MEASURING SECTOR PRODUCTIVITY
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Monitoring & Evaluation, MAF Policy


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Purpose & Outline

• Purposes:
  – What MAF’s doing and future research;
  – Discussion of an alternative method.

• Outline:
  o Background
  o Current results
  o Current method and data
  o Alternative method (Labour share)
  o Results comparison
  o Conclusion & Future research

Background

- MAF’s Growth and Productivity project
- Productivity measurement, Trade performance, and others
- Started 06/07, now second year
- Productivity measurement works with Statistics NZ and Massey University;
- Currently using 2 methods: Index number (Statistics NZ data) and Malmquist (Massey’s project using MAF’s Farm Monitoring data)
Some Definitions

- Total Factor Productivity, not partial productivity;
- TFP measures production efficiency;
- Changes as a result of changes in management practices and technology;
- Important source for long term growth;
- BUT not a measure for profitability;
- TFP contributes to profitability BUT doesn’t incl. price effects;
- MAF’s TFP measures at aggregated industry level;

Current TFP results

Agriculture, forestry, and downstream sectors TFP growth
(annual average growth rate %, 1972-2006)

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Agriculture</th>
<th>Food, Beverage &amp; Tobacco Manufacturing</th>
<th>Forestry &amp; Logging</th>
<th>Wood &amp; Papers Manufacturing</th>
<th>SNZ Measured Sector</th>
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</thead>
<tbody>
<tr>
<td>1972-2006</td>
<td>2.0%</td>
<td>2.6%</td>
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<tr>
<td>1972-1984</td>
<td>-0.5%</td>
<td>1.3%</td>
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<td>1984-2006</td>
<td>3.4%</td>
<td>3.4%</td>
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<tr>
<td>1988-2006</td>
<td>2.2%</td>
<td>1.0%</td>
<td>2.1%</td>
<td>0%</td>
<td>1.5%</td>
</tr>
<tr>
<td>1988-1993</td>
<td>-1.3%</td>
<td>1.8%</td>
<td>5.0%</td>
<td>-0.5%</td>
<td>1.1%</td>
</tr>
<tr>
<td>1993-2006</td>
<td>3.6%</td>
<td>0.7%</td>
<td>0.9%</td>
<td>0.2%</td>
<td>1.7%</td>
</tr>
</tbody>
</table>
Current data and method

• **Data**
  - Industry aggregate data from Statistics NZ (GDP, productive capital stock, labour FTEs)

• **Method**
  - Tornquist chained index
  - Input index aggregated from K and L index weighted by their shares of total factor income
  - K share derived by user cost of capital method; L is residual

Method cont.

• User cost of capital
  \[ UCC = PKS_{\text{current prices}} \times (d + r) \]
  Where \( d \) is capital depreciation rate, \( r \) is rate of return on capital.

• K share = \( \frac{UCC}{GDP_{\text{current prices}}} \)

• L share = 1 - K share

• Total factor input index
  \[ q_t = \left( \frac{\kappa_t}{\kappa_{t-1}} \right)^{\frac{w_{K,t} + w_{K,t-1}}{w_{K,t-1}}} \left( \frac{\omega_t}{\omega_{t-1}} \right)^{\frac{w_{L,t} + w_{L,t-1}}{w_{L,t-1}}} \]
  where \( w_k \) is K share and \( w_l \) is L share
Alternative method

- Data now available for deriving Labour share
- Advantage:
  - use available National Account data (incl COE, GOS, Tax, Subsidy); and proportion of self-employed;
  - don’t have to approximate capital ror and other data required for K share method

- \( L \text{ share} = \frac{\text{employee’s wage} + \text{self-employed’s wage} + \text{production tax attributed to } L}{GDP} \)

- \( K \text{ share} = 1 - L \text{ share} \)

Results of L share method

Agriculture, forestry, and downstream sectors TFP growth
(annual average growth rate %, 1988-2006)

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<tbody>
<tr>
<td>1988-2006</td>
<td>2.2%</td>
<td>2.0%</td>
<td>1.0%</td>
<td>0.7%</td>
<td>2.1%</td>
<td>1.7%</td>
<td>0%</td>
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<td>1.5%</td>
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</tbody>
</table>
Results cont.

TFP Agriculture: method comparison

TFP Index 1996=1

Ag K share

Ag L share

Results cont.

TFP Forestry: method comparison

TFP Index 1996=1

Forestry K share

Forestry L share
Results cont.

TFP FB&T: method comparison

Results cont.

TFP W&P: method comparison
Results cont.

Contribution of TFP, capital, and labour to sector GDP growth
(annual average growth rate %, 1988-2006)

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<thead>
<tr>
<th>Time Period</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Output</td>
<td>K contribution</td>
<td>L contribution</td>
<td>TFP contribution</td>
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<tr>
<td>1988-2006</td>
<td>growth</td>
<td>K share method</td>
<td>L share method</td>
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<tr>
<td></td>
<td>1.5%</td>
<td>0%</td>
<td>-0.7%</td>
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<td>0.9%</td>
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<td>2.0%</td>
<td>1.4%</td>
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<td>1.5%</td>
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</tbody>
</table>

Conclusion & Future Research

• L share method shows;
  – Slightly lower TFP estimates
  – Higher K contribution;
  – Lower L contribution;
• Advantage of L share method: reflects better factor share as don’t have to approx data;
• K share method underestimate K share as missing tax component and approx ror;
• New method only change TFP slightly due to changes in the weighting components NOT the real factor growth
Future Research

• Qualitative analysis of factors contributing to sector TFP growth;
• Modelling determining factors of TFP growth (Op research contract with Massey Uni);
• TFP measurement for sub-sector level using SNZ aggregate data;
• TFP measurement for sub-sector level using Farm-level data and possibly SNZ Longitudinal Firm Performance Data (LFPD / IBULDD)

Comments / Questions

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