Impacts of U.S. biofuel policies on international trade in meat and dairy products

*Domestic and Trade Impacts of U.S. Farm Policy: Future Directions and Challenges*

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Outline

• Ethanol and the Renewable Fuels Standard
• Other modelling research
• Lincoln Trade and Environment Model
• Scenarios modelled
• Results – U.S. and world
• Discussion and conclusion
Ethanol background

- Increased ethanol interest
  - Arab oil embargo
  - Greenhouse gas emissions
  - Improved corn-based ethanol technology
- U.S., State tax credits promote ethanol
Potential impacts of RFS

- RFS increases demand for corn
- The U.S. provides about 60% of world corn exports
- Diverting U.S. corn to ethanol likely to increase food prices
- Largest impacts on crop and livestock sectors
- Food security concerns for poor
Prior modelling research

• Swenson (2006) – regional input-output modelling review
  – Small impacts on counties’ economies
  – Increased food prices

• Elobeid and Tokgoz (2006) – world partial equilibrium model
  – Ethanol market; U.S., Brazil, and ROW
  – U.S. policies raise corn prices 2.78% (2007)
Lincoln Trade and Environment Model

- LTEM used to analyse RFS
- Non-spatial, partial equilibrium international trade model
  - Based on SWOPSIM, later VORSIM (Roningen)
- Synthetic model: parameters from literature
- Biofuels modelling comprised:
  - 18 countries or regions (incl. ROW)
  - 22 commodities (three for oilseed complex, five for dairy industry, four livestock, plus corn)
Description of scenarios

• RFS modelled as exogenous increase in corn demand
  – Corn market affected directly
  – Corn also input into livestock equations

• Scenario #1: 15 billion gallons equals 37% increase in U.S. corn demand

• Scenario #2: 37% increase in demand, and 10% corn productivity increase
# U.S. corn results

Impacts on corn producer prices, production and trade (per cent change)

<table>
<thead>
<tr>
<th></th>
<th>Scenario 1 (demand)</th>
<th>Scenario 2 (demand &amp; efficiency)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Producer price</td>
<td>15.1</td>
<td>8.3</td>
</tr>
<tr>
<td>Production</td>
<td>8.9</td>
<td>16.5</td>
</tr>
<tr>
<td>Trade</td>
<td>-46.4</td>
<td>-26.1</td>
</tr>
</tbody>
</table>
## World price impacts

Impacts on corn, meat and milk world prices
(per cent change)

<table>
<thead>
<tr>
<th></th>
<th>Scenario 1</th>
<th>Scenario 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>15.15</td>
<td>8.28</td>
</tr>
<tr>
<td>Beef and veal</td>
<td>0.93</td>
<td>0.52</td>
</tr>
<tr>
<td>Sheep</td>
<td>1.06</td>
<td>0.60</td>
</tr>
<tr>
<td>Poultry</td>
<td>1.11</td>
<td>0.63</td>
</tr>
<tr>
<td>Whole milk powder</td>
<td>0.59</td>
<td>0.33</td>
</tr>
<tr>
<td>Butter</td>
<td>0.78</td>
<td>0.44</td>
</tr>
</tbody>
</table>
## Country-specific results

Producer returns changes for selected countries (per cent change)

<table>
<thead>
<tr>
<th></th>
<th>Scenario #1</th>
<th>Scenario #2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>USA</td>
<td>NZL</td>
</tr>
<tr>
<td><strong>Corn</strong></td>
<td>25.41</td>
<td>32.43</td>
</tr>
<tr>
<td><strong>Beef and veal</strong></td>
<td>-0.32</td>
<td>1.42</td>
</tr>
<tr>
<td><strong>Sheep</strong></td>
<td>-0.12</td>
<td>1.96</td>
</tr>
<tr>
<td><strong>Poultry</strong></td>
<td>0.00</td>
<td>2.08</td>
</tr>
<tr>
<td><strong>Raw milk</strong></td>
<td>-0.04</td>
<td>1.22</td>
</tr>
</tbody>
</table>
Discussion

• Several effects of increased corn demand
  – Lower U.S. exports
  – Higher production everywhere
  – U.S. livestock: slightly higher prices, slightly lower production, change in feed composition
  – Food system adapts

• Uneven impacts across production systems
  – Intensive, grain-based systems have higher costs, essentially unchanged revenues
  – Pasture-based systems have higher revenues, unchanged costs: NZ benefits from RFS
Conclusion

• Corn market impacts of ethanol
  – Large in isolation
  – Moderated by trade impacts
  – Efficiency gain reduces impact

• Small flow-on impacts on livestock sectors

• Extensive, pasture-based production gains from ethanol demand

• Modelling useful for analysing impacts
Future research programme

• Sensitivity analysis on elasticities
• More work on pig and poultry sectors
• Biofuels demand in other countries
  – Affects different crops, e.g., sugar in Brazil
  – Biodiesel in addition to ethanol – affects oilseed crops
• Disaggregate into production systems
• Analyse greenhouse gas impacts
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Thank you!

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