EUROPEAN CENTRAL BANK

EUROSYSTEM

Understanding the productivity growth slowdown in the euro area:

Insights from the ESCB expert group on productivity

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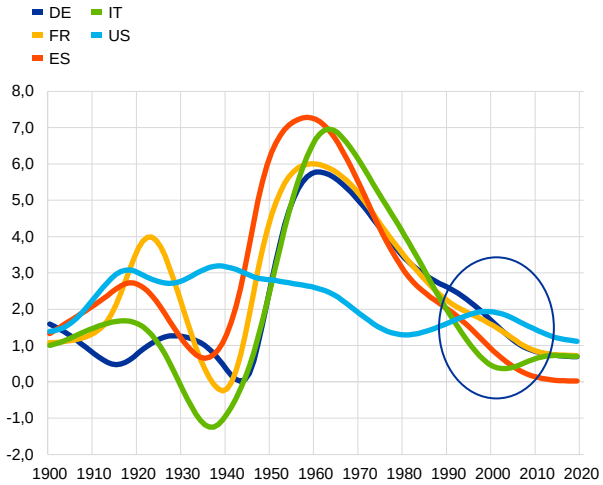
The expert group on productivity of the European System of Central Banks (ESCB)

- Established in 2019
- About 50 members, from the ECB and 18 NCBs
- Chaired by Wolfgang Modery; coordinated by me
- Share data and codes, extend one-country analysis and collaborate in new analysis
- Work in 2 phases:
  - 2021; Analysis of EU productivity trends (all the basics) – 2021
  - 2024: Analysis of the impact of COVID and the digital and green transition
  - Coming up (2025): monetary policy and productivity

The big picture

Productivity growth on a declining trend in advanced economies since decades

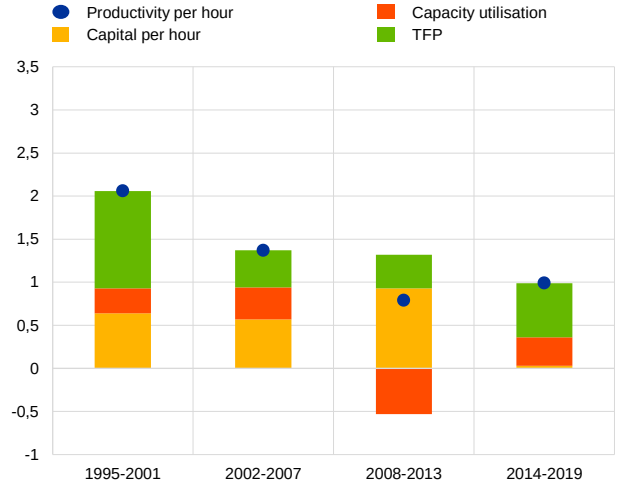
Trend in real GDP per hour growth, smoothed annual %



Source: Authors' calculations on Bergeaud, A. et al. (2016)
Notes: The trend is calculated using a Hodrick-Prescott filter with a smoothing parameter lambda of 10

Main driver is declining Total Factor Productivity (TFP) growth, and weak capital deepening after 2013

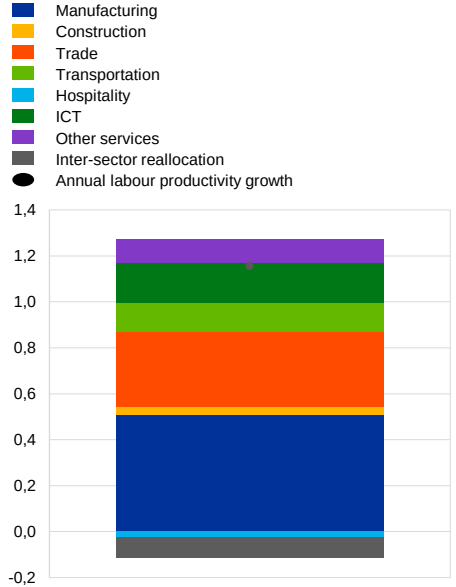
Contributions to growth in GDP per hour, EU-27 different periods



Source: Authors' calculations on AMECO, Eurostat, European Commission and Board of Governors of the Federal Reserve System (US) data.

