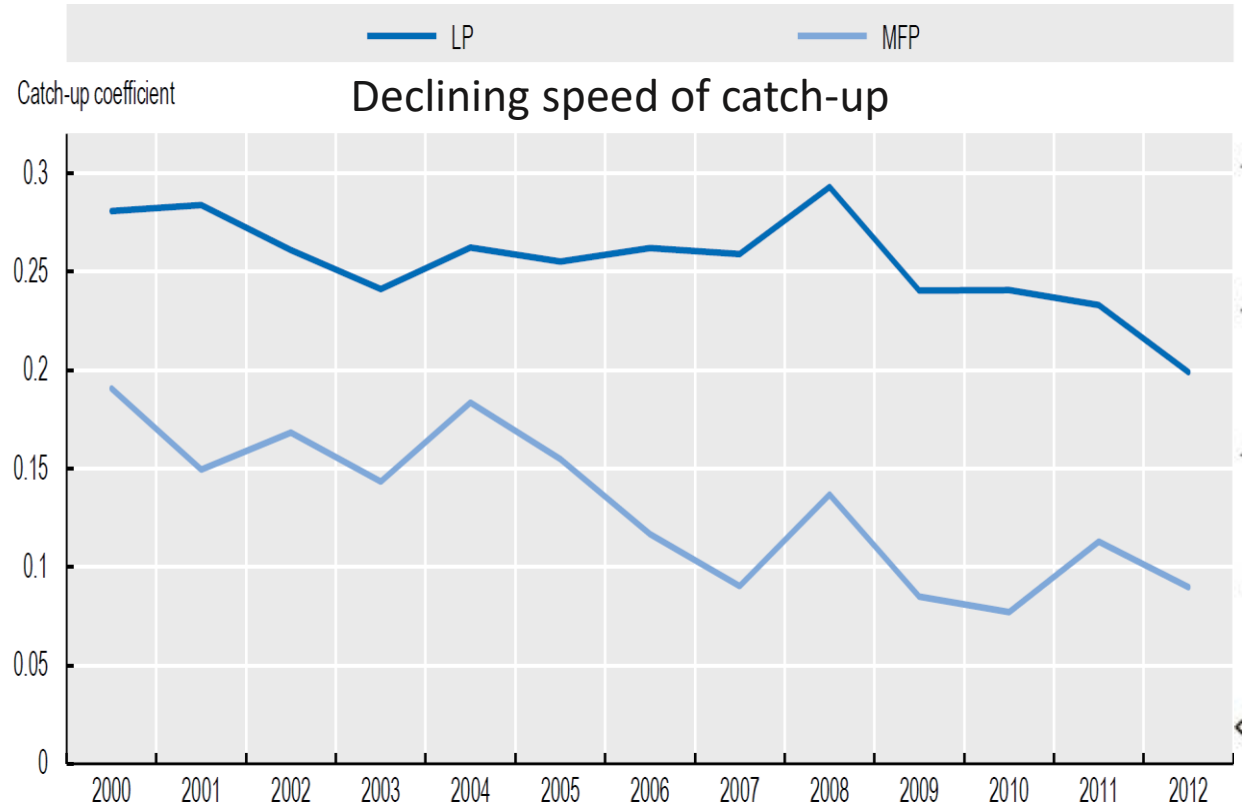
Increased productivity gaps across firms

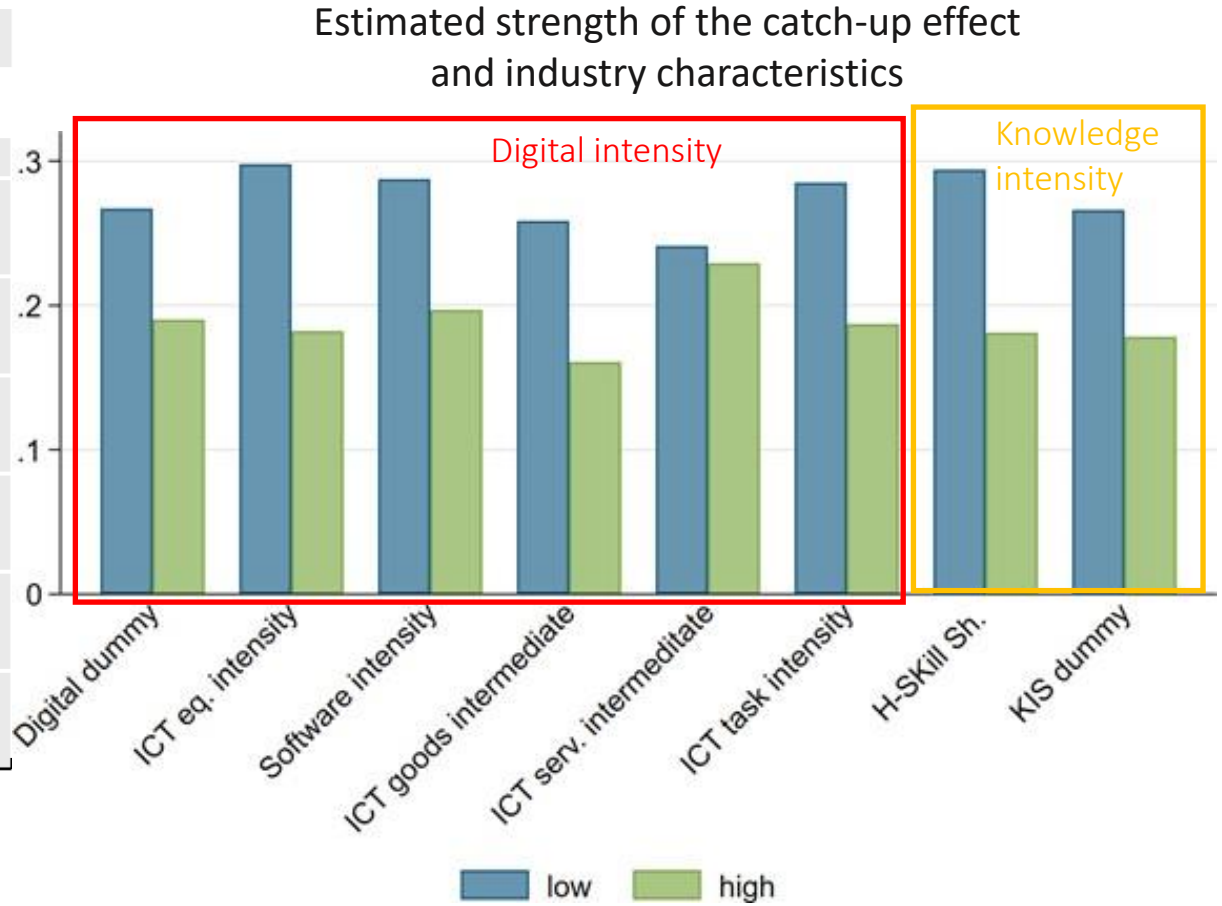
increasing productivity gap between firms at the frontier and other firms





*Criscuolo, 2021 - based on Andrews, Criscuolo and Gal (2016): "The Best vs the Rest: The Global Productivity Slowdown, Divergence across Firms and the Role of Public Policy"

