An Assessment of Barriers to Trade in Biofuels on Production and Consumption in Canada

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and
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Toronto, Ontario
Consumption Mandate in Canada

• Average renewable content
  • Gasoline: 5% by 2010.
  • Diesel: 2% by 2012.
### Implications of Federal Mandate

<table>
<thead>
<tr>
<th></th>
<th>Projected Demand Created by Mandate</th>
<th>Current Production Capacity</th>
<th>Required Increase in Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ethanol</strong></td>
<td>3.1 billion litres</td>
<td>1.5 million litres</td>
<td>1.6 billion litres (↑ 107%)</td>
</tr>
<tr>
<td>(by 2010)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Biodiesel</strong></td>
<td>600 million litres</td>
<td>322 million litres</td>
<td>278 million litres (↑ 86%)</td>
</tr>
<tr>
<td>(by 2012)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Proposed Biodiesel Projects in Alberta

- Advanced Biodiesel Group, Irricana 20 million litres/yr
- BFUELS Canada Corp, Chin 24-40 million litres/yr
- Biostreet Canada Inc, Vegreville 175 million litres/yr
- CR Fuels, Strathmore 114 million litres/yr
- CR Fuels, Purple Springs 114 million litres/yr
- Canadian Bioenergy, Fort Saskatchewan 200 million litres/yr
- Cansource Biofuels Corp, Mayerthorpe 40 million litres/yr
- Dominion Biodiesel, Calgary 22 million litres/yr
- Alberta Ethanol & Biodiesel GP, Innisfail 378 million litres/yr
- Kyoto Fuels, Lethbridge 33 million litres/yr
- Western Biodiesel Inc., Aldersyde 19 million litres/yr
- Western Biofuels, Lavoy 227 million litres/yr

- TOTAL 1382 million litres/yr
Economic Research Problem - 1

• Producers of biofuel in Canada have a comparative disadvantage in production.
  – Lower opportunity costs in Brazil, Southeast Asia and in tropical regions.
    – Land
    – Labour
    – Capital
    – Feedstock
Tariffs stifle access to cheaper sources of supply.

<table>
<thead>
<tr>
<th>Tariff Item</th>
<th>Description</th>
<th>MFN Tariff</th>
<th>Applicable Preferential Tariffs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2207.20.11.00</td>
<td>Ethyl alcohol, specially denatured</td>
<td>4.92¢/litre</td>
<td>CCCT, LDCT, UST, MT, CT, CRT: free</td>
</tr>
<tr>
<td>2207.20.12.00</td>
<td>Ethyl alcohol, denatured</td>
<td>4.92¢/litre</td>
<td>CCCT, LDCT, UST, MT, CT, CRT: free</td>
</tr>
<tr>
<td>2207.20.29.00</td>
<td>Ethyl alcohol, not denatured</td>
<td>12.28¢/litre</td>
<td>CCCT, LDCT, UST, MT, CT, CRT: free</td>
</tr>
<tr>
<td>3824.90.90.99</td>
<td>Miscellaneous chemical products, other, other, other (biodiesel)</td>
<td>6.5%</td>
<td>CCCT, LDCT, UST, MT, MUST, CIAT, CT, CRT: free GPT: 3%</td>
</tr>
</tbody>
</table>
Economic Research Problem - 3

• What are the consequences of import barriers given the projected increase in demand for biofuels in Canada?
Hypotheses

With effective import barriers:

1. Biofuel prices will be higher in Canada than they would otherwise be.
   • Implications for quantities demanded and supplied

2. World biofuel prices will be lower than they would otherwise be.
   • Implications for quantities demanded and supplied
Overview

• Background
  – WTO Classification of Biofuels
  – Production and Trade in Canada

• Conceptual Framework

• Empirical Model

• Preliminary Results
WTO Classification of Biofuels - 1

- Beyond the scope of the paper, but contextually important:

- World Customs Organization lists biofuels as agricultural or chemical products, not as fuels.
  - No separate HS code for fuel ethanol
    - Specially denatured, denatured, other denatured
    - Undenatured
  - Many other products are listed with biodiesel in HS 3824.90.
    - Difficult to separate out biodiesel.
Issues:

1. WTO rules differ for agricultural and industrial goods
   → different rules for ethanol and biodiesel
   → tariff rates are higher on ethanol than biodiesel

2. Biofuels could be classified as environmental goods in the ongoing negotiations on Environmental Goods and Services
   → subject to faster liberalization