Strong dependence on the manufacturing sector

Contribution of sectors to annual productivity growth, average 1996-2017



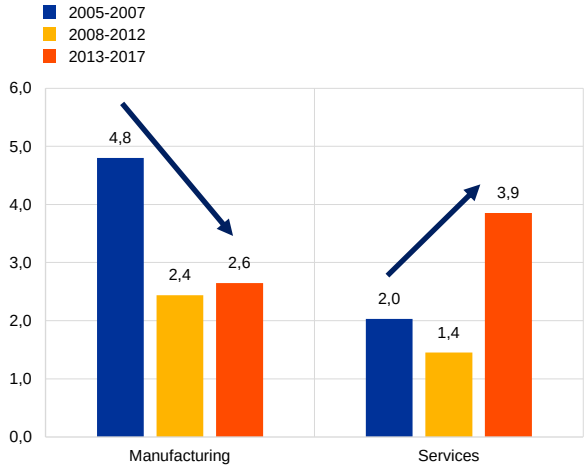
Source: Authors' calculations on Eurostat, NACE 2-Digits data. Productivity measured as value added per hour worked

Comparison with US

Weak TFP growth: Slow technology creation

Frontier manufacturing firms are slowing technology creation…

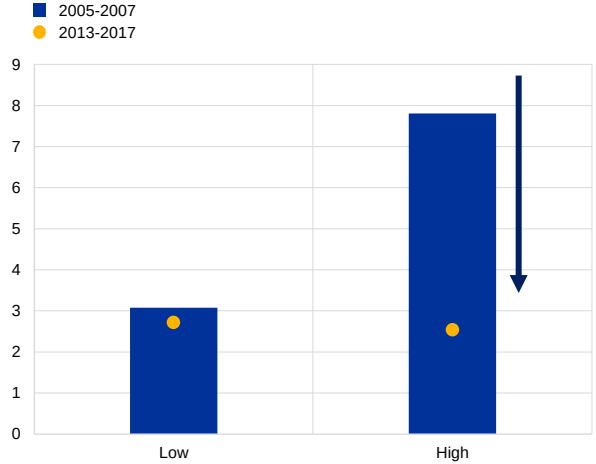
Average annual TFP growth of euro area frontier firms, different periods



Sources: Own calculations using ECB iBACH-Orbis.
Note: Weighted average annual TFP growth rates of the top 5% most productive firms in DE, FR, IT, ES, BE and PT in a given year and 4-digit industry.

…in particular in high-tech manufacturing sectors

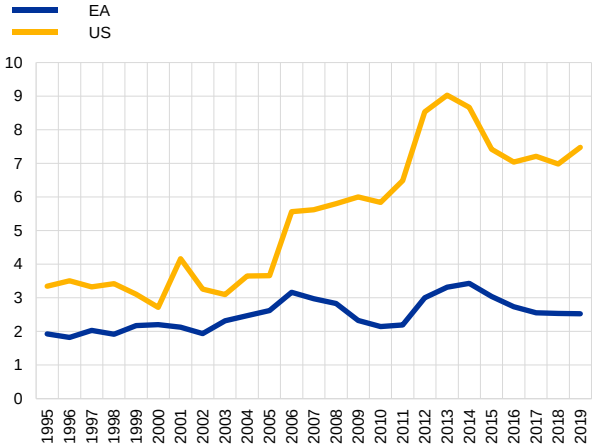
Average annual TFP growth of frontier firms by sectoral technology intensity in manufacturing



Sources: Own calculations using ECB iBACH-Orbis
Note: High and low technology intensive according to R&D intensity following the Eurostat classification. Data includes pooled data from DE, FR, IT, ES, BE and PT.