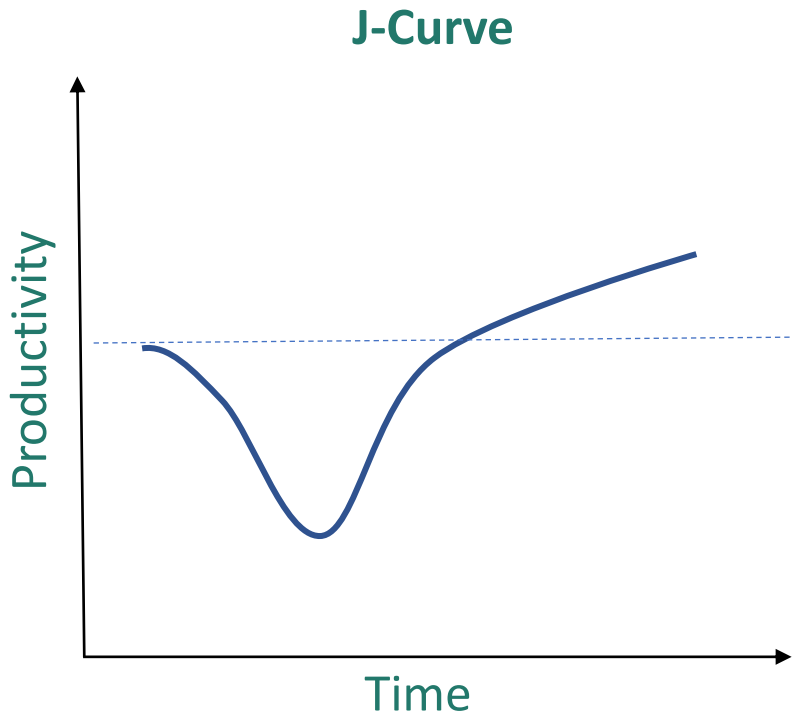




• Notes: LP = labour productivity; MFP = multi-factor productivity. The left panel represents the estimates for the catch-up effect over time. It plots coefficients from a regression of productivity growth on the productivity gap interacted with year dummies, including country-year and industry fixed effects. The countries included are: AUS, BEL, CAN, CHE, DNK, FIN, FRA, HUN, IRL, ITA, NOR, PRT, SWE. Only manufacturing and non-financial market services are depicted. The right panel reports the difference in LP growth, due to the catch-up effect, between firms at the average level of LP gap in the p(0-10) group and firms at the average LP gap in the p(10-40) group, in industries with low vs. high values of the indicators considered. For dummy variables the low and high values are 0 and 1. For other indicators, the low and high value correspond to the 10th and 90th percentiles of the value of the characteristic across sectors. Source: Berlingieri, Calligaris, Criscuolo and Velrhac (2020), "Laggard firms, technology diffusion and its structural and policy determinants", https://doi.org/10.1787/281bd7a9-en.

Technology and knowledge diffuse to laggards at a declining speed and Catch-up lower in digital and knowledge intensive industries …

What are the links between Digital technologies (e.g. AI) and productivity?



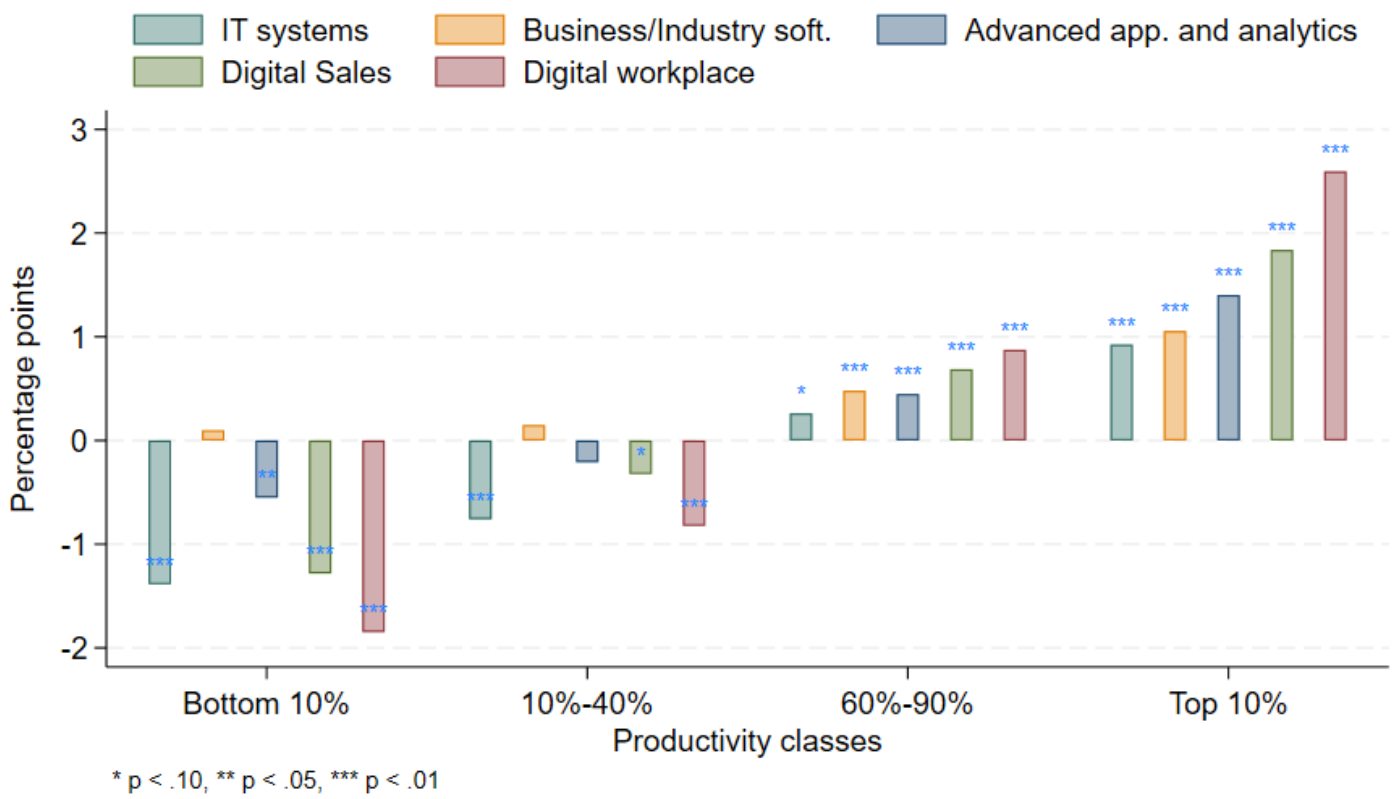
Elaboration based on Brynjolfsson, Rock, and Syverson (2019)

- Diffusion across firms requires **intangibles and human capital**
  - It takes time for productivity gains to materialise
  - Especially for GPTs such as AI (J-curve)

- **What do we see so far** in OECD recent and ongoing work?
  - AI users tend to be **more productive**, especially the largest ones
  - These premia do not seem to reflect the use of AI alone
  - Complementary assets play a key role, with productivity advantages likely related to the **selection** of more digital and competitive firms into AI use

Ex-ante more productive (larger, and digital) firms were more likely to digitalise over the COVID-19

Likelihood of introducing new digital products during the pandemic by productivity class in 2019

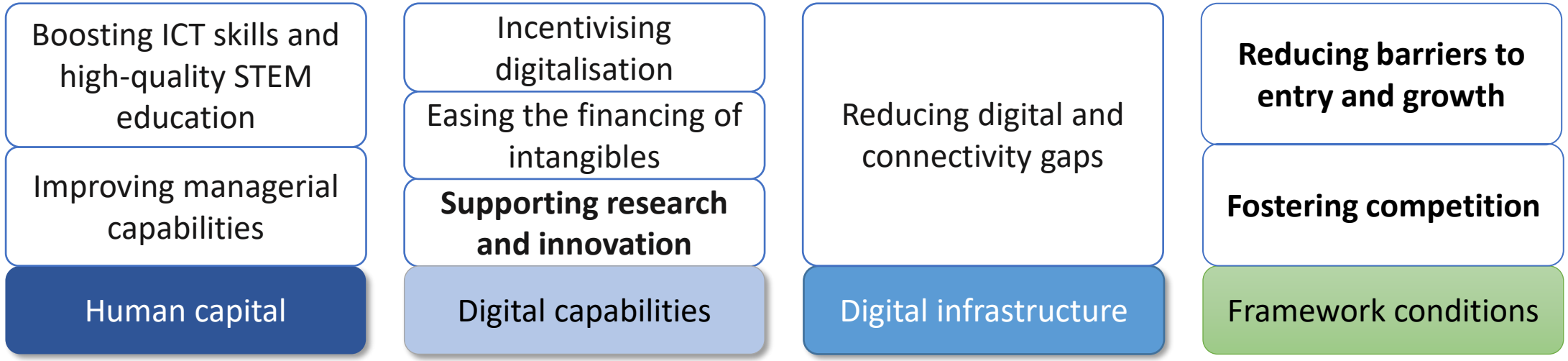


- Significant increasing association along the productivity distribution, across technology classes
  - LPM controlling also for size, age, human capital, digitalisation, firm structure, country-sector FE
  - Robust to other specifications (e.g. Logit)
- Significant positive associations also between digitalisation over COVID and:
  - Ex-ante digitalisation levels
  - Ex-ante size