3. The Brazilian government recently proposed that ethanol be reclassified as a fuel.
   → do biofuel subsides provide actionable benefits to producers of agricultural feedstock?
World Production of Ethanol 1975-2007

Source: Steenblick, 2007
# Production in Canada

## Ethanol

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>City</th>
<th>Province</th>
<th>Feedstock</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permolex</td>
<td>Red Deer</td>
<td>AB</td>
<td>Wheat</td>
<td>40,000,000 L</td>
</tr>
<tr>
<td>Husky Energy</td>
<td>Lloydminster</td>
<td>SK</td>
<td>Wheat</td>
<td>130,000,000 L</td>
</tr>
<tr>
<td>Terra Grain Fuels*</td>
<td>Belle Plaine</td>
<td>SK</td>
<td>Wheat</td>
<td>150,000,000 L</td>
</tr>
<tr>
<td>Poundmaker</td>
<td>Lanigan</td>
<td>SK</td>
<td>Wheat</td>
<td>12,000,000 L</td>
</tr>
<tr>
<td>NorAmera Bioenergy</td>
<td>Weyburn</td>
<td>SK</td>
<td>Wheat</td>
<td>25,000,000 L</td>
</tr>
<tr>
<td>Husky Energy</td>
<td>Minnedosa</td>
<td>MB</td>
<td>Wheat</td>
<td>130,000,000 L</td>
</tr>
<tr>
<td>Canadian Bioenergy</td>
<td>Sturgeon</td>
<td>AB</td>
<td>Canola</td>
<td>225,000,000 L</td>
</tr>
<tr>
<td>Logen</td>
<td>Ottawa</td>
<td>ON</td>
<td>Wheat Straw</td>
<td>2,000,000 L</td>
</tr>
<tr>
<td>IGPC*</td>
<td>Aylmer</td>
<td>ON</td>
<td>Corn</td>
<td>150,000,000 L</td>
</tr>
<tr>
<td>Greenfield Ethanol*</td>
<td>Hensall</td>
<td>ON</td>
<td>Corn</td>
<td>200,000,000 L</td>
</tr>
<tr>
<td>Greenfield Ethanol</td>
<td>Tiverton</td>
<td>ON</td>
<td>Corn</td>
<td>26,000,000 L</td>
</tr>
<tr>
<td>Greenfield Ethanol</td>
<td>Chatham</td>
<td>ON</td>
<td>Corn</td>
<td>150,000,000 L</td>
</tr>
<tr>
<td>Greenfield Ethanol*</td>
<td>Johnstown</td>
<td>ON</td>
<td>Corn</td>
<td>200,000,000 L</td>
</tr>
<tr>
<td>Greenfield Ethanol</td>
<td>Varennes</td>
<td>QC</td>
<td>Corn</td>
<td>120,000,000 L</td>
</tr>
<tr>
<td>Collingwood Ethanol*</td>
<td>Collingwood</td>
<td>ON</td>
<td>Corn</td>
<td>50,000,000 L</td>
</tr>
<tr>
<td>Suncor Energy</td>
<td>St. Clair</td>
<td>ON</td>
<td>Corn</td>
<td>200,000,000 L</td>
</tr>
</tbody>
</table>

Source: Canadian Renewable Fuels Association
Ethanol Imported into Canada (millions of litres)
Canada Fuel Ethanol Imports

<table>
<thead>
<tr>
<th>Major Sources</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>Québec</td>
</tr>
<tr>
<td>United States</td>
<td>Ontario, Saskatchewan, Alberta, Manitoba,</td>
</tr>
<tr>
<td></td>
<td>British Columbia, Québec</td>
</tr>
</tbody>
</table>

**Minor sources**: Austria, Ireland, Italy, Japan, United Kingdom
Exports of Denatured Ethyl Alcohol, any strength (millions of litres)
## Denatured Ethyl Alcohol Exports

<table>
<thead>
<tr>
<th>Major Sources</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontario</td>
<td>Georgia, Russian Federation, USA, Ukraine, Japan, Iran, Haiti, Greece, Turkey, Israel, India, Germany</td>
</tr>
<tr>
<td>Alberta</td>
<td>USA, South Africa, Iran, France</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>USA</td>
</tr>
</tbody>
</table>
Conceptual Framework
FAPRI Modeling System

Model Interactions
Trade, Prices, and Physical Flows

- Macroeconomic Variables
- Policy Parameters

International Dairy
International Livestock
International Grains
U.S. Dairy
U.S. Livestock
U.S. Crops
International Oilsseeds
International Sugar
International Rice

Ethanol
Conceptual Framework - 2

• **International ethanol model:**
  – Multi-market partial equilibrium

  – Complete country models for
    • U.S., Brazil, China, India, and EU-25
    • Net trade equations are set up for **Canada**, Japan, South Korea, and ROW.