Falling behind the US in AI-related innovation

AI-related patents as a share of total triadic patents, EA vs. US, in %

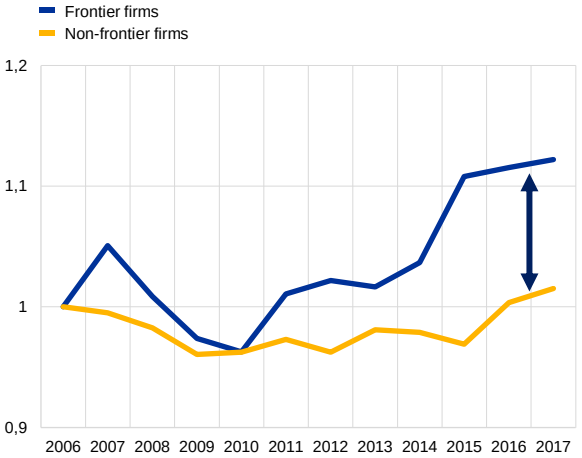


Source Google Patents on triadic ICT-related patents

Weak TFP growth: Slow diffusion of new technologies

Increasing innovation in services but diffusion to all firms is slowing down

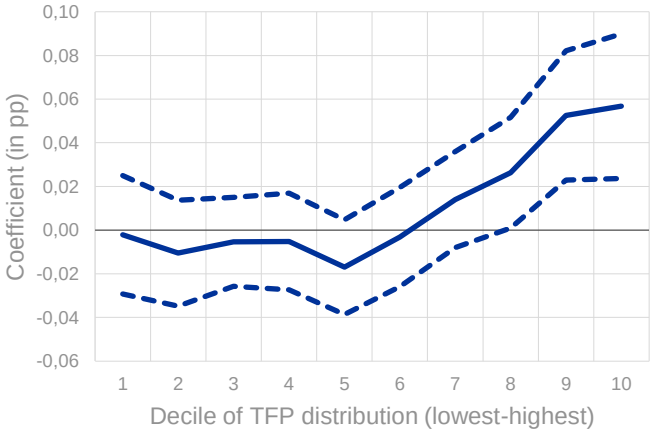
TFP gap between frontier and laggard firms in the service sector over time, pooled sample 6 EA countries



Sources: Own calculations using ECB iBACH-Orbis for DE, FR, IT,ES, BE and PT.
Notes: Frontier firms are the top 5% of the TFP distribution in a given year and 4-digit industry. Laggards are the median firm in a given year and 4-digit industry.

Gap between frontier and laggard firms can worsen with new digital technologies…

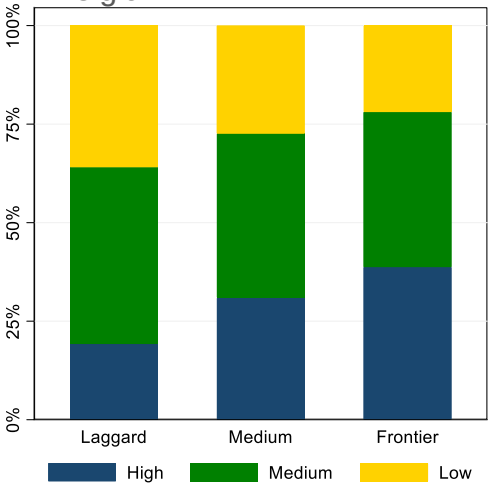
Marginal impact of sector digital intensity on TFP growth by TFP decile



Source: Anderton et al. (2023)
Note: Estimated impact of 1 pp increase in sector digital intensity on the TFP growth of firms operating in the sector, as a function of their initial TFP level

…because firms need complementary skills and investments to reap the benefits from digitalisation

Human capital by type of firm, Belgium

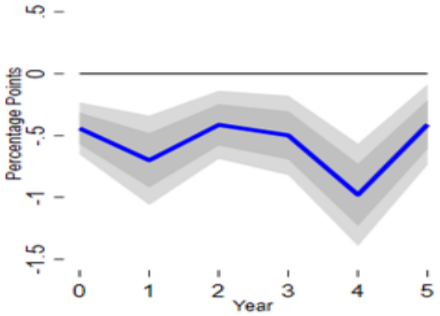


Source: Authors' calculations on employer-employee Belgian data
Note: simple averages across all two-digit sectors and over time.

