

Digitalisation and productivity

Innovations in tech contributing to transport sector productivity



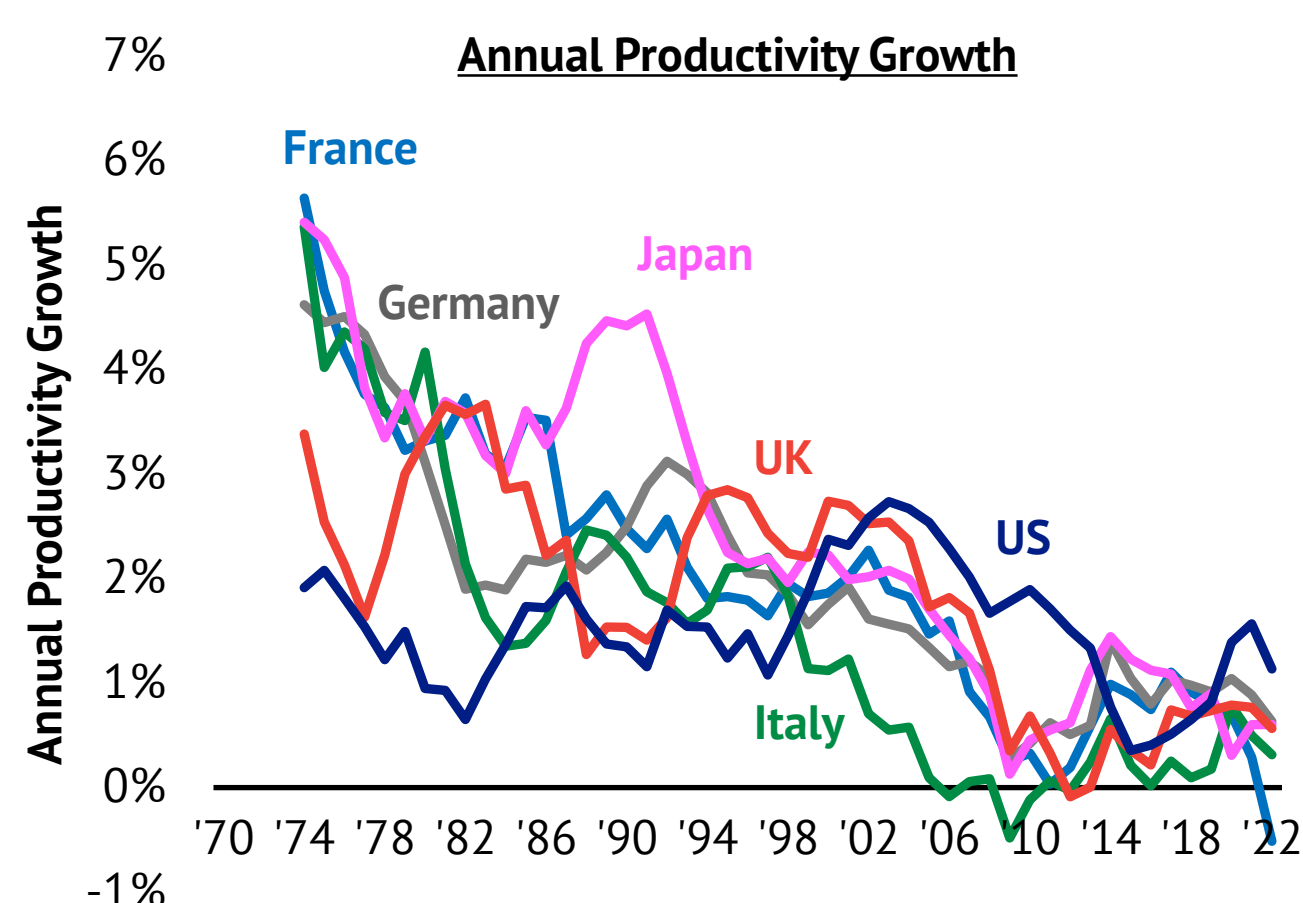
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1. Background

- Productivity is one of the **key drivers of economic growth** – bringing better services, higher wages, and greater quality of life.
- However, since the 1970s, **productivity growth in developed countries has been slowing down**, especially after the 2008 financial crisis.
- Modern **information and communication technologies (ICTs)** may be the solution – enhancing efficiency, reducing costs, and driving Innovation.



- While the **transport sector** is critical for global supply chains, it is **one of the least digitalised** – only 64% of firms use digital tech.
- The sector is also the **largest global GHG emitter** (23%).
- ICT adoption may thus greatly benefit the transport sector – **lowering energy use & emissions and increasing productivity.**

Research questions

- What impact does greater digitalisation have on **labour productivity** in the transport sector of 20 OECD countries in 1995–2019?
- How does greater adoption of ICTs influence **energy productivity** in the transport sector in the same period?