Note: The figure displays the relation between firm labour productivity (in 2019) and the probability of introducing new digital products in 2020 and/or 2021, for each digital class. For each technology class, the estimated regression model is a linear probability model that employs the digital technology class dummy as dependent variable and includes – in addition to the productivity class – size class, age class, and other complementary factors (IT staff, overall digitalisation proxy) as main independent variables. The technology class dummy is equal to 1 if the firm has introduced a new digital product for the given technology class in 2020 and/or 2021.. Each regression includes 2-digit sector-country fixed effects and employs robust standard errors. Results for missing productivity classes are not reported. Results are robust using the log of labour productivity in 2019, excluding plants at the top 1% of the productivity distribution, employing a logit model as the main regression model, and using a different proxy for digitalisation as control.

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

A weakening competitive environment?

The academic literature and several OECD analyses document a number of trends suggesting changes in the overall competition environment:

↑ **Concentration** (Autor et al., 2020; Bajgar et al., 2019, 2021, 2023; Bessen, 2017; De Loecker et al., 2022; Calligaris et al., 2024).

↑ **Entrenchment** (Bessen, 2020; Bajgar, Criscuolo & Timmis, 2021; Calligaris et al., 2024)

↑ **Mark-ups and mark-ups dispersion** (Calligaris et al., 2018 & 2024, De Loecker et al. 2022, De Ridder et al. 2022)

↓ **Entry rates** (Akcigit and Ates, 2021; Calvino et al., 2020; Decker et al., 2017; Biondi et al., 2024)

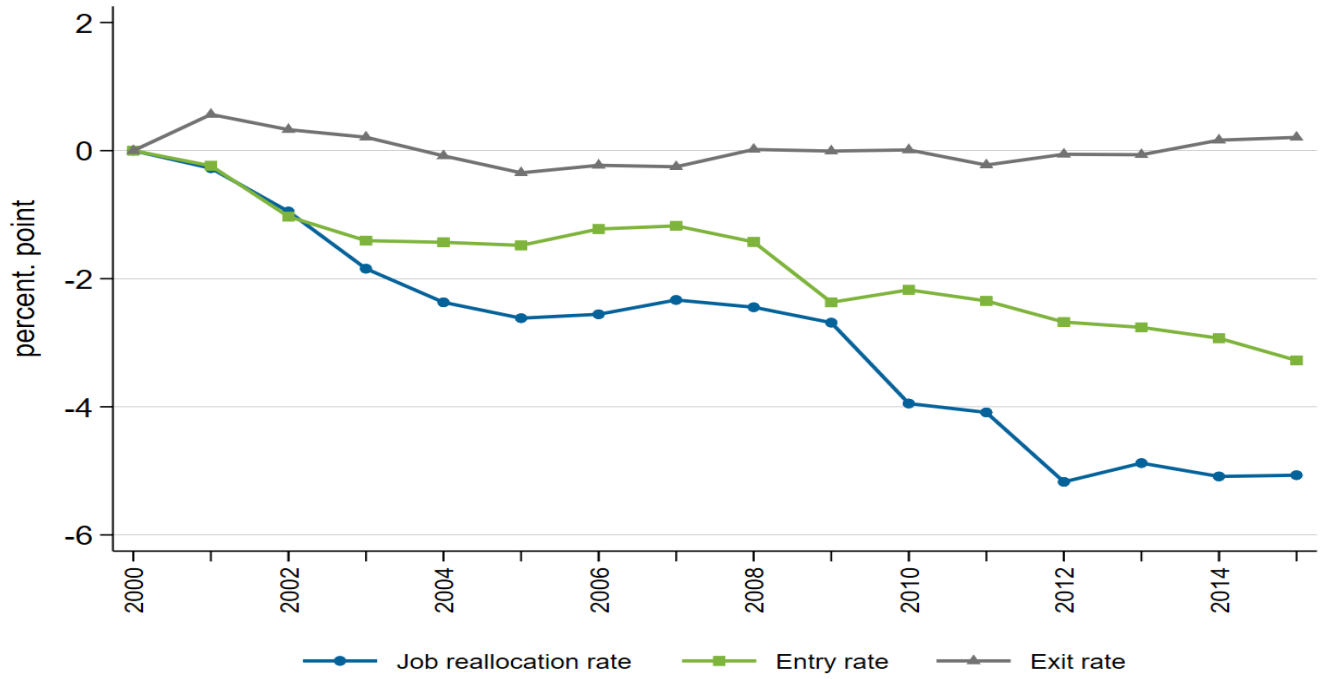
Each of them has limitations in capturing the degree of competition….

…but most of them seem to point in the same direction: a weakening of competition

Dynamism is steadily declining

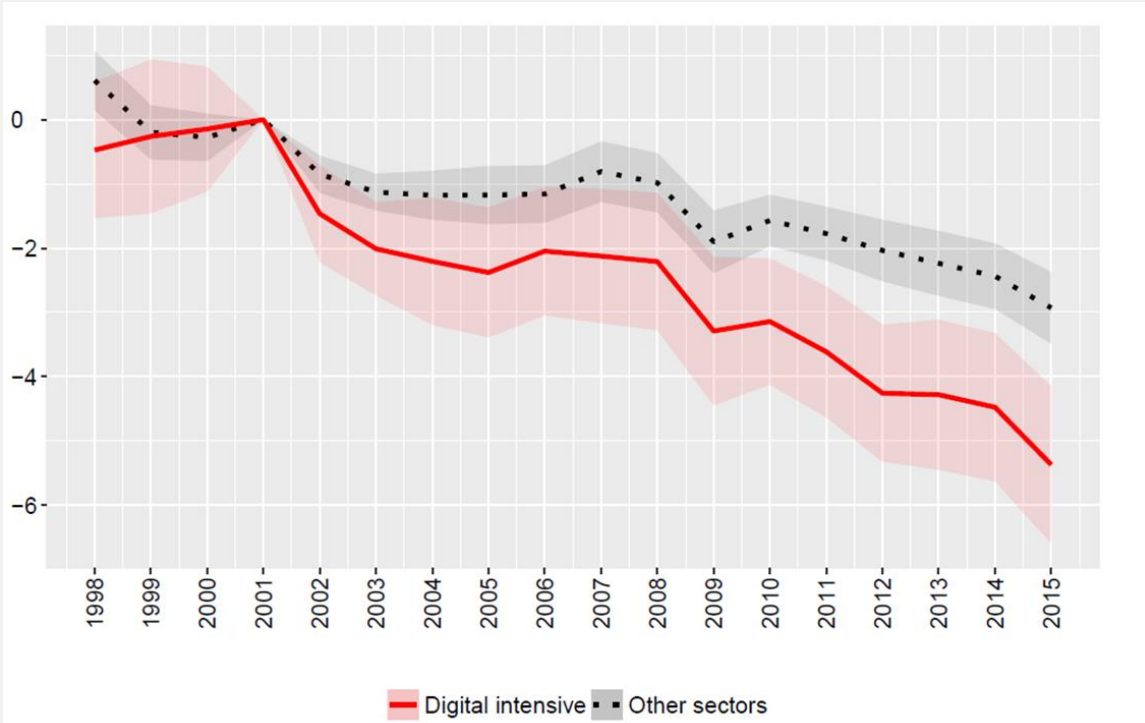
On average, JR and ER have declined by 5 pp and 3 pp respectively, over 15 years

