THE GLOBAL PRODUCTIVITY SLOWDOWN, TECHNOLOGY DIVERGENCE AND PUBLIC POLICY: A FIRM LEVEL PERSPECTIVE

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Slow Growth in Productivity: Causes, Consequences and Policies
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Weak labour productivity underpins the collapse in OECD potential growth

Contribution to potential per capita output growth (% pts unless otherwise noted)

The debate (e.g. Gordon vs Brynjolfsson) has centred on innovation prospects at the global frontier (GF) but we know little about GF firms.

Our **firm level** analysis suggests:

- Labour productivity (LP) at GF remained robust but laggard firms increasingly fell behind.

- LP divergence reflects MFPR divergence and possibly technological divergence, broadly defined (i.e. intangibles).

- Some explanations: “winner takes all” dynamics and stalling diffusion.

- Policy weakness potentially amplified MFPR divergence and the aggregate productivity slowdown.

**Our contribution:** *brining micro evidence to a largely macro debate*
PRODUCTIVITY DIVERGENCE: NEW FIRM LEVEL EVIDENCE FROM 24 COUNTRIES
Rising labour productivity gap between global frontier and laggards

Average of labour productivity across each 2-digit sector (log, 2001=0)

Average of MFPR (Wooldridge) across each 2-digit sector (log, 2001=0)

Manufacturing

Services

Capital deepening plays less of a role

... which may reflect technological divergence

Average of mark-up adjusted MFPR across each 2-digit sector (log, 2001=0)

Divergence remains after correcting for mark-ups behaviour

PRODUCTIVITY DIVERGENCE: STRUCTURAL DRIVERS
Technological divergence: winner takes all dynamics?

MFPR

ICT-intensive services

Non ICT-intensive services

Frontier firms

Laggards

Top 10%

Top 2%
Technological divergence: winner takes all dynamics?

Sales

ICT-intensive services

Non ICT-intensive services

Frontier firms

Laggards

Frontier firms

Laggards
Higher MFPR divergence, weaker aggregate MFP performance

Residual aggregate MFP and the MFPR gap at the industry level; 1998-2007

Data averaged across 12 OECD countries and purged of industry and year fixed effects

Source: EU KLEMS and authors calculations based on ORBIS data
Technological divergence: is declining market contestability an issue?

Declining firm turnover: fewer young firms, while marginal firms increasingly survive.

A higher productivity threshold for entry, while marginal firms survive despite a collapse in their MFPR.

Notes: Non-viable old firms are those older than 10 years that record negative profits over at least two consecutive years. The omitted group are firms older than 10 years that do not record negative profits over at least two consecutive years (viable old firms).
PRODUCTIVITY DIVERGENCE: 

ROLE OF POLICY
The pace of market reform in services has slowed over time

The restrictiveness of product market regulations

A: Network industries  B: Professional Services

A large literature links competitive pressures to within-firm productivity growth and technology adoption

MFP divergence greatest in sectors where reform lagged.

Notes: The horizontal line in the boxes represents the median, the upper and lower edges of each boxes reflect the 25th and 75th percentiles and the markers on the extremes denote the maximum and the minimum across countries.
Sluggish market reform effort in services amplified MFP divergence

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

- **Transport**: 2.3% observed increase in gap
- **Energy**: 2.3% observed increase in gap
- **Retail**: 2.4% observed increase in gap
- **Legal and accounting services**: 3.8% increase in gap due to slow deregulation
- **Technical services**: 3.9% increase in gap due to slow deregulation

MFP divergence was perhaps inevitable due to structural changes in the global economy but policy could have worked harder.
A1. Characteristics of the global frontier
A2. Divergence: robustness
A3. Divergence: capital deepening
A4. Divergence: mark-ups
A5. Divergence: sales
A6. Divergence: comparisons with industry data
A7. Divergence: longer term evidence from industry data
A8. Entrenchment at the global frontier
A9. Slowing convergence to the frontier
A10. Divergence & market reform in services: descriptives
A11. Divergence & market reform in services: econometrics
A1. The globally most productive firms: Who are they?

