PATTERNS OF FIRM LEVEL PRODUCTIVITY IN IRELAND
RESULTS FROM MULTIPROD MODEL
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Outline

• High level macro picture

• Firm level productivity analysis
  • Rationale
  • The MultiProd model
  • Data

• MultiProd Results (2006-2014)
  • Concentration measures – impact of large firms
  • Productivity distribution – the best vs the rest
  • Efficiency of resource allocation
Global productivity slowdown since 1990s

- Slowdown accelerated pre-crisis
- OECD countries slowed down the most

Patterns are consistent across measures of productivity (LP & MFP)

Source: Conference Board Total Economy Database
High level of labour productivity

GDP and GNI per hour worked (2015 USD - 2011 PPPs)

Source: OECD
Decline in growth rate

Year-on-year productivity growth in Ireland

Source: CSO experimental estimates of productivity (forthcoming)
Need for firm-level productivity analysis

- Aggregate productivity statistics hide underlying drivers
  - Countries might display the same level, but be characterised by very different underlying distributions

- Three channels of aggregate productivity growth:
  i. Innovation at the frontier
  ii. Diffusion from frontier to laggard firms
  iii. Resource allocation

- ... each of these factors may call for different policy responses.
MultiProd – *Micro drivers of aggregate productivity*

- The MultiProd project is based on a ‘distributed microdata’ methodology
  - Harmonised software sent to countries
  - Researchers in each country will run the code on their confidential microdata
  - Aggregated output respect confidentiality rules – followed CSO approach
  - Cross country Micro-aggregated results then analysed by the OECD

- Comparable data analysed across countries

- Productivity measured in exactly the same way across countries

- Generates [non-confidential aggregate statistics](#) to allow for cross country analysis
MultiProd Model - Output

- Produces estimates of Labour and Multi-factor productivity (MFP)
  - Solow method: \[ MFP = GO - \beta_K K - \beta_L L - \beta_I I \]
    - Industry specific factor shares (cross-country median)
  - Wooldridge method: Regression based approach (GMM)
    - Corrects for bias in estimates

- Aggregation level
  - Industry (Manufacturing, Utilities, Market and Non-Market Services)
  - Sectoral level (2-digit NACE)

- Basic moments are computed (e.g. mean, median, standard deviation)
  - Refined by percentiles of distribution (10th, 50th, 90th), age, size, ownership

- Various measures of the efficiency of resource allocation
  - Measures strength of relationship between firm-size and productivity
Data

  - Year, Sector, Country of Ownership, Birth Year
  - Investment, Value Added, Gross Output, Intermediate Inputs
  - Employment, Wages

- **Business Register (2006-2014):**
  - Weighting to make results representative of population
  - Dealing with entry/exit of firms
  - Changes in industry classification

- **Deflators, K/L ratios and depreciation rates based on National Accounts**
  - Sector level (Nace Rev. 2)

  - Manufacturing & Utilities: 2,500 firms (yearly average)
  - Market & Non-Market Services: 7,500 firms (yearly average)
The MultiProd Model – cross country results

- Cross country results based on 18 countries (excl IE)
- Evidence of widening gap between most and least productive firms
- Results based on Orbis data show a consistent pattern
MultiProd Results for Ireland (2006-2014)
Granularity – the contribution of largest firms (1)

Irish results more concentrated than the cross-country MultiProd results
- Manufacturing 80% of VA and 68% of employment in cross-country
- Services 79% of VA and 66% of employment

Source: MultiProd on the basis of CSO data
Granularity – the contribution of most productive firms

- Most productive firms in manufacturing account for 70 percent of aggregate productivity on average over 2006-2014

- 40 percent (on average) in services, although growing over the period

Source: MultiProd on the basis of CSO data
Labour productivity distribution – across sectors

- Results broadly consistent with results of the MultiProd benchmark group (excl. scientific R&D)

Source: MultiProd on the basis of CSO data
Foreign firm Labour productivity and employment premium