(i.e. around 0.35 pp and 0.2 pp each year)



Entry rates

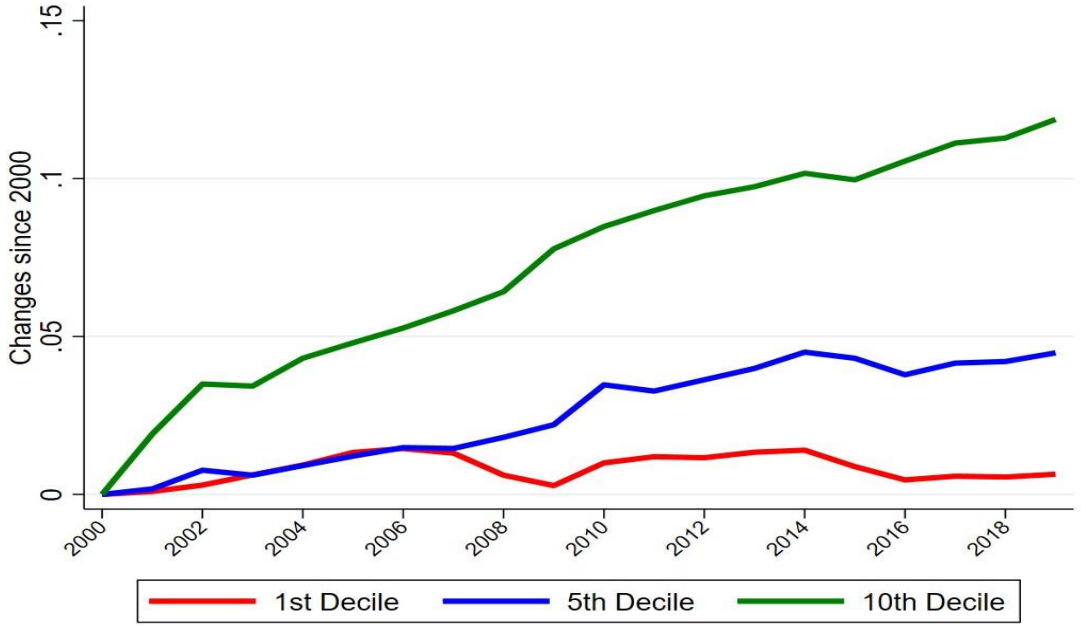
Average trends within country-sector - cumulative change in percentage points



Source: Calvino et al. (2020) "Declining business dynamism: structural and policy determinants", STI Policy Paper and Calvino and Criscuolo, 2019.

Markups are rising, driven by the highest markup firms

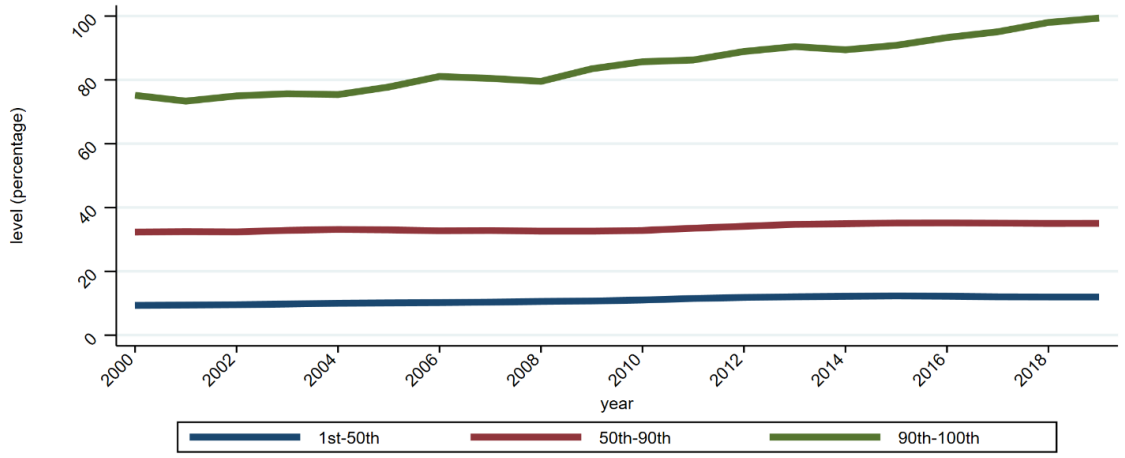
Markups growth over time (2000-2019) in different parts of the distribution



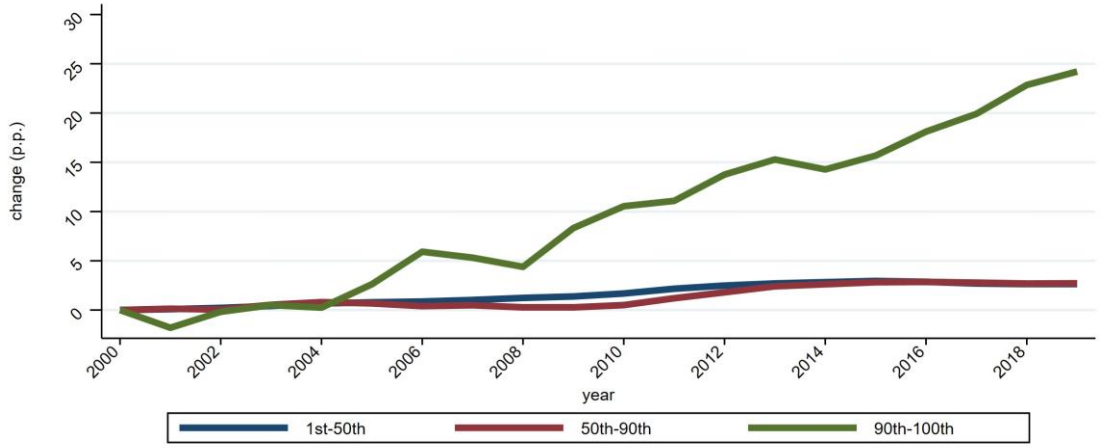
Source: OECD/PIE ongoing work, "Measuring and analysing the evolution of competition in the EU during the last 20 years". Figure based on Calligaris et al., (2018, 2022) "Mark-ups in the digital era", STI WP.