Structural green transformation adds to the short-term challenges, but can be an opportunity in the long run

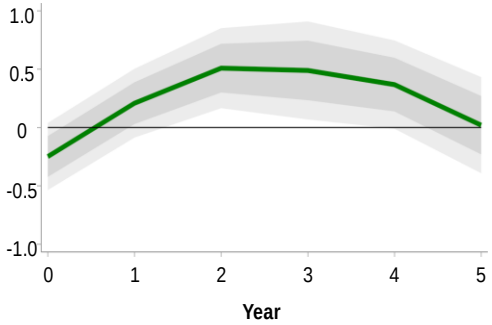
Environmental policies will be costly in the short-term, in particular for small firms with limited access to capital…

Change in TFP growth of polluting firms after tightening environmental policy, in pp



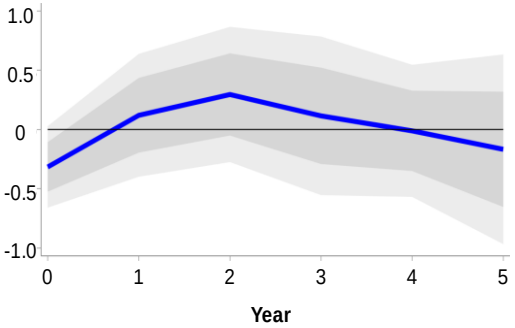
…but will support green innovation with positive productivity impacts in the long-term…

Increase in green patent applications of polluting firms after tightening environmental policy, in pp



…without crowding-out other innovations

Non-green patent applications after tightening environmental policy, polluting firms, in pp



Source: Bentatti et al. (Journal of Environmental and Economic Management 2024), and Benatti et al. (ECB WP 2024)

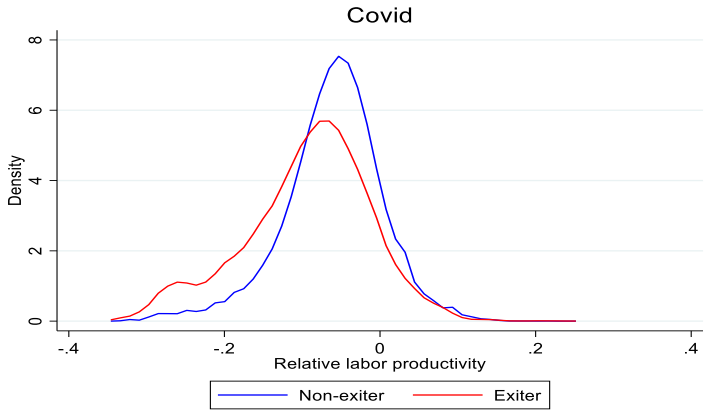
Notes: Impulse responses of polluting firms' TFP growth and green patent applications to 1 pp tightening of the environmental policy indicator over 5 years. Environmental policy measured by the OECD Environmental Policy stringency indicator. Data for DE, FR, IT, ES, BE and PT, 2003-2019 from ORBIS-iBACH. Patent date from ORBIS IP database

Data; impact on small firms

Recent shocks with a negative impact on productivity growth: the impact of the pandemic

Despite being a different type of shock, there was cleansing during the pandemic although to a lesser extent than in other crises

