The producer welfare effects of trade liberalization when goods are perishable and habit-forming: the case of asparagus

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### Some Ag Imports are perishable and seasonal

<table>
<thead>
<tr>
<th>Seasonal</th>
<th>Perishable</th>
<th>Non-perishable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Orchard Crops:</strong> grapes, berries, cherries, peaches</td>
<td>Apples, Oranges, Beans, Garlic</td>
<td></td>
</tr>
<tr>
<td><strong>Greenhouse Crops:</strong> Mushrooms, Broccoli, Tomatoes, Cut Flowers</td>
<td>Meats, Some Grains</td>
<td></td>
</tr>
</tbody>
</table>

### Key Issues For Trade:
- Out of season imports increase availability
- Out of season imports may not compete U.S. domestic supply
- Out of season imports may cause habit formation (Becker, 1977, “Consumption Capital”)
  - Strengthens/sustains demand for in season domestic products
  - Positive habits may offset some of the harm of import comp.
United States

Trade Effect: A Tariff increases the price and domestic producer welfare.

U.S. Trade Partner
The Case of Asparagus

• Highly Seasonal Spring Crop
  – 10-13 year growth cycle
  – Hand picked daily for 2-3 months then allowed to “fern out”
  – Canned, frozen asparagus of lesser quality
• 95% of supply from US, Peru, and Mexico
  – U.S. supplies February to June
  – 21.3% MFN tariff reduced to 5% Sept to November
  – Mexico: NAFTA (1994)
• 2008 Farm Bill – MLA for Low Prices From Imports
  – $15M for the 4 preceding years (2004 to 2007)
  – Split Between fresh and frozen suppliers.
    - $1.75 M to Fresh Producers, $1.75 M to Frozen
Asparagus Imports: Rising, Seasonal

Fig. 1

Fig. 2. U.S. fresh asparagus supply by source: 2007–2010 (millions of pounds).
Emp. Strat. to Measure the Offset of Habits

1. Estimate a demand elasticities for veg with habits
   – Assumed homogenous quality in asparagus
   – Supply elasticities pulled from available estimates

2. Create Equilibrium Displacement Model
   A. Simulate the (positive) benefit of re-imposing MFN tariffs on U.S. producers (assuming no habits)
   B. Simulate the (negative) effect of reduced habits on U.S. producers

3. Compare total net benefit of re-imposing MFN tariff and to MLA Provided in Farm Bill.
1. Demand System Estimation

- **Data (Monthly, 1992-2008)**
  - Quants: AMS Product Movement Data (nat. aggreg.)
  - Prices: ERS outlook prices augmented w import prices

- **Trans Log Demand System**
  - Flexible, Comparable to AIDS model
  - 4 goods (asparagus, broccoli, carrots, cauliflower)
    - LaFrance – Inclusion of numeraire good overcomes the problem of assuming income separability.
  - Lagged consumption is a demand shifters
    - Discounted “memory” of past consumption captures habits
    - Discount rate is estimated at .5589
### Elasticities of Demand with Respect to Lagged Consumption

<table>
<thead>
<tr>
<th>Asparagus</th>
<th>Broccoli</th>
<th>Carrot</th>
<th>Cauliflower</th>
<th>Numeraire</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lag Asp.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asp.</td>
<td>0.64</td>
<td>0.08</td>
<td>0.03</td>
<td>-0.04</td>
</tr>
<tr>
<td></td>
<td>(0.48)</td>
<td>(0.18)</td>
<td>(0.15)</td>
<td>(0.33)</td>
</tr>
<tr>
<td>Broc.</td>
<td>0.33</td>
<td>0.51</td>
<td>0.25</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td>(0.53)</td>
<td>(0.37)</td>
<td>(0.25)</td>
<td>(0.57)</td>
</tr>
<tr>
<td>Car.</td>
<td>-0.42</td>
<td>0.01</td>
<td>0.16</td>
<td>0.17</td>
</tr>
<tr>
<td></td>
<td>(0.54)</td>
<td>(0.29)</td>
<td>(0.29)</td>
<td>(0.61)</td>
</tr>
<tr>
<td>Cauliflower</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cau.</td>
<td>0.38</td>
<td>-0.11</td>
<td>0.26</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>(0.38)</td>
<td>(0.2)</td>
<td>(0.16)</td>
<td>(0.46)</td>
</tr>
<tr>
<td>Numeraire</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Num.</td>
<td>-0.94</td>
<td>-0.69</td>
<td>-0.69</td>
<td>-1.07</td>
</tr>
<tr>
<td></td>
<td>(0.96)</td>
<td>(0.57)</td>
<td>(0.52)</td>
<td>(1.02)</td>
</tr>
</tbody>
</table>
2. Create the Equilibrium Displacement Model