Industry concentration has risen

CR4 levels over time (2000-2019) in different parts of the distribution



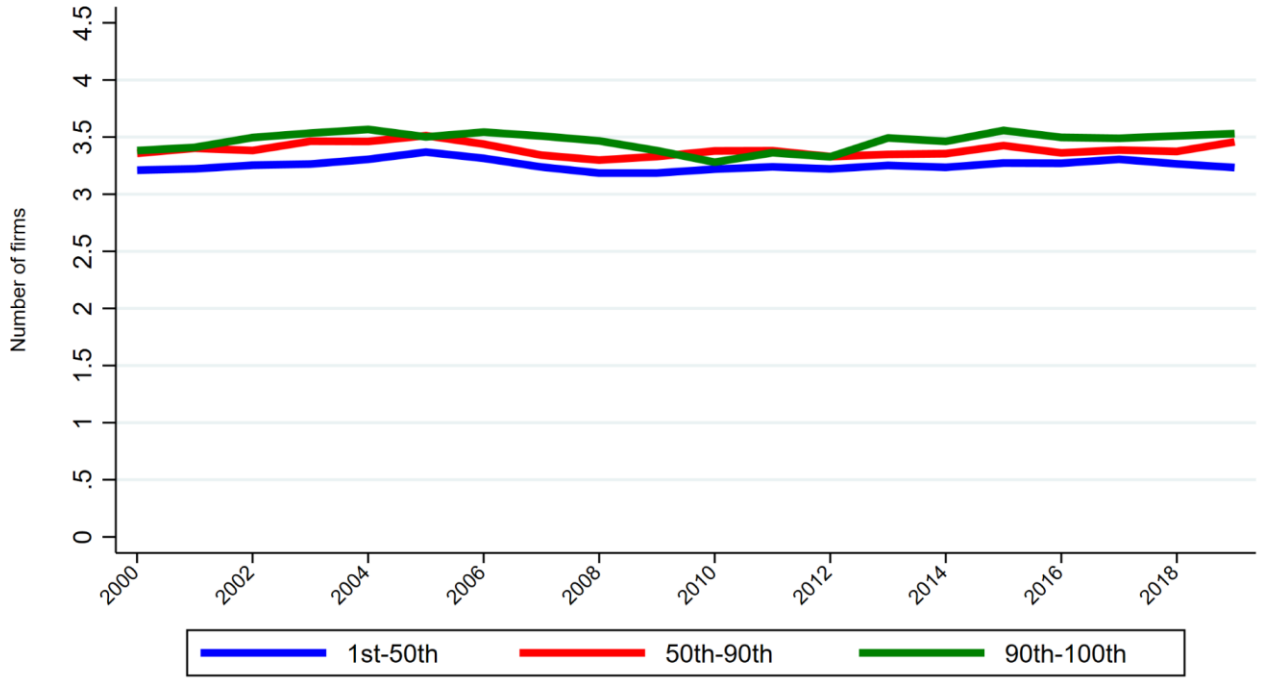
CR4 growth over time (2000-2019) in different parts of the distribution



Source: OECD/PIE ongoing work, "Measuring and analysing the evolution of competition in the EU during the last 20 years". Figure based on the methodology developed in Calligaris et al., (2019) "Industry Concentration in Europe and North America", STI WP.

Entrenchment rather high along the whole concentration distribution

Entrenchment levels (2000-2019) in different parts of the CR4 distribution



Source: OECD/PIE ongoing work, "Measuring and analysing the evolution of competition in the EU during the last 20 years".

The role of Competition and Product Market Regulation

Pro-competitive PMR as an incentive for lagging firms to boost their productivity – a few key channels

- Sharpening the **incentives** for incumbent firms to adopt better technologies (Bloom, Draca and Van Reenen., 2015; Perla, Tonetti and Waugh, 2015; Steinwender, 2015; Baily, 1993; Baily et al., 2005)

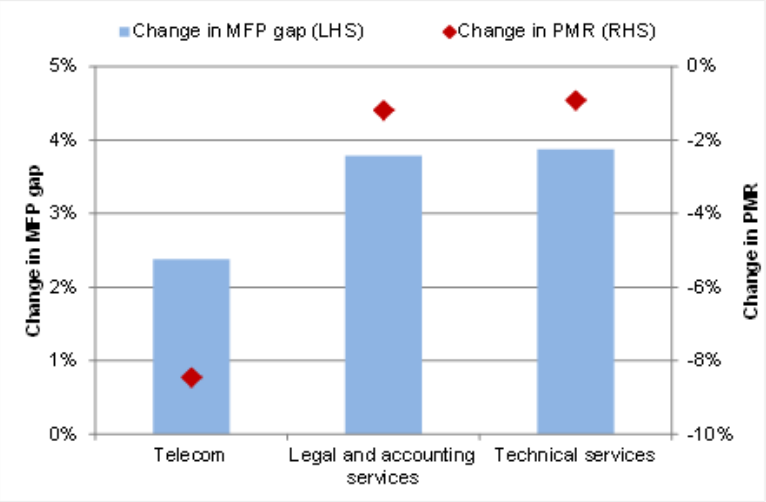
- Raising **managerial quality**, which is complementary to adoption (Bloom and Van Reenen, 2010; Bloom et al 2012)

- Reducing **entry barriers**: young firms possess a comparative advantage in commercialising leading technologies (Henderson, 1993; Baumol, 2002)

- Raising returns to technology upgrade in downstream manufacturing sectors via **input-output linkages** (Bourlès, Cette, Lopez, Mairesse and Nicoletti, 2013)

Slower reform goes hand in hand with a larger increase in the **productivity gap**

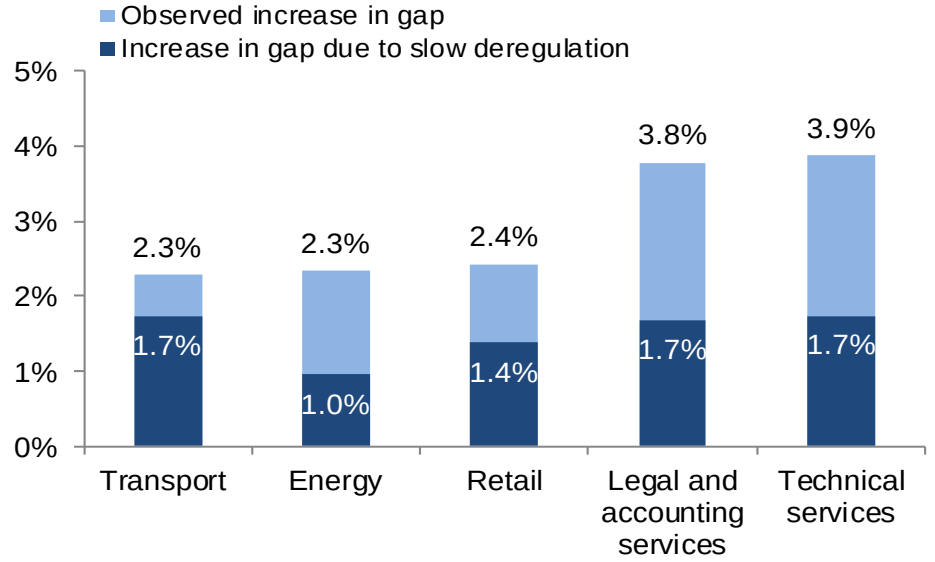
Selected industries; annual average change over time and across countries



Note: The figure shows the annual change in the (log) MFPR gap between the frontier and laggard firms and

the change in the (log) PMR indicator. Technical services refer to architecture and engineering.

Estimated contribution to the annual change in the MFP gap of the slower pace of reform *relative to the fastest reforming industry* (telecoms)

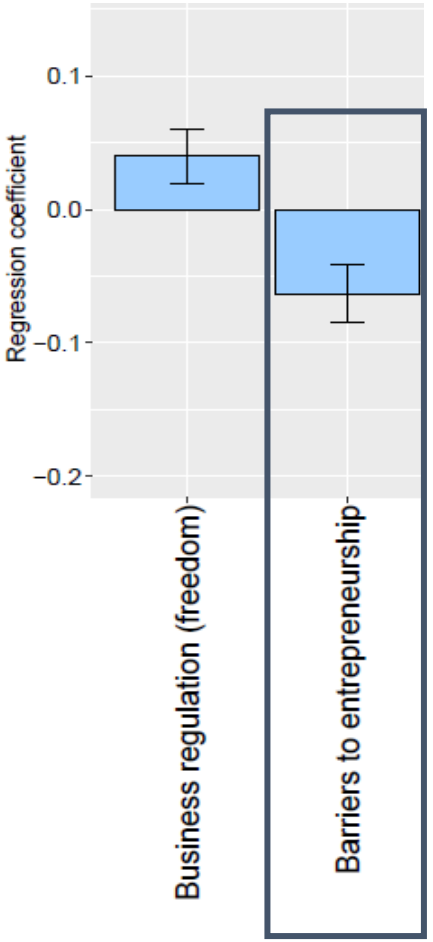


Source: Andrews, Criscuolo and Gal (2016)

