LONG-RUN PRODUCTIVITY

...productivity isn't everything, but in the long run it is almost everything.

Paul Krugman, 1994

Dan Andrews
Senior Economist
Economics Department
Organisation for Economic Co-operation & Development

Meeting with Norwegian Productivity Commission

Based on joint work with the Directorate for Science, Technology and Innovation
Cross-country gaps in GDP per capita mainly reflects productivity shortfalls

A. Percentage GDP per capita difference compared with the upper half of OECD countries¹

B. Percentage difference in labour resource utilisation and labour productivity²

Note: GDP/Population=(GDP/Employment) * (Employment/Population)

3 key questions:

- How do we think about long-run productivity performance?
- Should we be worried about recent evidence and emerging trends?
- What are the relevant policy issues for future productivity?

Caveat: the analysis largely focuses on policy issues that are relevant to the typical OECD economy and we deal less with some specific issues – i.e. informality, infrastructure & quantity of human capital – that may matter for Brazil.
New Approaches

Changing the unit of analysis: firm level perspective to complement the traditional aggregate view.

Addressing future challenges

Future economic growth will increasingly depend on multi-factor productivity (MFP).

Some sources of productivity growth, while relevant for past performance, may be increasingly difficult to harness in the future, focus on policy issues that may become increasingly relevant.

Relevance for public policy

Firm level perspective and forward-looking approach to identify relevant issues important policy recommendations.
Outline

1. Anatomy of the productivity slowdown
2. Analytical framework
3. Key policy issues and selected structural policy recommendations
The productivity slowdown in long run perspective

Source: Conference Board Total Economy Database
Stalling convergence...

Per cent gap in GDP per hour worked with the United States
Structural dimensions to the slowdown: an entry story?

Declining start-up rates across OECD countries

Entry directly affects reallocation and indirectly within-firm productivity by placing pressure on incumbents to innovate (+ less radical innovation in the future).

1. Anatomy of the productivity slowdown

2. Analytical framework

3. Key policy issues and selected structural policy recommendations
If technology flows freely across borders, aggregate productivity growth is a positive function of:

- Productivity growth rate of the global frontier $\rightarrow$ diffusion of new innovations from the frontier.
- An economy’s (static) productivity gap with the global productivity frontier $\rightarrow$ catch-up driven growth based on adoption of unexploited existing technologies.

BUT the process of productivity convergence is not automatic
Analytical framework:

3 types of firms + 2 technologies

1. Widespread **heterogeneity**: very high MFP and very low MFP firms coincide within narrowly-defined industries.

2. **Adoption lags** for new technologies across countries have fallen, but long-run **penetration rates** once technologies are adopted have diverged (Comin & Mestieri, 2013).

3. MFP growth of **laggard** firms is more closely related to productivity developments at the **national frontier** (NF), as opposed to the **global frontier** (GF).

*New GF technologies do not immediately diffuse to all firms. They are first adopted by NF firms, and only diffuse to laggards once they are adapted to national circumstances.*
The economic forces shaping aggregate productivity growth

1. Growth at the global frontier
   - Trade and FDI
   - Spillovers and adoption
     - International mobility of skilled labour

2. Growth at the national frontier
   - Upscaling
   - Investment in KBC
   - Spillovers and adoption
     - Resource reallocation
   - Growth of laggards

AGGREGATE PRODUCTIVITY GROWTH
What’s happening at the global productivity frontier?

Solid growth at the global productivity frontier but spillovers disappointed

Labour productivity; index 2001=0

Firms at the global productivity frontier have become older

Average age (years) of firms in the frontier and non-frontier groups


Notes: Frontier is measured by the top 100 firms in each 2-digit industry and each year, based on Solow residual-based MFP.
Outline

1. Anatomy of the productivity slowdown
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3. Key policy issues and selected structural policy recommendations
Key issues for policymakers

1. Support innovation in firms at the global frontier (GF)

2. Facilitate the diffusion of:
   - New technologies from the GF to NF firms
   - Existing technologies from the NF to the laggards

3. Reallocate scarce resources to the most productive firms
   - Up-scaling and resource reallocation more generally.
   - Allocate human capital efficiently.

