Reassessing Effective Protection Rates in a *Trade in Tasks* perspective: Evolution of Trade Policy in “Factory Asia”

Antonia Diakantoni
Hubert Escaith

Causes and Consequences of Globalization
24-26 April 2012, Groningen, NL
Effective Protection Rates (EPRs): What, Why?

• History, limitations
  – EPRs as analytical indicator of tariff escalation
  – EPRs associated to the production function
  – Poor predictive power due to fixed factor proportions (Leontief technology using I-O matrices)

• EPR revival
  – International trade moves from "trade in (final) goods" to "trade in tasks"
  – Vertical specialization and trade in value added perspective
  – New sets of IO data and their linkages
Effective Protection Rates (EPRs): Properties

- The formula: \( EPR_j = \frac{t_j - (\Sigma_i t_i \cdot a_{ij})}{1 - \Sigma_i a_{ij}} \)

- EPR vs nominal protection (NP)
- EPRs as a ratio of value added (MFN-0)
- Main properties

EPR can be negative, even if positive nominal rate of protection \( t_j > 0 \).
EPR lower than nominal protection, if protection on output smaller than on inputs.
EPR will be higher (i) the larger/lower the nominal tariff on output/inputs and (ii) the smaller the value added at world prices.
If the nominal tariff schedule is flat, EPR equals nominal protection
High positive EPRs create an anti-export bias
I.a The data

- **International input-output**
  - 10 economies: China, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, Chinese Taipei, Thailand, and the USA
  - 3 reference years 1995, 2000 and 2005 (estimate)
  - 76 sectors of activity, aggregated into 64 sectors to match the tariff data
  
  *Source: Institute of Developing Economies, JETRO and WTO estimates*

- **Tariff line MFN applied duties and import statistics**
  - Calculation of NPs: weighted tariff averages by product and partner at the HS 6-digits, aggregated at the sector level
  - 3 reference years 1995, 2000 and 2005, MFN applied rates
  - 53 good-producing sectors and partners (10 plus RoW)
  - Standard concordance tables (versions of the HS - correlate HS tariff data to the ISIC industrial sectors)
  
  *Source: WTO Integrated Data Base (IDB)*
I.b  The method

• Initial data exploration
  - Value added, Nominal protection and EPRs
  - Developed / developing countries
  - Time and sectoral dimensions

• Detangling structural and tariff effects
  – Changes in trade policy (nominal tariff schedule) vs.
  – Changes in inter-industrial productive structure (input-output matrix)
I.b  The method *cont’d*

- Detangling nominal exchange rates and inflation effects
- Law of one price (constant real exchange rate):
  1. Imported inputs move as international inflation and changes in nominal exchange rate *vis à vis* the US dollar.
  2. Domestic inputs move as the domestic rate of inflation.

❖ both (1) and (2) should move in parallel in the long term, but …
Domestic and imported content of exports, share

- Proportion changes with country size, development level and output composition
- Magnitudes increased globally and shares remain balanced
- Domestic intermediate input contents of exports are predominant, 90% in agriculture and raw materials and 72% in manufactures
Domestic and imported content of exports
(gross, % of total output value)

No systematic one to one complementarity between imported and domestic inputs
(variations in rate of value-added per unit of output)
Towards lower EPRs

<table>
<thead>
<tr>
<th></th>
<th>AGRICULTURE</th>
<th></th>
<th>MANUFACTURES</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DVG</td>
<td>DVG</td>
<td>DVD</td>
<td>DVG</td>
</tr>
<tr>
<td>1995</td>
<td>NP</td>
<td>EPR</td>
<td>NP</td>
<td>EPR</td>
</tr>
<tr>
<td>Median</td>
<td>6.5</td>
<td>4.9</td>
<td>1.3</td>
<td>0.9</td>
</tr>
<tr>
<td>Mean</td>
<td>27.2</td>
<td>29.6</td>
<td>2</td>
<td>1.1</td>
</tr>
<tr>
<td>2005</td>
<td>NP</td>
<td>EPR</td>
<td>NP</td>
<td>EPR</td>
</tr>
<tr>
<td>Median</td>
<td>3.9</td>
<td>2.6</td>
<td>1.9</td>
<td>3.1</td>
</tr>
<tr>
<td>Mean</td>
<td>11.9</td>
<td>15.5</td>
<td>2.1</td>
<td>3.9</td>
</tr>
</tbody>
</table>

Changes are more significant:

... for developing countries (DVG) than developed (DVD)