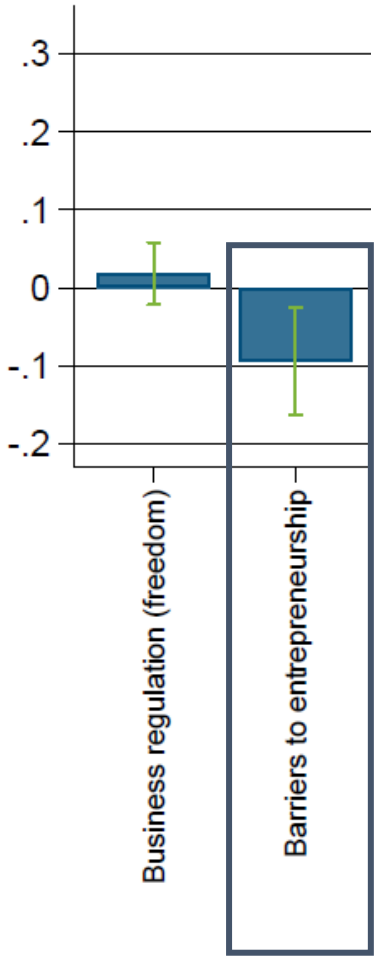
MFP divergence was perhaps inevitable due to structural changes in the global economy...but policy could have worked harder to counter such forces

The decline in dynamism is faster when barriers to entrepreneurship are stronger

Decline in entry rates



Decline in job reallocation rates



- **barriers to entrepreneurship**, from the OECD PMR database. [A high value of the index indicates stronger barriers to entrepreneurship.]

→ ***Main results:***

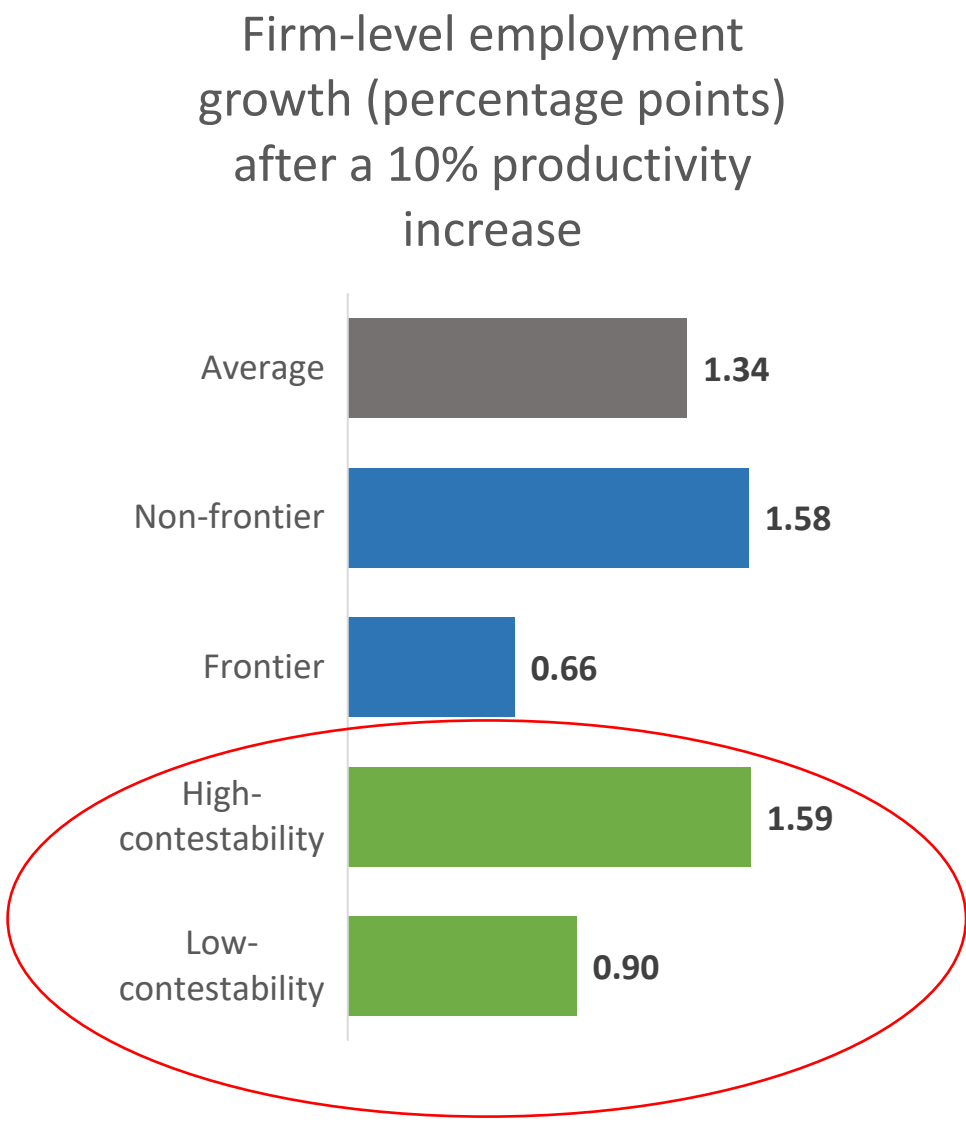
→ *High regulatory barriers to entrepreneurship amplify declines in entry rates and are associated with stronger declines in job reallocation.*

→ *Reducing administrative burdens for start-ups is particularly relevant in digital intensive sectors.* (F.Calvino, and C. Criscuolo (2019), "Business dynamics and digitalization", STI Policy Papers, No. 62.)

Source: F. Calvino, C. Criscuolo, R. Verlhac (2020) "Declining business dynamism: structural and policy determinants", STI Policy Paper No. 94.

The potential employment benefits from productivity growth rely on firms' ability to compete based on efficiency

- On average firm-level productivity growth and employment growth are positively associated
- This positive relationship relies on an indirect competition mechanism:
  - Firms that improve their relative productivity increase their sales and therefore labour demand
- This relationship is stronger for non-frontier firms
  - Higher potential employment gains associated with competing with the frontier
- This relationship appears stronger in more contestable markets (Measured as lower gap between firms' markups)
  - Asymmetries in market power may prevent firms to gain market shares when improving their relative productivity



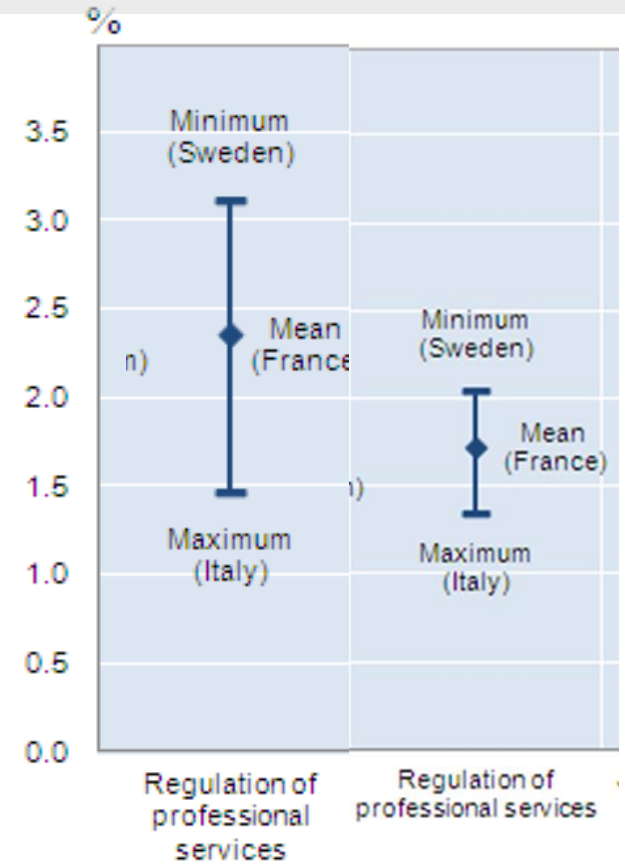
The ability of innovative firms to upscale depends on **regulatory burden** as well as on other framework policies

- Cumbersome PMR in business services may raise the cost of expanding the firm

- Indeed they are found to be negatively associated with **capital flows** to patenting firms and **employment growth** of patenting firms

