Measuring the Efficiency product output: An Application to Food Industry in Canada

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Objective:
• Obtain a reliable and up-to-date measure of performance
• Investigate the efficiency and the productivity of food processing
• Use two different Methodology
  • Input Distance Function
  • Translog production Function

Method
The input distance function is:

(1) \[ \ln D_{it} = \alpha_0 + \alpha_i \ln y_i + \frac{1}{2} \alpha_k \ln X_{ki} + \frac{1}{2} \sum_k \Sigma_k \beta_{ki} \ln X_{ki} \ln X_{mi} + \sum_k \Sigma_k \delta_{mi} \ln X_{mi} \ln y_i + \lambda t + \frac{1}{2} \lambda_i t^2 + \sum_k \lambda_k \ln X_{ki} t + \sum_m \lambda_m \ln y_i t + v_{it} - u_{it} \]

Production Function without time trend:

(2) \[ \ln Y_{it} = \alpha_0 + \sum_k \alpha_k \ln X_{mi} + \frac{1}{2} \sum_m \Sigma_k \delta_{ki} \ln X_{ki} \ln X_{mi} + \delta_t t + \frac{1}{2} \delta_i t^2 + \sum_k \lambda_t \ln X_{ki} t + v_{it} - u_{it} \]

Data and Variable:
Statistic Canada’s website
Provinces in this study are: Quebec, Ontario, Alberta and British Columbia
The data are from 1983-2003.

X variables
• Production Workers
• Investment
  • Building and Engineering
  • Equipment and machinery
• Input
  • Energy
  • Materials

Y variable
Output

Results
Change in Productivity (U_{it}) 1983-2003

<table>
<thead>
<tr>
<th></th>
<th>Que.</th>
<th>Ont.</th>
<th>Alb.</th>
<th>B.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>Input</td>
<td>Prod</td>
<td>Input</td>
<td>Prod</td>
</tr>
<tr>
<td>Mean</td>
<td>0.024</td>
<td>0.0872</td>
<td>0.147</td>
<td>0.0856</td>
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</tbody>
</table>

Malmquist index 1983-2003

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<th>Que.</th>
<th>Ont.</th>
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<tbody>
<tr>
<td>Input</td>
<td>Prod</td>
<td>Input</td>
<td>Prod</td>
<td>Input</td>
</tr>
<tr>
<td>Mean</td>
<td>1.336</td>
<td>0.891</td>
<td>1.375</td>
<td>0.873</td>
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</tbody>
</table>

Result

Conclusion
• All provinces are:
  • Almost efficient using production Function method
  • Not efficient using input distance function
• Malmquist indexes are
  • Production Function method denotes regress or deterioration in performance
  • Input Distance Function indicates improvements in the relevant performance
• Technological Changes
  • Same trends
  • Decreasing under both functions