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OECD | Economics Department

Based on joint work with Dan Andrews and Chiara Criscuolo

Groningen Growth and Development Centre
25th Anniversary Conference
June 2017
Weak labour productivity underpins the collapse in OECD potential growth

Contribution to potential per capita output growth

Pre-crisis: MFP story
Post-crisis: K story

Our contribution: bring more micro evidence to a largely macro debate

Key findings:

1. Productivity at Global Frontier remained robust but *laggard* firms increasingly fell behind.

2. Some *explanations*:
   1. “Winner takes all” dynamics
   2. Stalling diffusion of technologies
   3. Market dynamism fell

3. **Policy** weakness amplified MFP divergence and hence the productivity slowdown
DATA AND MEASUREMENT
Data and measurement

- **Data: Orbis**
  - Balance sheets and income statements from BvD
  - 24 OECD countries, 1997-2014
  - Both manufacturing and services
  - Large and small firms (we restrict to 20+ employees)

- **Measuring productivity**
  - Labour productivity (deflated, PPP converted at industry level)
  - MFP (prod.fn. estimation based Wooldridge + markup correction)

- **Measuring the Global Frontier** ("top 5%")
  - Set of best-performing productivity outcomes within industries
  - Schumpeterian growth → most innovative firms change over time
PRODUCTIVITY DIVERGENCE: THE FINDINGS
Rising labour productivity gap between global frontier and laggards

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

- **Manufacturing**
- **Services**

**Frontier**

**Laggards**
... largely reflects MFP divergence

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

Capital deepening plays less of a role

Manufacturing

Services

Frontier

Laggards
... 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

Manufacturing

Services

Frontier

Laggards

Frontier

Laggards
PRODUCTIVITY DIVERGENCE: POTENTIAL DRIVERS
Diverging capabilities?
“Winner takes all” at the frontier?

MFPR divergence

ICT-intensive services

Non ICT-intensive services

-0.2
0.0
0.2
0.4
0.6
0.8
1.0
Frontier firms
Laggards
Top 10%
Top 2%

Frontier firms
Laggards
Top 10%
Top 2%
But more MFP divergence across firms ~ worse aggregate 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
Lack of capabilities? Catch-up of laggards weakening

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

A: MFPR

\[
\Delta \ln A_{icst} = \delta_1 \Delta \ln A_{F_{cst}} + \delta_2 \text{gap}_{icst-1} + \sum_j \delta_3^j \text{gap}_{cst-1}^j \times D_t^j + \sum_j \delta_4^j X_{isct}^j + \delta_s + \delta_{ct} + \varepsilon_{icst}
\]

B: Mark-up adjusted MFPR
Lack of capabilities?
Harder to reach frontier as it’s more entrenched

Proportion of frontier firms in time $t$ according to their frontier status in $t-2$
Lack of incentives?
Signs of weakening market contestability

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 deregulation in services has slowed

The restrictiveness of product market regulations

A: Network industries  
B: Professional Services

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.
Empirical approach: country x industry x year level regressions

1. OLS of long differences:

\[ \Delta^{ld} MFP_{gap_{s,c,t}} = \beta_0 + \beta_1 \Delta^{ld} PMR_{s,c,t} + \beta_2 \Delta^{ld} E_{s,c,t} + \delta_c + \delta_s + \delta_t + \epsilon_{s,c,t} \]

2. Instrumental variables of long differences: “Reform pressure” or “reform waves”
## Slower product market reform: a larger increase in the gap

### MFP divergence and product market regulation in services

Estimation method: five-year long differences (1998-2013)

<table>
<thead>
<tr>
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<th>Y: Δ MFP gap</th>
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<th>Y: Δ Mark-up corrected MFP gap</th>
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<td>(1)</td>
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<td>Δ Product Market Regulation_s,c,t</td>
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<tr>
<td>R-squared</td>
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<td>0.323</td>
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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.
## Slower product market reform: a larger increase in the gap

### MFP divergence and product market regulation in services


<table>
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<th>“Reform pressure”</th>
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<td>( \Delta \text{Product Market Regulation}_{s,c,t} )</td>
<td>0.326** (0.163)</td>
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<td>0.569*** (0.189)</td>
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<td>R-squared</td>
<td>0.193</td>
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Summary

• The slowdown in aggregate productivity growth masks an **increasing divergence** between GF and laggard firms

• Technological and structural changes could
  – lead to “winner takes all” dynamics
  – make adoption more difficult
  → Signs of declining **capacity** to catch up and use latest technologies

• But **incentives** seem to have weakened too:
  – Declining market contestability
  – Regulatory policy plays a role
THANK YOU

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ADDITIONAL SLIDES
The Global Frontier: Who are they? Descriptives in brief

- Frontier firms have
  - larger market shares
  - higher capital intensity
  - higher wages
  - higher mark-ups
  - more patents

  … More so in services than in manuf.

- Productivity gap is also higher in services

- Frontier is composed of various countries
The globally most productive firms: Who are they?

A: Labour productivity based frontier definition

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sector: manufacturing</th>
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<td>22.2 ***</td>
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How much is it a capital deepening story?

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

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<tr>
<th>Manufacturing</th>
<th>Services</th>
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<tbody>
<tr>
<td>Frontier</td>
<td>Frontier</td>
</tr>
<tr>
<td>Laggards</td>
<td>Laggards</td>
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</table>
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

Manufacturing

Services

Frontier

Laggards

Frontier

Laggards
Firm-level patterns vs average industry level productivity

Labour Productivity in the Business Sector

Industry-level data show bigger divergence from early 2000s

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

Labour quality adjusted MFP also shows divergence

MFP estimation based on wagebill instead of employment

<table>
<thead>
<tr>
<th>Year</th>
<th>Manufacturing Frontier</th>
<th>Manufacturing Laggards</th>
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Defl. source: NationalAccounts (#obs. in fro.: 47164, tot.: 930589)
Included (23): AT BE DE DK EE ES FI FR GB GR HU IE IT JP KR LU LV NL PL PT SE SI US
Productivity estimation (Wooldridge, 2009)

- Value added based production function, estimated separately for each industry:
  \[ y_{it} = \beta_K^j k_{it} + \beta_L^j l_{it} + \nu_{c,j} + \eta_{t,j} + \epsilon_{it} \]

- Proxy \( g(k,m) \) (rich polynomial) for productivity and use GMM to control for endogeneity
  \[ y_{it} = \beta_K^j k_{it} + \beta_L^j l_{it} + g(k_{it-1}, m_{it-1}) + \nu_{c,j} + \eta_{t,j} + u_{it} \]

- Define MFP as residual:
  \[ MFP_{ij} = r_{ij} - \hat{\gamma}_i^j k_{it} - \hat{\gamma}_i^j l_{it} \]
Mark-up Correction

- \( MFPR^c_{it} = MFPR_{it} - \log(\mu_{it}) \), where the MFP values are measured in logs and \( \mu \) denotes the estimated mark-up.

- \( MFPR^c \) is purged from mark-up variations and hence is not influenced by market power changes under the assumptions:
  - At least one input of production is fully flexible
  - Firms minimize costs

\[
\mu_{it} = \frac{P_{it}}{MC_{it}} = Output\ Elasticity_{ikt} / Output\ Share_{ikt} = \frac{\hat{\beta}_L^j}{wS_{it}}
\]

- The labour coefficient is estimated using the GMM estimation method by Wooldridge (2009).

- The denominator is obtained by using a prediction of firm-level value added by a rich polynomial function of observable inputs in order to retain only the anticipated part of output developments.