The Market Equilibrium Condition

\[ Q^D(P, \text{lag } Q) - \sum_k Q^{S,k}((1 - t_k)P) = 0. \]

as Elasticities

\[ A \delta \ln P + B \delta \ln \text{Lag } Q + C \tau_i_k = 0. \]

\[(E^D_P - (\varphi_k E^S_{P,k})I),\]

Lag Dem. Elast.

Monthly Shares of Supply

\[E^D_{\text{Lag } Q},\]

Lag Dem. Elast.

\[(\varphi_k E^S_{P,k}),\]

Own Supply Elast. ranges from 0.2 to 0.6, cross elast. is zero
2. Create the Equilibrium Displacement Model: Welfare Effect

\[
\Delta CS_i = \int_{P_i^{**}}^{P_i^*} Q_i^D(P_i) \partial P_i \approx -\partial P_i \left( \frac{1}{2} (2Q_i + \partial Q_i) \right)
\]

\[
\frac{\Delta CS_i}{(P \times Q)_i} = \partial \ln P_i (1 + 0.5 \partial \ln Q_i),
\]

\[
\Delta PS_i = \sum_k \int_{(1-t)P_i^{**}}^{((1-t)P_i)^*} Q_{i,k}(t_i,k P_i) \partial (t_i,k P_i)
\approx \sum_k (\partial P_i t_{i,k} - \partial t_{i,k} P_i) \frac{1}{2} (2Q_{i,k} + \partial Q_{i,k}).
\]

\[
\frac{\Delta PS_i}{(P \times Q)_i} = \sum_{k=1}^{K} (\partial \ln P_i - \partial t_{i,k})' (1 + 0.5 \partial \ln Q_{i,k}).
\]
### Welfare Effects without Habits (Changes as Percent of Total Revenue)

<table>
<thead>
<tr>
<th></th>
<th>Consumer Surplus</th>
<th>Producer Surplus</th>
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<tbody>
<tr>
<td></td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>NAFTA</td>
<td>0.32</td>
<td>6.12</td>
</tr>
<tr>
<td>ATPA</td>
<td>0.16</td>
<td>5.65</td>
</tr>
<tr>
<td>Both</td>
<td>0.48</td>
<td>11.77</td>
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<td>NAFTA</td>
<td>.55</td>
<td>6.36</td>
</tr>
<tr>
<td>ATPA</td>
<td>.35</td>
<td>5.85</td>
</tr>
<tr>
<td>Both</td>
<td>.90</td>
<td>12.21</td>
</tr>
</tbody>
</table>
3. Total Welfare Effects

- We find that the estimated loss from the tariff reductions of NAFTA and the ATPA is less than the annualized farm bill support of $1.75M ($7.5 M over 4 years) to fresh producers.
- The estimated loss is even smaller when habit effects are included.
Conclusions

• Seasonality and habit formation may offset the harm to producers from trade liberalization
  – Very specific to goods, trade patterns
    • Asparagus might be a prime example.
    • Chilean grapes, berries and stone fruit?
  – Some preference for out-of-season supply is already embedded in tariff code