Uncertainty about Indirect Effects of US Ethanol on Brazilian Land Use

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www.fapri.missouri.edu
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What are the indirect effects of US biofuels?

- Indirect effects
  - Feedstock use
  - Market effects
  - Land use

- Studies
  - Partial equilibrium
  - General equilibrium
Models

**US model**
- FAPRI-MU US agricultural and biofuel markets
  - national crop and milk supplies
  - no reduced form for trade

**World model**
- Standardized representation
  - Brazil, Argentina, China, India, Indonesia, EU, and Mexico; and rest of world trade
  - wheat, rice, corn, other coarse grains, sugar, soybean, rapeseed, sunflower, palm oil, vegetable oil, oilseed meal, beef, pork, and poultry; and ethanol
Standard agricultural market representation (excluding US)

- **Land use**
  - Agricultural uses
  - Crop land
    - wheat, rice,…
  - Sugar
  - Pasture

- **Crop markets**
  - Production
  - Food
  - Feed
  - Fuel
  - Stocks
  - Trade

- **Meat markets**
  - Production
  - Food
  - Trade

- **Demand**
  - Food
    - wheat, rice, corn,…
  - vegetable oil
  - sugar
  - beef, pork, poultry
  - Feed
Partial equilibrium, world markets

Commodities
- wheat
- rice
- corn
- other coarse grains
- vegetable oil
- oilseed meal
- sugar
- beef
- pork
- poultry
- ethanol

Countries, regions
- US
- Brazil
- Argentina
- China
- India
- Indonesia
- European Union
- Mexico
- rest of world

world prices
clear
world markets

United States

Brazil

other countries

rest of world net exports
US ethanol model

- Ethanol demand
  - Additive
  - E10
  - E85

- Supply capacity building and use

- Policy
  - Tax credits and tariffs
  - EISA mandates
Standard land allocation (not US)
Land allocation elasticities

<table>
<thead>
<tr>
<th>Stage</th>
<th>Low</th>
<th>Base</th>
<th>High</th>
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</thead>
<tbody>
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<td>First stage</td>
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Petroleum price change effects from US perspective only

Petroleum price change

Demand for biofuels

Costs of production

Feedstock demand

Land allocation

Crop prices

Demand for biofuels

Feedstock demand

Land allocation

Other uses

Meat supply & demand

Initial shock

First incidence

Narrow effects

Full effects
Petroleum from $125 to $160: Effects on US ethanol market
Petroleum from $125 to $160: Effects on Brazil ethanol market
Petroleum from $125 to $160: Effects on Brazil land use

<table>
<thead>
<tr>
<th>Land Class</th>
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<th>High</th>
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<tbody>
<tr>
<td>Other land classes</td>
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<td>-54.9</td>
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<tr>
<td>Forest</td>
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<tr>
<td>Rice</td>
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<td>-8.7</td>
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Base values in percentage change.
Petroleum from $125 to $90: Effects on Brazil land use

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<th></th>
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<th>Base</th>
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<td>Rice</td>
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Petroleum from $125 to $160: Effects on market prices
What to conclude about indirect effects on land use?

Land allocation responsiveness critically important, but so are other assumptions.

- Ethanol market effects?
- Commodity market interactions?

Complicated interaction of ethanol market, commodity market, and land use effects.

- Larger price effects consistent with inelastic markets $\rightarrow$ small land use effects or small consumption effects.
- Smaller price effects consistent with elastic markets $\rightarrow$ larger land use or consumption effects.
For more information

- For more on the FAPRI-MU US stochastic baseline and biofuel policy analysis work, go to
  - http://www.fapri.missouri.edu/.

- For FAPRI US and world baseline and analysis, go to