Trade liberalisation, institutions and persistent habits – a CGE model analysis for developing countries

Nordic conference on development economics
Helsinki, 11-12 June 2018

VATT INSTITUTE FOR ECONOMIC RESEARCH
Janne Niemi
Contents

1. Research questions / Motivation
2. Building blocks (models and theories)
3. Model and data
4. Illustrative simulation results
1. Research questions / Motivation

• Questions:
  – Imperfect substitution between goods from different sources (domestic, imported from different countries)
  – If the Armington elasticities change in time, what are the effects on expected outcomes?
  – International trade CGE modelling: Generalise taste change in long-run (recursive dynamic) simulations?

• Underlying motivation:
  – Implications to welfare gains from trade?
  – Food, trade and development
2. Building blocks (models and theories)

- Armington model of international trade
- Habit persistence / habit formation
- Interdepended preferences
- Linear Expenditure System (LES)
2. Building blocks (models and theories)

“Armington” model of trade

- Imperfect substitution in international trade (Armington 1969)
  - Real or perceived heterogeneity (especially in aggregate data)
  - Consumer behaviour (individual)
  - Trading practices, institutions (especially NTMs)
- Two-level nested structure common in CGE trade models:
  (1) domestic/imported;
  (2) imported/imported
- This study concerned with (2)

Diagram:
- Total Demand
  - Imported
  - Domestic
  - Origins 1, 2, …, n
2. Building blocks (models and theories)

Habit persistence

• Current consumption depends on past consumption: “The more the consumer eats today, the hungrier he wakes up tomorrow.”

• First suggested by Duesenberry (1949): Savings data inconsistent with standard theory.

• “Gap” in the literature 1985-2010
2. Building blocks (models and theories)

Habit persistence

  - Future consumption depends on the “habit stock” of not only the individual, but of all other individuals as well.
  - Habits treated as external to the consumer.

- Trade context:
  - Consider broader definition of ‘habits’: Institutional constraints, Non-tariff barriers, long-term contracts, delivery reliability etc.
3. Implementing the model: expenditure system

- Expenditure shares in an AIDS

\[ s_{it} = \alpha_i + \sum_j \gamma_{ij} \ln p_j + \beta_i \ln \left( \frac{m}{P} \right) \]

- (Re)specify \( \alpha \) to reflect habit persistence

\[ \alpha_i = \alpha_i^* + \lambda_i q_{i,t-1} \]

- Expenditure system

\[ s_{it} = \alpha_i + \lambda_i b_{it} + \sum_j \gamma_{ij} \ln \frac{p_j}{p_M} \]

where

\[ b_{it} = \frac{p_{it} q_{it-1}}{m_t} \]
3. Implementing the model: code

- The long-run import demand \( q_{xs\_lr} \) is identical to the standard GTAP model import demand \( q_{xs} \).

  Equation LR_IMPORTDEMAND
  # regional long-run demand for disaggregated imported commodities by source (HT 29) #
  (all,i,TRAD_COMM)(all,r,REG)(all,s,REG)
  \[
  q_{xs\_lr}(i,r,s) = qim(i,s) - \text{ESUBML}(i,s) \times [pms(i,r,s) - pim(i,s)];
  \]

- The short-run import demand \( q_{xs} \) is now dependent on parameter LAMBDAM, which defines the "base demand" and adjustment speed towards the long-run demand.

  Equation IMPORTDEMAND
  # regional short-run demand for disaggregated imported commodities by source #
  (all,i,TRAD_COMM)(all,r,REG)(all,s,REG)
  \[
  VIMS(i,r,s) \times [p100 + qxs(i,r,s) + pms(i,r,s)]
  = LAMBDAM(i,s) \times VIMS\_B(i,r,s) \times [p100 + pms(i,r,s)]
  + [1-LAMBDAM(i,s)] \times VIMS\_LR(i,r,s) \times [p100 + pms(i,r,s) + qxs\_lr(i,r,s)];
  \]
4. Data and Scenarios

- GTAP 9a database
- Rice, wheat, coarse grains
  - Large trade volumes
  - Somewhat (but not entirely) homogeneous
  - Relevant for trade and development considerations
- Stylised trade policy scenario simulated with (modified) dynamic GTAP model with different elasticity and habit persistence options.
## 4. Data and Scenarios: Regional aggregation