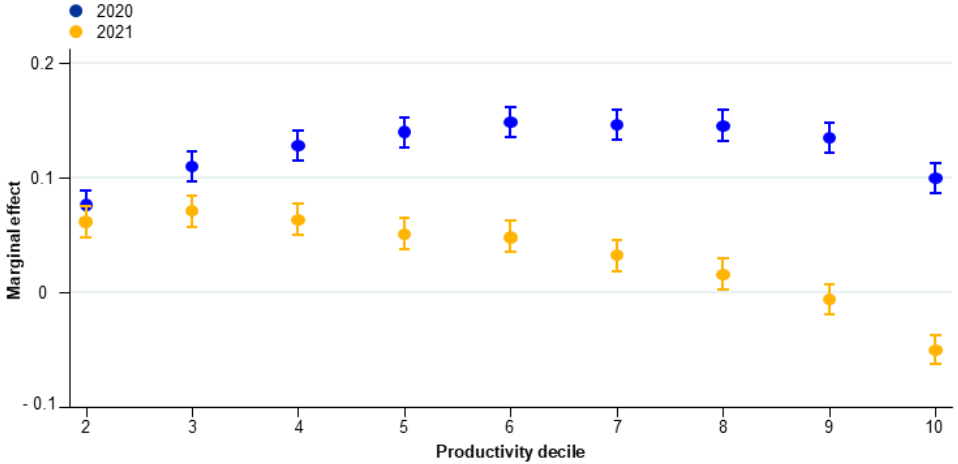
Productivity of exitors relative to incumbents in their same market: 2020



Source: Authors' calculations on ECB iBACH-Orbis.
Notes: DE, FR, ES, IT, BE and PT. GFC is 2008-09 and COVID-19 refers to 2020. Sector-specific distributions aggregated using sector value added weights; low productive firms defined as bottom 50% in each sector

Policy support was fundamental to avoid a wave of bankruptcies, but mitigated cleansing when extended over time

Probability of receiving wage subsidies by productivity of the firm, 2020 and 2021 (average across countries with data)



Source: Authors' calculations on firm-level data from HR, LV and SK
Notes: Changes in the probability of receiving subsidies for a change in firm productivity decile with respect to the lowest productivity decile. The whiskers represent confidence intervals.

Evidence on mitigated cleansing effect

What have we learnt?

Secular decline in trend labour productivity growth and recent negative developments

- Driven by **declining contribution of TFP growth** and weak capital deepening
- **Climate policies** with a **negative** TFP impact over the **short-term**
- **Recent shocks** (COVID, energy, bottlenecks) with **negative TFP impact**

Why is TFP growth declining? Lack of innovation and diffusion of new technologies

- **Decline in innovative edge** in manufacturing
- **Increase in gap** with the US in **AI-related innovation**
- **Slow diffusion** of new technologies to laggards
- **Productivity impacts** of digital technologies **not significant in most firms**

Some positive news over the medium-term

- **New wave of innovation in green technologies**
- **Faster diffusion of genAI** than previous digital technologies
- Some of the required complementary investments foreseen under **NGEU**

Thanks for your time and interest!

Background slides

Main messages from the COVID-19 report

1. Reallocation of resources across firms was productivity-enhancing, but less than in other crises;
2. Policy support supported the survival of firms; broadly well targeted in 2020 but less so in 2021;
3. The pandemic triggered structural changes with possible impact on long-term productivity growth: 1) online sales boom; 2) telework; 3) labour supple (sick leave, schooling) – here

Main messages from the digitalisation report

1. Digital uptake low, compared to the US, and uneven across countries and types of firms
2. Productivity gains from digitalisation estimated to be low (and heterogeneous), although productivity growth would have been much lower without digitalisation
3. Important complementary role of skills, investment in other intangibles and institutions

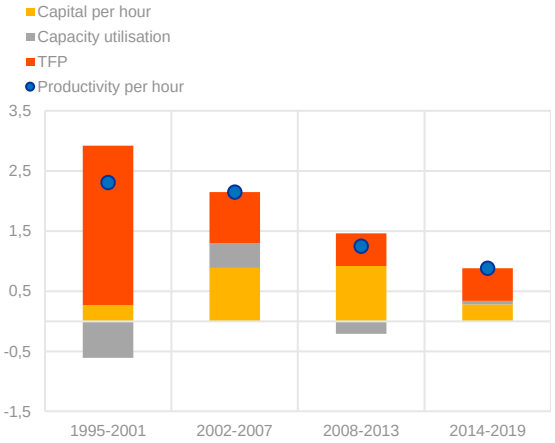
Main messages from the climate report

1. Climate change will impact EU countries/regions heterogeneously
    - Depending on average temperature, sector composition, adaptation efforts and complementary factors (development, insurance coverage, fiscal space…)
2. A disorderly transition will have a negative impact on productivity growth over the long-term
3. Transition policies can spur green innovation, with no crowding-out effects, but resulting productivity gains will take time to realise;
    - Impact of transition policies on firms depend on their size, access to finance and innovativeness
4. Transition policies will trigger resource reallocation across sectors and within sectors, with different impacts on aggregate productivity depending on the sector