  – Composed of behavioral equations for production, consumption, ending stocks, and net trade.
Conceptual Framework - 3

- The model solves for world ethanol prices by equating ES and ED across countries.

- In the country models, including **Canada**:
  - Demand for ethanol is derived from a refiner’s cost function for blended gasoline.
  - The proportion of ethanol in blended fuel ↑ as the ethanol price ↓ to capture substitution effects.

- The relationship between quantity supplied of ethanol and price is estimated with consideration to:
  - Feedstock (**corn** and **wheat**)
  - Prices of dry-mill ethanol co-products (**DDGs**)
  - Production subsidies
Conceptual Framework - 4

• The U.S. ethanol model is incorporated within the U.S. crops model
  – includes behavioral equations that determine crop planted acreage, domestic feed, food and industrial uses, trade, and ending stocks.

• The model solves for the set of prices that brings annual supply and demand into balance in all markets.
Conceptual Framework - 5

• Brazilian anhydrous ethanol price as the world ethanol price,
  – Assume Brazil is the major exporter of ethanol.

• Domestic prices for ethanol in each country is linked to world price through exchange rates and other price policy wedges.
Empirical Model – 1

• Calibrated on 2006 data, generates a 10-year baseline to 2016.

• Current policies maintained
  – Tax credits
    • US: ethanol $0.135/litre; biodiesel $0.264/litre
  – Tariffs
    • US: ethanol tariff of $0.143/litre
Empirical Model – 2

• Data for ethanol supply and utilization:

• Macroeconomic data:
  – International Monetary Fund and Global Insight.

• Canadian data:
  – Agriculture Canada, Statistics Canada, USDA’s Foreign Agricultural Service Attaché Reports.
Empirical Model - 3

• **Two scenarios:**
  
  1. Impact of an increase in Canadian ethanol demand to 10% of domestic liquid fuel consumption by 2011 (i.e., doubling the present mandate), **with a trade response.**

  2. Impact of an increase in Canadian ethanol demand to 10% of domestic liquid fuel consumption by 2011 (i.e., doubling the present mandate), **without a trade response.**
Preliminary Results - 1

Share of Ethanol Fuel Consumption

Ratio


Baseline Scenario
Impact on World Ethanol Price - Trade Response Scenario
Preliminary Results - 2

Impact on Canadian Ethanol Market by 2016

Trade Response Scenario

<table>
<thead>
<tr>
<th></th>
<th>Production</th>
<th>Consumption</th>
<th>Net Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline</strong></td>
<td>450</td>
<td>600</td>
<td>200</td>
</tr>
<tr>
<td><strong>Scenario 1</strong></td>
<td>500</td>
<td>800</td>
<td>200</td>
</tr>
</tbody>
</table>

**Legend:**
- Blue: Baseline
- Purple: Scenario 1

**Units:**
- Production, Consumption, Net Imports: Million gallons
Impact on Brazilian Ethanol Market by 2016

Trade Response Scenario

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Scenario 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>6000</td>
<td>7000</td>
</tr>
<tr>
<td>Consumption</td>
<td>3000 mill</td>
<td>5000</td>
</tr>
<tr>
<td>Net Exports</td>
<td>2000</td>
<td>1000</td>
</tr>
</tbody>
</table>
Impact on Canadian Ethanol Market by 2016

No Trade Response Scenario

<table>
<thead>
<tr>
<th>Million Gallons</th>
<th>Production</th>
<th>Consumption</th>
<th>Net Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>400</td>
<td>600</td>
<td>100</td>
</tr>
<tr>
<td>Scenario 2</td>
<td>800</td>
<td>900</td>
<td>200</td>
</tr>
</tbody>
</table>

Preliminary Results - 4
Concluding Remarks

• Need to improve the mouse trap
  – With trade
    • Ethanol prices in Canada = prices in the US
    • But, prices increase by about US$0.10/gallon
      – This seems large.
  – w/o trade,
    • ethanol prices in Canada NOT solved endogenously.
    • A 10% ethanol blend requirement will be costly and have an important welfare effects.