Manufacturing 2014

<table>
<thead>
<tr>
<th>Category</th>
<th>Average foreign firm employment multiple: (2.8)</th>
<th>Productivity premium: 399%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmaceutical</td>
<td>(20.4)</td>
<td>123%</td>
</tr>
<tr>
<td>Transport equipment</td>
<td>(3.1)</td>
<td>117%</td>
</tr>
<tr>
<td>Metal products</td>
<td>(3.2)</td>
<td>114%</td>
</tr>
<tr>
<td>Food &amp; beverages</td>
<td>(34.2)</td>
<td>83%</td>
</tr>
<tr>
<td>Furniture &amp; other</td>
<td>(4.6)</td>
<td>70%</td>
</tr>
<tr>
<td>Rubber and Plastic</td>
<td>(3.7)</td>
<td>66%</td>
</tr>
<tr>
<td>Chemicals</td>
<td>(7.3)</td>
<td>61%</td>
</tr>
<tr>
<td>Wood and paper prod.</td>
<td>(5.3)</td>
<td>61%</td>
</tr>
<tr>
<td>Machinery and equipment</td>
<td>(15.1)</td>
<td>50%</td>
</tr>
<tr>
<td>Computer &amp; electronics</td>
<td>(5.6)</td>
<td>24%</td>
</tr>
<tr>
<td>Textiles &amp; apparel</td>
<td>(5.7)</td>
<td>11%</td>
</tr>
</tbody>
</table>

Source: MultiProd on the basis of CSO data
Foreign firm Labour productivity and wage premium

Source: MultiProd on the basis of CSO data
Productivity dispersion – labour productivity

Manufacturing

Services

Source: MultiProd on the basis of CSO data
## Productivity dispersion – by country

<table>
<thead>
<tr>
<th>Country</th>
<th>2011</th>
<th>(Labour Productivity) p90-p10 ratio</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Manufacturing</td>
<td>Services</td>
</tr>
<tr>
<td>Australia</td>
<td>6.7</td>
<td>7.8</td>
<td></td>
</tr>
<tr>
<td>Austria</td>
<td>7.1</td>
<td>11.2</td>
<td></td>
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<tr>
<td>Belgium</td>
<td>5.0</td>
<td>5.7</td>
<td></td>
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<tr>
<td>Chile</td>
<td>20.1</td>
<td>34.1</td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>4.3</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>3.2</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>3.9</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td>16.3</td>
<td>26.8</td>
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<tr>
<td>Indonesia</td>
<td>22.4</td>
<td>-</td>
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</tr>
<tr>
<td>Italy</td>
<td>5.3</td>
<td>7.5</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>3.5</td>
<td>4.0</td>
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<tr>
<td>Netherlands</td>
<td>7.4</td>
<td>19.7</td>
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<tr>
<td>New Zealand</td>
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<td>8.1</td>
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<tr>
<td>Norway</td>
<td>5.6</td>
<td>8.8</td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
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<td>14.2</td>
<td></td>
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<tr>
<td>Sweden</td>
<td>4.3</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td><strong>OECD (MultiProd)</strong></td>
<td><strong>6.6</strong></td>
<td><strong>9.2</strong></td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>7.7</td>
<td>9.3</td>
<td></td>
</tr>
<tr>
<td>Ireland (95-10)</td>
<td>9.8</td>
<td>14.1</td>
<td></td>
</tr>
</tbody>
</table>

Source: MultiProd on the basis of CSO data
Efficiency of Resource Allocation – Olley Pakes Method

- Aggregate productivity is the weighted average of firm productivity
- Can be decomposed into unweighted firm average, and the covariance between productivity and size
- The Covariance term is known as the Olley-Pakes (OP) gap and measures efficiency in the allocation of resources

Source: MultiProd on the basis of CSO data
Efficiency of Resource Allocation – cross country results 2011

Due to the efficiency of resource allocation in 2005 USD Purchasing Power Parity terms.
Conclusions

- Aggregate productivity levels comparatively high, but growth rate declining

- Skewed distributions
  - Large firms dominate value add and employment
  - Most productive firms dominate aggregate productivity
  - Large foreign firm productivity premium

- Productivity dispersion (i.e. ‘the gap’) is widening

- Efficiency of resource allocation driven by foreign firms (in specific sectors)
  - Efficient allocation of resources among non-MNE firms important for living standards
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