Past productivity trends: US

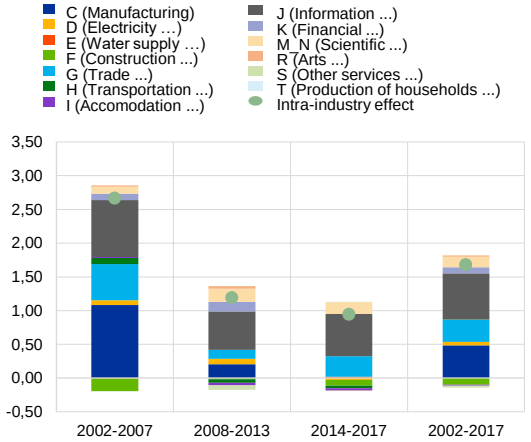
Same developments in the US but stronger TFP growth drives higher labour productivity growth

(Growth accounting decomposition of labour productivity growth; in percentage points)



ICT is the main contributor to intra-industry productivity growth

(in percentage points)



Sources: Own calculations on AMECO data.

Transition policies: Impact on different firms

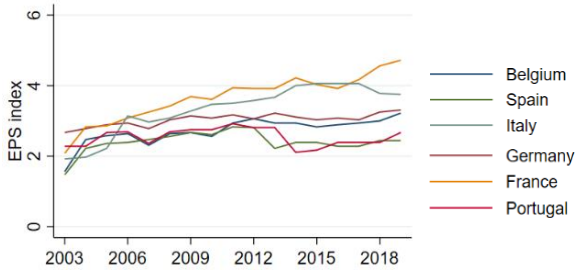
There will be winners and losers; advantage for large polluting firms with easier access to capital and innovation-prone structures

Impact of 1 pp increase in EPS on polluting firms TFP growth at different extremes of the size, equity ratio and innovativeness distribution after 3 years. Different policies

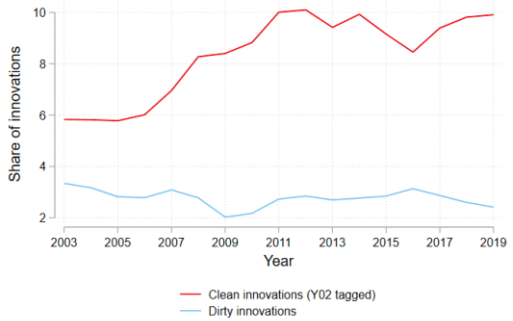
Source: Bentatti et al. (2023), and Benatti et al. (forthcoming 2024)
Notes: Impulse responses of polluting firms' TFP growth to 1 pp EPS shocks (positive changes) after 3 years. Environmental policy measured by the OECD Environmental Policy stringency indicator. Data for DE, FR, IT, ES, BE and PT, 2003-2019

Data

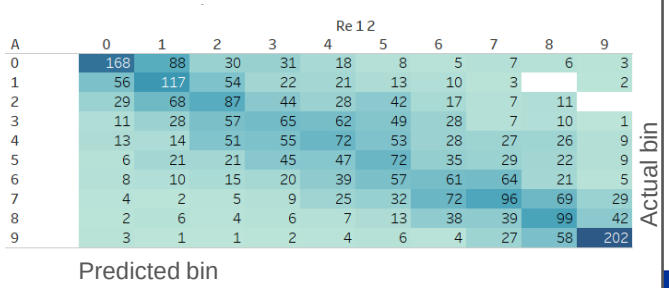
- Environmental Policy Stringency (EPS) indicator by OECD
  - 3 sub-indicators: market, non-market, technology support (from 0 to 6)