Change in firm capital and employment associated with a 10% change in the patent stock

Selected OECD countries; 2002-2010



Source: Andrews, Criscuolo and Menon (2013)

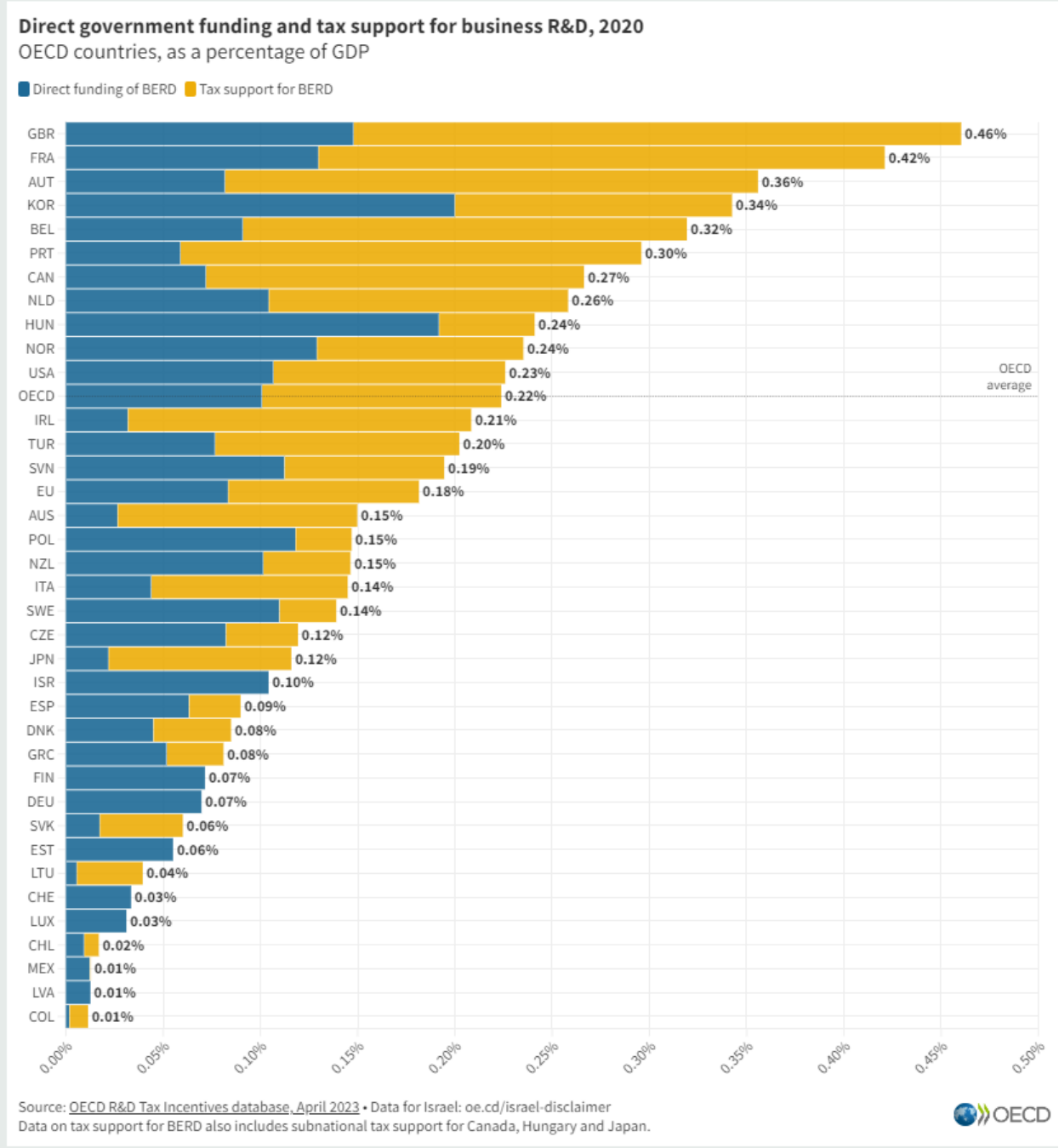
But Competitive business environment is not enough….

Policies tools complementary to competition

Policy areas			
New Industrial Policy (horizontal and targeted)	Supply-Push measures		*Demand Pull tools*
	Within	*Between*	
	Tax expenditures (e.g. R&D tax incentives), *grants, subsidies; Financial instruments; Skills policies; public R&D, infrastructure, energy*	*Entrepreneurship Policies*	*Product standards, Public procurement, Awareness raising campaigns*
Regulations and framework conditions	Increase business transparency, remove regulatory barriers (at country and EU level) and red tape (especially important for "potential" entrants), Intellectual Property Systems, judicial efficiency, financial markets, tax system		
Trade policy	Openness, level playing fields Single Markets (in products and services) Bilateral agreements		
Education/Skills Policies, research and Migration	STEM, training, Apprenticeships, Visas, etc.		
Ecosystem/Coordination	University-Business linkages ; University entrepreneurship / incentives for commercialisation		

Supporting Business R&D expenditure

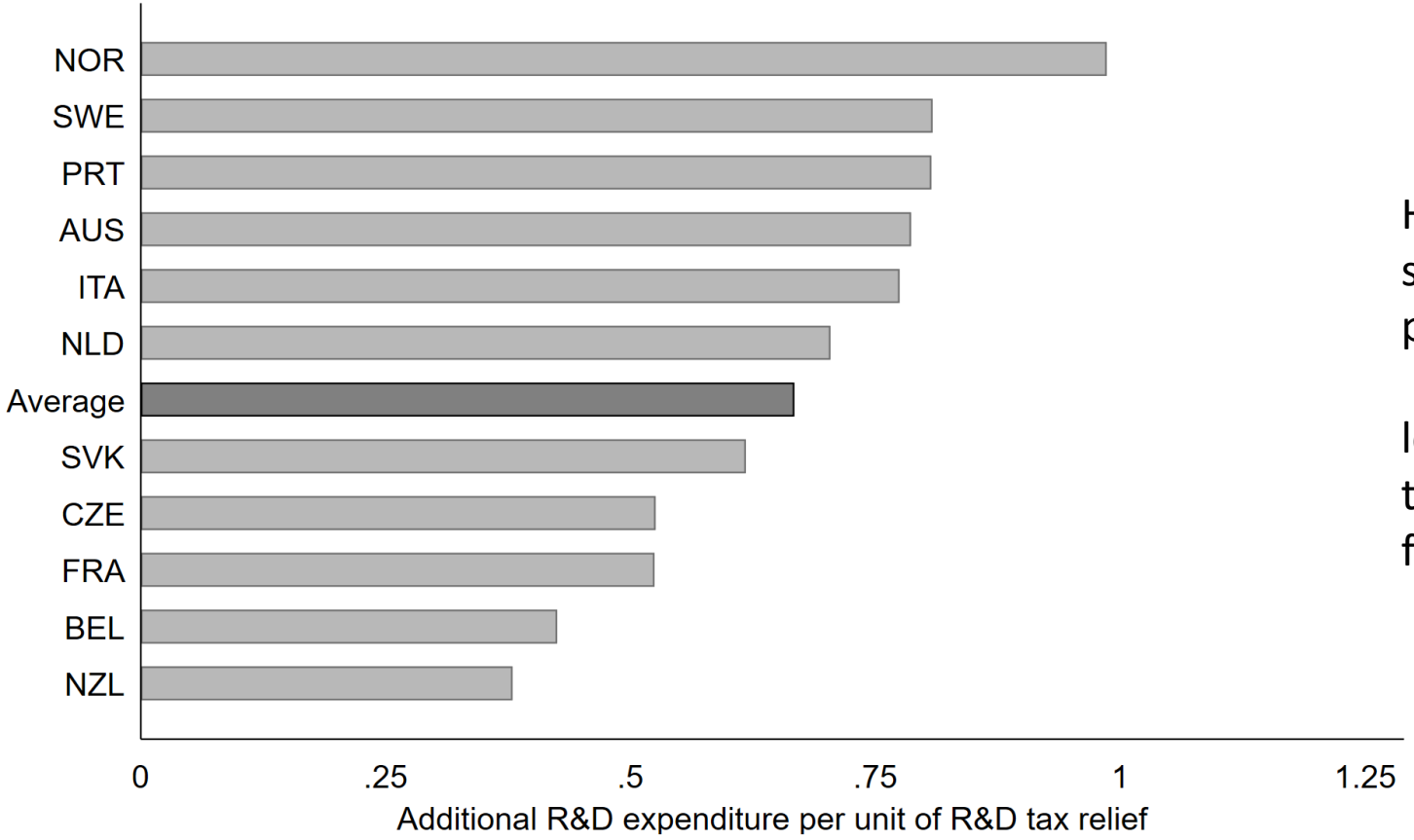
- Investment in R&D key for economic growth (Romer, 1990; Aghion and Howitt, 1992).
- On average, Over 2/3 of R&D in OECD countries performed within private firms (OECD, 2023).
- Externalities/Market failures:
  - Knowledge spillovers from R&D mean that, on their own, private firms will invest in R&D less than what is socially optimal.
  - Information asymmetries between firms and investors leading to credit constraints
- To correct for knowledge externalities and information asymmetry/credit constraints, governments subsidise business R&D.
- Across countries, the number one policy tool to do so is R&D tax incentives,which accounted for more than half of the total government support for business R&D in the OECD area in 2021 (OECD, 2024).