... for the mean than for the median

(reduced level and dispersion of nominal and effective tariff protection rates)
Simulations: changes in tariff policy or in production structure

EPRs of Developing countries, differentiated tariff and production effects

D=P observed; D<P duties (D) older than production patterns and vice versa

Source: Table 8
Simulations: changes in tariff policy or in production structure

EPRs of Industrialised countries, differentiated tariff and production effects

D=P observed; D<P duties (D) older than production patterns and vice versa

Source: Table 8
Adjusted and non adjusted EPRs for exchange rate and inflation effects (comparison with 1995)

Basic idea: no change if domestic prices and xrate followed the law of constant PPP

Impacts of the 1997 Asian crisis: differentiated and slowly absorbed
Average Propagation Length (APL) of a Tariff Hike

• The scale of the impact depends on the length of the supply chain; in an input-output setting, a rough measure of the depth of supply chains could be given by the average propagation length (APL) of a shock.

• an inverse Leontief or Ghosh matrix to trace both direct and indirect impacts, APL is formulated as a weighted average of the number of production stages which the impact from industry "j" goes through until it ultimately reaches industry "i".

• At each iteration, the net impact is used as a weight; it tends to zero when the number of iterations increases. APL is closely related to the notion of vertical integration.
# Sectorial APLs, 2005

*(foreign component only, adjusted)*

<table>
<thead>
<tr>
<th>Sector</th>
<th>China</th>
<th>Japan</th>
<th>USA</th>
<th>Korea</th>
<th>Taipei</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy</td>
<td>1.2</td>
<td>0.4</td>
<td>0</td>
<td>0.3</td>
<td>0</td>
<td>0.4</td>
</tr>
<tr>
<td>Crude petroleum and natural gas</td>
<td>11.5</td>
<td>0.3</td>
<td>17.5</td>
<td>1.3</td>
<td>0.1</td>
<td>6.8</td>
</tr>
<tr>
<td>Food, beverage and tobacco</td>
<td>9.6</td>
<td>4.6</td>
<td>6.9</td>
<td>1.7</td>
<td>0.6</td>
<td>4.1</td>
</tr>
<tr>
<td>Textile, leather, and other</td>
<td>18.5</td>
<td>4.2</td>
<td>2.3</td>
<td>3.7</td>
<td>3.7</td>
<td>3.9</td>
</tr>
<tr>
<td>Chemical products</td>
<td>40.7</td>
<td>66.8</td>
<td>45</td>
<td>27.3</td>
<td>23.5</td>
<td><strong>24.1</strong></td>
</tr>
<tr>
<td>Petroleum and petrol products</td>
<td>22.5</td>
<td>11.3</td>
<td>9.7</td>
<td>12.9</td>
<td>10.7</td>
<td>11.7</td>
</tr>
<tr>
<td>Metals and metal products</td>
<td>75.8</td>
<td>100</td>
<td>27.3</td>
<td>31.6</td>
<td>17.8</td>
<td><strong>27.5</strong></td>
</tr>
<tr>
<td>Industrial machinery</td>
<td>20.7</td>
<td>23.1</td>
<td>9.5</td>
<td>3.8</td>
<td>2.6</td>
<td>6.8</td>
</tr>
<tr>
<td>Computers and electronic equipment</td>
<td><strong>25.2</strong></td>
<td>43.1</td>
<td>19.3</td>
<td>18.1</td>
<td>20.3</td>
<td><strong>16.5</strong></td>
</tr>
<tr>
<td>Other electrical equipment</td>
<td>25.2</td>
<td>25.7</td>
<td>23.2</td>
<td>8.4</td>
<td>8.5</td>
<td>10.7</td>
</tr>
<tr>
<td>Transport equipment</td>
<td>10.5</td>
<td>29</td>
<td>10.4</td>
<td>3.8</td>
<td>0.6</td>
<td>6.4</td>
</tr>
<tr>
<td>Other manufacturing products</td>
<td>18.1</td>
<td>17.6</td>
<td>8.4</td>
<td>3.8</td>
<td>3</td>
<td>5.9</td>
</tr>
<tr>
<td>Average</td>
<td>16.9</td>
<td>17</td>
<td>10</td>
<td>6</td>
<td>4.7</td>
<td>7</td>
</tr>
<tr>
<td>Median</td>
<td>11.5</td>
<td>4.6</td>
<td>6.9</td>
<td>2.1</td>
<td>0.7</td>
<td>4.3</td>
</tr>
</tbody>
</table>