- Orbis & iBACH: firm level data
  - 6 EA countries: BE, FR, DE, IT, PT, SP (2003-2019)
  - Orbis IP database to identify firms' green and brown innovations (patent families)

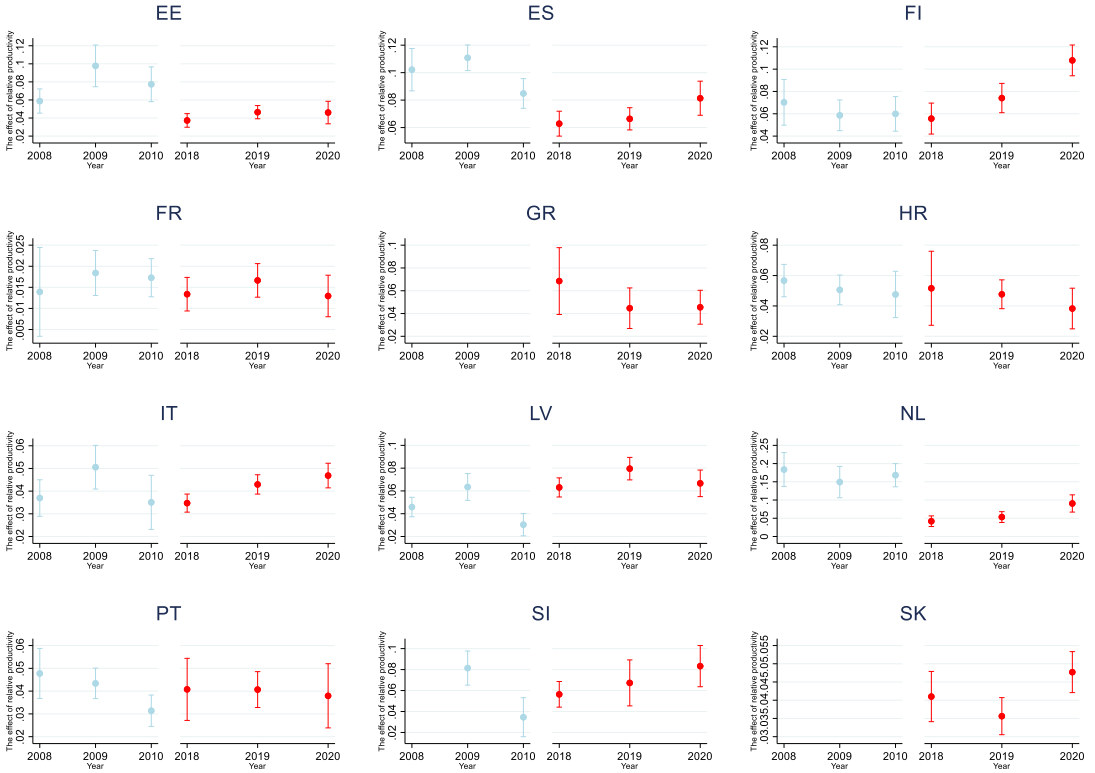


- Urgentem data:
  - 35k large firms
  - Machine learning algorithm: Extreme Gradient Boosting (XGBoost)
  - Estimation of CO2 equivalent emission for each firm in the sample



Mitigated productivity-enhancing reallocation, relative to other crises

Elasticity of employment growth to relative firm's productivity over time, GFC vs. COVID-19



Source: Authors' calculations based on individual firm data originating from the included countries.
Notes: Elasticity of firm-employment growth to its productivity relative to the average in the sector. A higher elasticity implies a wider gap in employment growth of high versus low productivity firms, and therefore higher productivity-enhancing reallocation. The elasticity has been estimated for years around the Global Financial Crisis and around COVID.

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What is needed?

- Fast implementation of **RRPs**
- Leverage on **competitive advantages of the EU**
- Complete **single market: scale!**
- **Facilitate access to finance**, also for small firms (CMU)
- **Support laggards** so they are able to benefit from existing new digital and green technologies