Scope for productivity growth via these channels, particularly #2 & #3, is influenced by the policy environment within countries.
Structural factors shaping the diffusion of new innovations from the global frontier

% difference in frontier spillover effect between maximum and minimum value of each structural variable, assuming 2% MFP growth at the frontier

<table>
<thead>
<tr>
<th>Variable</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade with the Frontier*</td>
<td>0.33</td>
</tr>
<tr>
<td>Participation in GVCs</td>
<td>0.06</td>
</tr>
<tr>
<td>Efficiency of skill allocation</td>
<td>0.23</td>
</tr>
<tr>
<td>Managerial quality</td>
<td>0.22</td>
</tr>
<tr>
<td>Business R&amp;D</td>
<td>0.17</td>
</tr>
<tr>
<td>E-government Readiness Index</td>
<td>0.38</td>
</tr>
</tbody>
</table>
Public policies shape the diffusion of new innovations from the global frontier

Estimated frontier spillover (% pa) associated with a 2% point increase in MFP growth at the frontier
Pro-competition PMR can facilitate catch-up of laggards to the NF

Impact of policy reforms on the MFP growth of laggard firms, 2005
Reducing PMR from high level in Greece to the OECD average
% difference between industries with high and low firm turnover

Key issues for policymakers

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Scope for productivity growth via these channels, particularly #2 & #3, is influenced by the policy environment within countries.
Significant differences in up-scaling potential across countries

Post-entry growth - average size of young and old firms


International trade is a key vehicle for technological diffusion but firms typically need to reach sufficient scale, before entry to international markets, given the fixed costs of trade.
Barriers to up-scaling can reduce the aggregate impact of NF firms

How much higher would overall manufacturing sector labour productivity be if NF firms were as productive and large as GF firms?

NF firms in Italy have productivity levels close to the GF but they are relatively small

Policy reforms that facilitate the growth of NF firms can boost labour productivity

Impact of policy reform to best practice on level of industry productivity
% difference between industries with high and low exposure to the policy

Key issues for policymakers

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Scope for productivity growth via these channels, particularly #2 & #3, is influenced by the policy environment within countries.
Cross-country differences in skill mismatch are significant

Percentage of workers with skill mismatch; selected OECD countries, 2011-12

But the improving the allocation of skills also matters for productivity

Simulated gains to labour productivity from reducing skill mismatch to the lowest level (%)

Skill mismatch, particularly over-skilling, is harmful for productivity because it constrains the ability of innovative firms to attract skilled workers and grow.

Reducing skill mismatch requires a range of policies.

The probability of skill mismatch and public policies

Spares
A1. Labour productivity growth slowed even before the crisis

Source: Conference Board Total Economy Database
A2. Structural dimensions to the slowdown: KBC

Investment in Knowledge-Based Capital; average annual growth

*KBC is often non-rival → MFP spillovers*

Source: calculations based on Corrado et al., (2012).
A3. The shape and distribution of firm performance matters…

Source: Adapted from Bartelsman et al (2008)
### A4. The globally most productive firms – who are they?

#### Mean firm characteristics: frontier firms and non-frontier firms

<table>
<thead>
<tr>
<th></th>
<th>Global Frontier Firms</th>
<th>Non-Frontier Firms</th>
<th>Difference in means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std Dev</td>
<td>Mean</td>
</tr>
<tr>
<td>Multi Factor Productivity (Solow)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Productivity</td>
<td>4.06</td>
<td>1.04</td>
<td>2.51</td>
</tr>
<tr>
<td>Employment</td>
<td>309</td>
<td>3770</td>
<td>229</td>
</tr>
<tr>
<td>Capital stock (€m)</td>
<td>31</td>
<td>355</td>
<td>19</td>
</tr>
<tr>
<td>Turnover (€m)</td>
<td>250</td>
<td>1731</td>
<td>59</td>
</tr>
<tr>
<td>Profit rate</td>
<td>0.57</td>
<td>0.33</td>
<td>0.13</td>
</tr>
<tr>
<td>Age</td>
<td>21.5</td>
<td>20.3</td>
<td>23.2</td>
</tr>
<tr>
<td>MNE status*</td>
<td>Probability</td>
<td>0.47</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td>Depreciated patent stock</td>
<td>3.71</td>
<td>45.15</td>
</tr>
</tbody>
</table>

Note: “Frontier firms” corresponds to the average labour productivity of the 50 globally most productive firms in each 2 digit sector in ORBIS. “Non-frontier firms” is the average of all other firms.
A5. GVC Participation

The chart shows the participation of various countries in the Global Value Chain (GVC) in 2009 and 1995. The countries are listed along the x-axis, and the participation percentage is represented along the y-axis. The blue bars indicate the participation percentage in 2009, while the white diamonds represent the percentage in 1995. Countries such as Singapore, Chinese Taipei, Philippines, Malaysia, Viet Nam, Lithuania, Thailand, Cambodia, China, Bulgaria, Hong Kong, China, Latvia, Romania, India, South Africa, Indonesia, Argentina, Brazil, and Russian Federation are shown.
A6. Estimated gains to MFP growth associated with raising GVC participation
A7. Low managerial quality is a barrier to higher labour productivity in Brazil

Source: OECD calculations based on the management scores and estimated coefficients in Bloom et al., (2012).