Regulatory reform of the QLD sugar industry

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Presentation at the Melbourne CGE workshop
September 2004

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OESR: Knowledge Leaders for Smarter Decision Making
Overview

• Background on OESR’s analysis of Sugar industry regulatory reform
• Adapting (modifying) QGEM to address the policy issue
• Methodology
  – PE inputs => inputs for SR
  – SR scenario => inputs for LR
  – LR scenario
Sugar industry example

• Background to this policy issue
  – Centre of International Economics -2002

• The policy scenario
  – 20% increase in cane yields
  – Abolishing cane production area system
  – Potential 30 week milling system
  – 20% reduction in harvesting costs
  – 10% reduction in cane transport costs
Policy analyst’s role

1. Interpreting the policy question
2. Choosing a model
3. Setting up the model
4. Calculating shocks
5. Running simulations and interpreting results
6. Writing reports and delivering presentations
Critical policy features

- Measures of economic impact
- Identifying the structure of sugar sector
- Regulations affecting the sugar sector
- Conceptual viewpoint on suitability of CGE model for the policy issue
Need for CGE analysis?

• Why NOT just rely on PE modelling?
• Take PE results and impose on CGE by endogensing Supply and Demand relationships
• Take initial PE shocks and impose on CGE using our Supply and Demand relationships
• Hybrid-approach
Modifications to QGEM

- Disaggregation of industry detail
- Add a ‘Top-down’ procedure (MRES)
- Modelling methodology
  - Incorporating PE outputs as simulation inputs to QGEM
  - Incorporating QGEM results from one simulation as inputs to another simulation
Industry disaggregation

• Separated out 4 new industries and commodities (H,SC,SM,R)

• This modification to the database provides several benefits
  – Provides data on the commodity flows & input structures that exactly matches the CIE data
  – Supports an industry structure that will allow us, once we have the theory, to model which agent acquires the benefit from each individual piece of the regulatory changes
MRES procedure

• MRES provides a theoretical structure that will support our goal of using the spatial breakdown of PE results for the various sugar-related industries

• Appendix B, Table B1
  – List of Statistical Divisions
  – Split of targeted & non-targeted Div’s
  – List of Sugar industries targeted for each Div (Harvesting, Sugar Cane farming, Sugar Milling, Refining)
Modelling methodology

• Modification in what sense?
  – Using information from PE to switch off various supply and demand relationships

• Addresses two key requirements
  – Incorporate external productivity estimates
  – Appropriate treatment to allocate income flows to factors of production and between vertically-integrated chain
Results determined by?

- PE data incorporated into QGEM simulations
- Our methodology for incorporating this PE data
- QGEM’s theoretical structure and database
Modelling methodology

- Two simulations
- Differentiated by our choice of closure
- The SR policy scenario closely resembles the PE analysis
- The LR policy scenario still draws heavily on the PE analysis but allows nominal values to vary according to relationships determined in QGEM
Shortrun simulation (p19)

- Start with SR closure (Section 3.4)
- Determine PE data to be used as QGEM targets (Table 1)
- Reversing MRES to import the PE model’s spatial detail
- Decide which component of QGEM’s theoretical structure needs to be ‘switched-off’ for each PE target value
<table>
<thead>
<tr>
<th>QGEM component</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Queensland Harvesting Industry</strong></td>
<td></td>
</tr>
<tr>
<td>Harvesting costs</td>
<td>-20.00</td>
</tr>
<tr>
<td><strong>Queensland Sugar Cane Growing Industry</strong></td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td>52.87</td>
</tr>
<tr>
<td>Land quantity</td>
<td>25.33</td>
</tr>
<tr>
<td>Land productivity (yield)</td>
<td>-21.97</td>
</tr>
<tr>
<td>Payments to labour</td>
<td>27.84</td>
</tr>
<tr>
<td>Labour productivity</td>
<td>-35.74</td>
</tr>
<tr>
<td>Capital quantity</td>
<td>25.33</td>
</tr>
<tr>
<td>Transport costs between the Sugar Cane and Sugar Milling Industries</td>
<td>-10.00</td>
</tr>
<tr>
<td><strong>Queensland Sugar Milling Industry</strong></td>
<td></td>
</tr>
<tr>
<td>Quantity of foreign exports</td>
<td>62.80</td>
</tr>
<tr>
<td>Payments to labour</td>
<td>41.28</td>
</tr>
<tr>
<td>Labour productivity</td>
<td>-22.98</td>
</tr>
<tr>
<td>Capital quantity</td>
<td>21.33</td>
</tr>
<tr>
<td>Capital productivity</td>
<td>-2.89</td>
</tr>
</tbody>
</table>
Shortrun simulation -3