Estimated Aggregate Incrementality Ratios (IRs)

- Appelt, et al (2020 and 2023) based on firm level data from 21 countries shows that R&D tax credit are linked to higher R&D expenditures especially amongst SMEs.
- Design matters! :Business responsiveness to R&D tax incentives: doubles if refundable R&D tax credit (SMEs)

  ○decreases by a 1/3 if upper ceiling/ threshold (large firms)



Highest in countries where R&D tax relief limits support: binding ceiling (Norway, Sweden) or preferential treatment for SMEs (Australia).

lowest in countries where no preferential treatment (Czechia, Belgium) or binding for few firms (France).

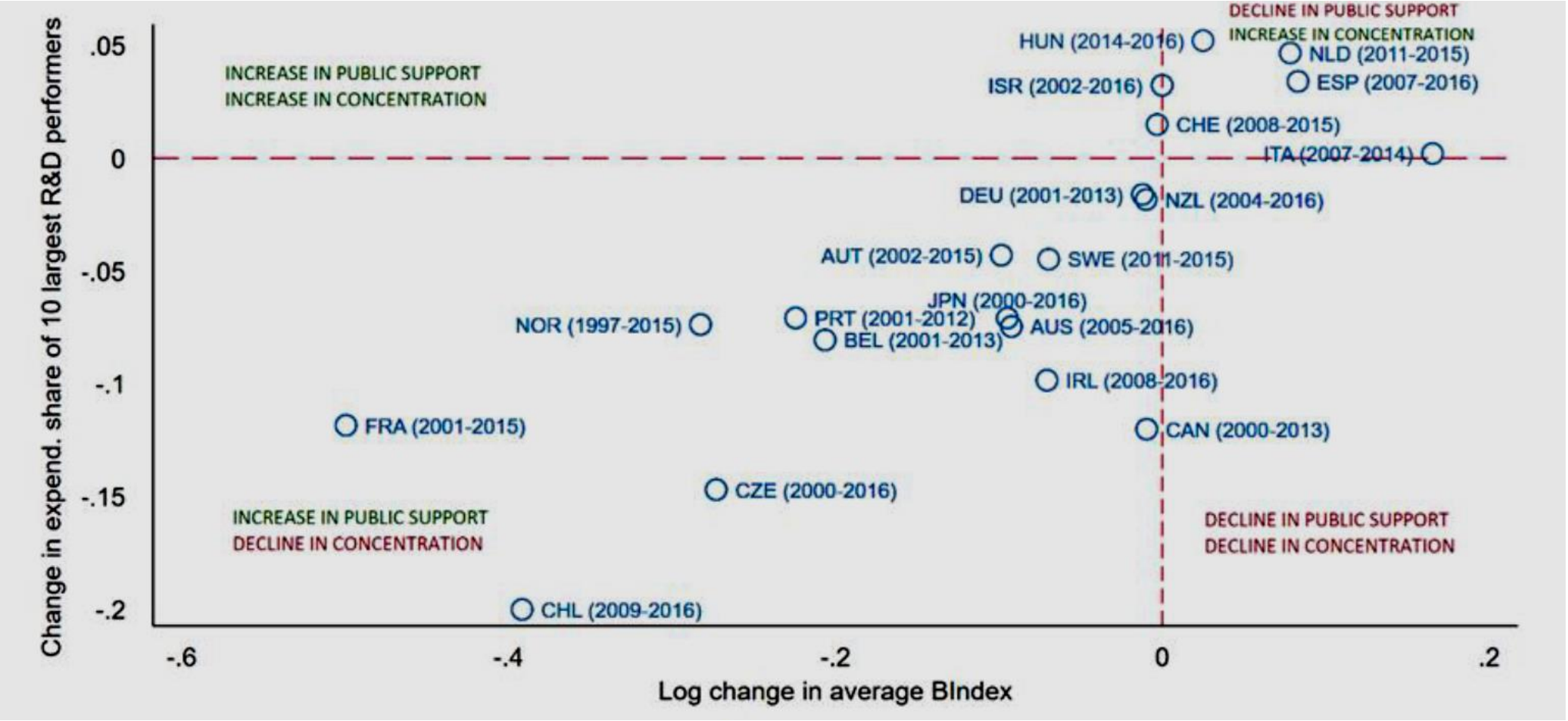
Note: $IR_{ct}^{agg} = \sum_i \sum_s w_{cist} IR_{cist}$ *where* $IR_{cist} = \frac{-e_{cis}}{1-(1-\overline{BIndex}_{cist})(1+e_{cis})}$ *and* w_{cist} R&D tax relief share received by firms in country *c*, industry *i* and size class *s* in the total R&D tax relief in 2019

Industrial policy must preserve contestability of markets

- Risk: Innovation policies may favour incumbents and firms that already have the capacity to innovate
- Design of policies matters. Industrial policies should:
  - Not discriminate against entrants and potential entrants
  - Facilitate exit of inefficient firms
- Insights from theory: Innovation support policies risk reducing growth and welfare, if not coupled with policies encouraging the exit of inefficient firms and entry of innovative ones (Acemoglu et al., 2018)

R&D tax Incentives and R&D Concentration

Changes in business R&D Concentration and the cost of R&D (B-Index) , between the first and the last year for each country



Source: Appelt et al., (2022) based on OECD microBeRD project, https://oe.cd/microberd, November 2021.

Note: 19 Countries; AUS, AUT, BEL, CHE, CHL, CZE, DEU, ESP, FRA, HUN, IRL, ISR, ITA, JPN, NLD, NOR, NZL, PRT, SWE

For each country, the figure plots a change in national R&D concentration across firms (establishments in the case of Israel) against the log change in the average B-Index. The changes are calculated between the first and last year available in the data for each country. The micro-aggregated statistics reported for Ireland are based on tax relief microdata and not directly comparable with the R&D survey-based results reported for other countries.

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Does Competition matter for Productivity and Innovation?

Productivity and Innovation, in its rate and direction, both determines and is affected by competition

The Relationship with innovation is theoretically complex and challenging to measure

Fundamental trade-off

- **market dynamism and creative destruction**: entry of innovative firms, threat of entry to incumbents, and exit of inefficient firms *(ex-ante)*
- **Market power**: recovering the fixed costs of innovation requires either sufficient scale or profitability per unit *(ex-post)*