<table>
<thead>
<tr>
<th></th>
<th>Country / Region</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>China</td>
<td>13 Rest of Europe and Central Asia</td>
</tr>
<tr>
<td>2</td>
<td>Indonesia</td>
<td>14 North Africa</td>
</tr>
<tr>
<td>3</td>
<td>Thailand</td>
<td>15 Ghana</td>
</tr>
<tr>
<td>4</td>
<td>Viet Nam</td>
<td>16 Nigeria</td>
</tr>
<tr>
<td>5</td>
<td>Bangladesh</td>
<td>17 Ethiopia</td>
</tr>
<tr>
<td>6</td>
<td>India</td>
<td>18 Kenya</td>
</tr>
<tr>
<td>7</td>
<td>Rest of Asia (excl high inc)</td>
<td>19 Mozambique</td>
</tr>
<tr>
<td>8</td>
<td>High income Asia and Oceania</td>
<td>20 Tanzania</td>
</tr>
<tr>
<td>9</td>
<td>North America</td>
<td>21 South Africa</td>
</tr>
<tr>
<td>10</td>
<td>Latin America (excl NAFTA)</td>
<td>22 Rest of Sub-Saharan Africa</td>
</tr>
<tr>
<td>11</td>
<td>European Union 28</td>
<td>23 Rest of the World</td>
</tr>
<tr>
<td>12</td>
<td>Black Sea Producers</td>
<td></td>
</tr>
</tbody>
</table>
### 4. Data and Scenarios: Commodity / sector aggregation

<table>
<thead>
<tr>
<th>Aggregated sectors</th>
<th>Included sectors and commodities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Rice</td>
<td>Paddy rice, Processed rice</td>
</tr>
<tr>
<td>2 Wheat</td>
<td>Wheat</td>
</tr>
<tr>
<td>3 Other grains</td>
<td>Cereal grains nec</td>
</tr>
<tr>
<td>4 Other food</td>
<td>Other primary agriculture, and processed food</td>
</tr>
<tr>
<td>5 Manufacture</td>
<td>All manufactured products, excl. food</td>
</tr>
<tr>
<td>6 Services</td>
<td>All services</td>
</tr>
</tbody>
</table>
### Policy scenarios

33% Reduction in “hidden” trading costs (e.g. NTMs) for rice, wheat and coarse grains.

<table>
<thead>
<tr>
<th></th>
<th>Multilateral</th>
<th>Unilateral</th>
<th>Unilateral &amp; Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treated commodities</td>
<td>Rice, Wheat, Other grains</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treated importing regions</td>
<td>All</td>
<td></td>
<td>EU28</td>
</tr>
<tr>
<td>Treated exporting regions</td>
<td>All</td>
<td>Low-income Sub-Saharan Africa</td>
<td></td>
</tr>
<tr>
<td>Capital accumulation</td>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>
## 4. Data and Scenarios: Scenario options

<table>
<thead>
<tr>
<th>Substitution between</th>
<th>Scenario options</th>
</tr>
</thead>
<tbody>
<tr>
<td>different sources of imports</td>
<td>Base</td>
</tr>
<tr>
<td>Habit persistence $\lambda_M$</td>
<td>0</td>
</tr>
<tr>
<td>Long-run elasticity $\sigma_M$</td>
<td>2s</td>
</tr>
<tr>
<td>Short-run elasticity $\gamma_M$</td>
<td>2s</td>
</tr>
</tbody>
</table>

| domestic and imported goods | | |
| Habit persistence $\lambda_D$ | 0 | 0 | .5 | .5 | .75 | .75 |
| Long-run elasticity $\sigma_D$ | s | s | s | s | 2s | 2s |
| Short-run elasticity $\gamma_D$ | s | s | .5 s | .5 s | .5 s | .5 s |

$s =$ GTAP 9 database substitution elasticity between domestic and imported (ESUBD); elasticity between sources of imports $ESUBM = 2 \times ESUBD$ for all commodities.
5. Simulation results

Trade
Multilateral (base): world trade volume index

Everything happens in t=1
Multilateral (M): world trade volume index

Smaller initial response, converges to base as expected…
Unilateral (M): world trade volume index

... but exceeds base in the Unilateral scenario
Multilateral (D): world trade volume index

In Multilateral, this happens with domestic-imported HP
Multilateral (M+D): world trade volume index

Impacts of the 2 nests HP are not separable / additive!
Unilateral (D): world trade volume index

D option converges in Unilateral
Unilateral (M+D): world trade volume index

Combined effect moves from D to M
5. Simulation results

Other macro variables
Differences to both directions.
Multilateral: private consumption

Mirror image of the GDP?
Multilateral: global investments

Drive the GDP
5. Simulation results

Changing the domestic-imported long-run elasticity
Multilateral (base): world trade volume index

Impact on trade already in t=1, and increases
In unilateral case impact more as expected
Unilateral (base): world aggregate GDP

Makes little difference for other macros in unilateral
5. Simulation results

Regional effects
Multilateral: Exports (difference to base)

Foreign-foreign has zero impact alone. Country differences
Multilateral: Consumption (difference to base)

Foreign-foreign has zero impact alone. Country differences
Unilateral: Exports (difference to base)

Changes to same direction in different countries, domestic-imported has little effect alone
Unilateral: Consumption (difference to base)

Negative impact on consumption, increases with more habit persistence
Conclusions

- Specification of imports demand does matter
- Does potentially produce a “better fit” to actual data
- Options have different effects depending on policy scope
- Options affect countries differently
- Big differences, but no changes of sign (detected so far)

- What are the mechanisms behind the results?
- Welfare implications? Can trade persistence compensate welfare loss from domestic price rise with habit persistence of domestic consumption?