### A: Labour productivity based frontier definition

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sector: manufacturing</th>
<th>Sector: services</th>
<th>Difference</th>
<th>Sector: manufacturing</th>
<th>Sector: services</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Laggard firms</td>
<td>Frontier-firms</td>
<td>Difference</td>
<td>Laggard firms</td>
<td>Frontier-firms</td>
<td>Difference</td>
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<tr>
<td></td>
<td>Mean</td>
<td>St.dev.</td>
<td>N</td>
<td>Mean</td>
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<tr>
<td>Productivity</td>
<td>10.7</td>
<td>0.6</td>
<td>21,191</td>
<td>12.0</td>
<td>0.4</td>
<td>825</td>
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<tr>
<td>Employees</td>
<td>49.3</td>
<td>52.1</td>
<td>21,191</td>
<td>45.1</td>
<td>33.8</td>
<td>825</td>
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<tr>
<td>Capital-labour ratio¹</td>
<td>86.1</td>
<td>115.3</td>
<td>21,191</td>
<td>274.5</td>
<td>425.5</td>
<td>825</td>
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<tr>
<td>Revenues²</td>
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<td>21.6</td>
<td>21,191</td>
<td>39.0</td>
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<tr>
<td>Markup (log)</td>
<td>0.1</td>
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<td>21,191</td>
<td>0.1</td>
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<td>825</td>
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<tr>
<td>Wages¹</td>
<td>34.2</td>
<td>16.7</td>
<td>21,191</td>
<td>54.6</td>
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### B: MFPR based frontier definition

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<td>St.dev.</td>
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<td>St.dev.</td>
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<tr>
<td>Productivity</td>
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<td>0.6</td>
<td>21,317</td>
<td>11.6</td>
<td>0.4</td>
<td>706</td>
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<tr>
<td>Employees</td>
<td>48.3</td>
<td>46.8</td>
<td>21,317</td>
<td>73.7</td>
<td>126.0</td>
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<td>Capital-labour ratio¹</td>
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<td>125.1</td>
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<td>706</td>
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<tr>
<td>Revenues²</td>
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<td>19.9</td>
<td>21,317</td>
<td>50.5</td>
<td>74.1</td>
<td>706</td>
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A2. Productivity divergence is robust to:

- Productivity measure: LP, MFP
- Frontier definition: Top 50, 100, 5%
- Robustness to different time periods
- More narrowly defined industries (3 and 4 digit)
- Robustness to retaining only HQ-s (their consolidated accounts, i.e. everything is at the group level) and standalone firms (not part of any group)
- Industry-level analysis from 1985 shows a bigger divergence from the early 2000s
A3. How much is it a capital deepening story?

Average capital deepening across each 2-digit sector (log, 2001=0)

A4. Mark-ups for frontier firms has grown in services but not in manufacturing

Average estimated mark-up across each 2-digit sector (log, 2001=0)

<table>
<thead>
<tr>
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<th>Services</th>
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A5. Frontier firms are getting larger in terms of sales!

Average of log sales for global frontier firms and the rest
Based on top 5% of MFP; index, 2001=0

A6. Firm-level patterns vs average industry level productivity

Labour Productivity in the Business Sector

A7. Industry-level data show bigger divergence from early 2000s

Unweighted average of TFP in the non-farm business sector; index 1985=0

A8. Entry into the global frontier has become more entrenched amongst top quintile firms

Proportion of frontier firms in time $t$ according to their frontier status in $t-2$

**A: MFPR**

**B: Mark-up corrected MFPR**

Manufacturing | Services
--- | ---
![Graph for MFPR](image1.png) | ![Graph for Mark-up corrected MFPR](image2.png)

From top 20% | From top 10% | From top 5%
A9. The speed of convergence to the frontier slowed, even before the crisis

Estimated convergence parameter from neo-Schumpeterian model
Dotted line: 95% confidence intervals

\[ \Delta \ln A_{icst} = \delta_1 \Delta \ln A_{F_cst} + \delta_2 \text{gap}_{icst-1} + \sum_j \delta_j^i \text{gap}_{icst-1} \times D_t^j + \sum_j \delta_j^i X^j_{isct} + \delta_s + \delta_{ct} + \varepsilon_{icst} \]
A10. Slower product market reform, a larger increase in the MFP 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.

A11. Higher MFP divergence when market reforms in services lagged

MFP divergence and product market regulation in services
Estimation method – five-year long differences; 1998-2013

<table>
<thead>
<tr>
<th>Y: Δ MFP gap</th>
<th>Y: Δ Mark-up corrected MFP gap</th>
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<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
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<tr>
<td>(3)</td>
<td>(4)</td>
</tr>
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</table>

| Δ Product Market Regulation<sub>s,c,t</sub> | 0.205*** | 0.231*** |
|                                            | (0.065)  | (0.083)  |
|                                            | 0.332*** | 0.311**  |
|                                            | (0.103)  | (0.132)  |

Country fixed effects | YES | NO | YES | NO |
Industry fixed effects | YES | YES | YES | YES |
Year fixed effects    | YES | NO  | YES | NO |
Country X year fixed effects | NO | YES | NO | YES |
Observations          | 458 | 458 | 376 | 376 |
R-squared             | 0.201 | 0.323 | 0.327 | 0.463 |

Notes: Cluster robust standard errors (at the industry-year level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1 Both the MFP gap and the PMR indicator are measured in log terms. The MFP gap is calculated at the country-industry-year level, by taking the difference between the global frontier and the average of log productivity of non-frontier firms.