- Table C1 provides full list of swaps
- Swaps common to all Sugar-related IND’s
  - Exogenise DIV output targets achieved by targeting (n-1) Div’s; and
  - Endogenising automatic link to State total
  - Exogenise switch that forces State result to be weighted sum of DIV results; and
  - Endogenise automatic link to National industry output
  - this allows us to target regional activity story provided by the CIE
E_z_div_A  #
Output of national industries at Statistical divisions  #
(All, j, NATIND_DIV) (All, d, STATDIV)

\[ z_{\text{div}}(j, d) = z(j, "QLD") + ff_{z_{\text{div}}}(j) + f_{z_{\text{div}}}(j, d) \]

SWAP  \( z_{\text{div}} = f_{z_{\text{div}}} \);

E_dsum_nat
# Adding up rule for loc-nat industries:
dsum_nat normally end. and zero #
(All, j, NATIND_DIV)

\[ dsum_{\text{nat}}(j) = z(j, "QLD") - \sum_{d, \text{STATDIV}} \text{DIVSHR}(j, d)*z_{\text{div}}(j, d) \]

SWAP  \( dsum_{\text{nat}} = ff_{z_{\text{div}}} \);
Shortrun simulation -5

- Sugarcane Harvesting
  - Exogenise basic price ( -20% )
  - Endogenising all-input technical chg
  - Note that this allows us to target
    Harvesting efficiency changes passed
    onto Sugar-farmers identified by the CIE
Shortrun simulation -6

- Sugarcane Farming example
  - Output targets by Statistical Division achieved by targeting (n-1) divisions and endogenising State total
  - Endogenising demand for sugarcane which normally would be determined via demand for Sugar Milling output (SM intermediate-input tech chg)
  - Note that this allows us to target Sugar Mill efficiency changes CIE identified
Shortrun simulation -7

- Sugarcane Farming
  - Employment target achieved by endogenising labour productivity
  - Target for factor returns to labour achieved by switching-off standard QGEM wage-pricing rule to allow divergence from other industries
  - Note that we are targeting Quantify and Value of labour identified by the CIE
Shortrun simulation -8

• Mechanical task of running simulation and recording results (including the endogenised variables which will be switched in the LR simulation)

• Sugarcane farming example
  – PE employment target of 11.09% achieved via endogenous 21.97% improvement in labour productivity
Longrun simulation -1

- Start with LR closure (section 3.4)
- Decide which component of QGEM’s theoretical structure needs to be ‘switched-off’ for each PE target value
- For the LR we believe QGEM is better suited, than PE model, to estimate
  - Some elements of sugar industries
  - Impacts on broader economy
Longrun simulation -2

• Still targeting real variables identified in PE model
• Allowing nominal value to vary in accordance with CGE relationships
  – Take endogenously determined supply and demand shifts from SR
  – Impose as shocks in the LR simulation allowing ‘traditional’ endogenous variables to be determined by QGEM
Longrun simulation -3

- Table C3 provides list of swaps where:
  - variable was ENDOGENOUSLY determined in Short Run simulation
  - variable is EXOGENOUS and shocked in Long Run simulation
  - Long Run shock value determined in the SR simulation
Longrun simulation -4

- Swaps targeting SR values
  - Harvesting: Exogenise all-input tech chg (SR p0a)
  - Sugarcane Farming: Exogenise Labour saving tech chg Endogenising employment (allowing exit from the industry for those owner-occupiers who don’t have LR profitability)
  - Sugar Milling: Exogenise Labour saving tech chg (SR employment)
  - Sugar Milling: Exogenise Capital saving tech chg (SR capital rentals)
Conclusion

- Two simulations approach allowed OESR to make use of PE analysis
- LR sim allows CGE to determine economic chgs in wider economy whilst incorporating sufficient endogeneity to allow the economy-wide effects to have feedback effects on sugar-industries
- SR raw sugar price (p0a = -2.68%)
- LR raw sugar price (p0a = -3.62%)
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