2. Contribution

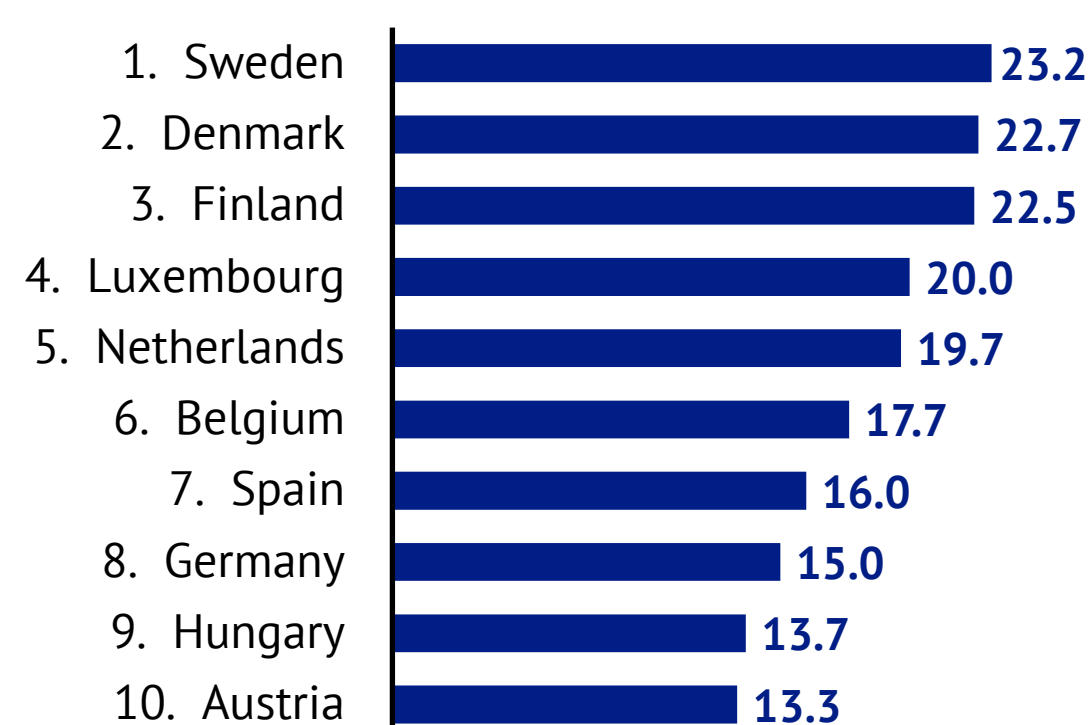
- Understanding the impact of digitalisation on productivity in the transport sector is limited.
- We look at both **labour productivity (LP)** and **energy productivity (EP)**, using the **latest available data**.
- Our results could benefit governments in their **productivity policies** and contribute towards **reversal of the low productivity growth**.

3. Data

- Dataset constructed from **four main sources**:
 - EU KLEMS**: Data on capital, labour, growth, and national accounts.
 - Groningen Growth and Development Centre**: PPP data.
 - IEA Energy Prices**: Non-electric and electricity industrial prices.
 - IEA World Energy Balances**: Detailed energy use across sectors.

- This data is complemented by variables from OECD, Eurostat, World Bank, and the US Bureau of Economic Analysis.
- This creates a panel dataset for five transport subsectors, 25 years (1995–2019), and 20 OECD countries.

Level of Digitalisation Score – EU (out of 27)



4. Methodology

- The dependent variables – **labour productivity (LP)** and **energy productivity (EP)** are defined as:

$$LP = \frac{\text{Real value added}}{\text{No. of employees}} \quad (1) \quad EP = \frac{\text{Real value added}}{(\text{En. cost} * \text{En. use})} \quad (2)$$

- The model is then estimated using **weighted panel fixed effects (FE)**:

$$\ln Prod_{i,t} = \beta_0 + \beta_1 \ln ICT_{i,t} + \beta_2 \ln X_{j,i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t} \quad (3)$$

- i represents countries/sectors
- t represents the years
- j is the number of control vars
- $Prod_{i,t}$ is LP or EP
- $ICT_{i,t}$ share of ICT capital in total capital
- $X_{j,i,t}$ are control variables
- α_i are country/sector FE
- γ_t are time FE
- $\varepsilon_{i,t}$ is the error term
- The **control variables include**: share of high-skilled workers, share of females, measures of corruption and investment, exports, infrastructure, R&D capital, and energy prices.

5. Results

1) Impact of ICTs on LP and EP

- ICTs have a significant positive impact** on both labour and energy productivity in the transport sector.
- Effect on energy productivity is **generally stronger**.
- ICT share ↑ from 10% to 11% increases LP and EP **by 1% and 1.5%, respectively**.
- Higher share of high-skilled workers, females, and lower corruption positively affect productivity

2) Impact of ICTs across time

- Examining the **structural break in 2009**, we **split the sample** into two subsamples: 1995–2008, and 2009–2019.
- After 2009, the impact of ICT capital becomes **smaller**, but still very significant.
- After 2009, ICT share ↑ from 10% to 11% increases LP and EP **by only 0.6% and 0.8%, respectively**.
- Thus, the positive ICT effect on **LP reduced by about 60%**, and by around **20% for EP**.

3) Impact of ICTs across transport intensity

- Looking at **transport intensity across countries** (share of transport sector value added in total value added).
- ICTs are more impactful** on both LP and EP in **less transport intensive countries**.
- In **low transport intensive** countries, ICT share ↑ from 10% to 11% increases LP and EP **by 1.5% and 2%, respectively**.
- In **high transport intensive** countries, this is **0.5% for LP and 0.4% for EP**.

