New Measures of Trade and Global Value Chains

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Measuring Bilateral Exports of Value Added: A Unified Approach and Application

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**Definition** Trade dependence of country R on country i is defined as: value added in country R related to demand in country i.

**Context**: world in which international production sharing is pervasive (Global Value Chains).

**Measurement strategy** Short run effect of closing down particular bilateral trade flows (through so-called hypothetical extraction in a Leontief demand driven model)
Value added in GVCs

Figure 1 Example of sequential production chain

Note: This GVC is a “pure snake” (Baldwin and Venables, 2013, JIE), but validity of indicators does not depend on shape of GVCs
VAX-D: Value added exports for direct use.

How much GDP of $R$ is related to exports to $S$?
VAX-D: Value added exports for direct use
VAX-P: Value added exports for final stage production

How much GDP of $R$ is related to final output produced in $T$? (e.g. Blanchard et al., 2017, *NBER-WP*)

*Note: These are non-direct exports*
**VAX-D:** Value added exports for direct use  
**VAX-P:** Value added exports for final stage production  
**VAX-C:** Value added exports for consumption

How much GDP of $R$ is related to final demand from $U$?  
(e.g. collapse 2008/09 analysed in Bems et al., 2011, 2013 )
Unified framework to measure exports of $R$ to $i$

**Hypothetical extraction method** (Los et al., *AER*, 2016):

$$\text{GDP}_R = v (I-A)^{-1} f$$

with $v$ value added to gross output by industry, $A$ world input requirements matrix and $f$ world final demand vector.

Compute **hypothetical GDP**$^*$ of $R$ through extraction of a particular trade flows (of intermediates and/or final goods) involving country $i$, where

$$\text{GDP}_{R^*} = v (I-A^*)^{-1} f^*$$

$$\text{VAX}_{Ri} = \text{GDP}_R - \text{GDP}_{R^*}$$
Unified framework to measure exports of $R$ to $i$

$$\text{GDP}_R^* = v \ (I-A^*)^{-1} \ f^*$$

- **For VAX-D**: set exports from $R$ to $i$ to zero in input coefficients matrix ($A$) and in final demands matrix ($f$)
- **For VAX-P**: set final output sales of $i$ to zero in $f$
- **For VAX-C**: set final demand by $i$ to zero in $f$

NB This can be easily extended to answer questions like: how much GDP of $R$ goes to $i$ through $j$
## Partner countries for exports by the UK (in mil US$, 2014)

<table>
<thead>
<tr>
<th>Country</th>
<th>GX</th>
<th>VAX-D</th>
<th>VAX-P</th>
<th>VAX-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>85,559</td>
<td>64,519</td>
<td>47,428</td>
<td>77,249</td>
</tr>
<tr>
<td>Germany</td>
<td>54,147</td>
<td>40,702</td>
<td>25,403</td>
<td>36,615</td>
</tr>
<tr>
<td>France</td>
<td>46,573</td>
<td>36,845</td>
<td>25,954</td>
<td>34,209</td>
</tr>
<tr>
<td>Ireland</td>
<td>34,477</td>
<td>27,275</td>
<td>13,478</td>
<td>14,828</td>
</tr>
<tr>
<td>China</td>
<td>27,405</td>
<td>19,194</td>
<td>18,140</td>
<td>29,480</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>23,757</td>
<td>20,654</td>
<td>8,153</td>
<td>2,404</td>
</tr>
<tr>
<td>Netherlands</td>
<td>23,602</td>
<td>17,874</td>
<td>8,065</td>
<td>12,956</td>
</tr>
</tbody>
</table>

Source: Authors’ computations based on WIOD, 2016 release
International Production Fragmentation and the Global Trade Slowdown

Marcel Timmer (Groningen Growth and Development Centre, University of Groningen) with Bart Los (UoG), Gaaitzen de Vries (UoG) and Robert Stehrer (wiiw)
The global import intensity (GII) of production: all imports related to production of a final good.

Note: Black (white) arrows indicate import (domestic) flows.
Changes in global import intensity (GII) of production

Note: Results for coefficients on year dummies (relative to 2000) in a regression of global import intensities (GII) of production in 271 GVCs with country-industry pair fixed effects. Dots indicate the point estimates and bars the 95 per cent confidence intervals based on two-way clustering by country and industry of finalisation. GIIs are measured in constant 2000 prices with chained Laspeyres volume indices as in equation (5).
### Table 3 Decomposition of import elasticity of global GDP

<table>
<thead>
<tr>
<th></th>
<th>2000-2008</th>
<th>2008-2014</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Unitary elasticity</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>(2) Effect of international production fragmentation (IPF)</td>
<td>0.469</td>
<td>0.202</td>
<td>-0.267</td>
</tr>
<tr>
<td>(3) Effect of global final demand composition</td>
<td>0.715</td>
<td>-0.001</td>
<td>-0.717</td>
</tr>
<tr>
<td>(4) <em>Change in product mix (DC1)</em></td>
<td>0.403</td>
<td>-0.014</td>
<td>-0.417</td>
</tr>
<tr>
<td>(5) <em>Change in country mix (DC2)</em></td>
<td>0.312</td>
<td>0.013</td>
<td>-0.300</td>
</tr>
<tr>
<td>(6) Import elasticity of global GDP</td>
<td>2.184</td>
<td>1.200</td>
<td>-0.984</td>
</tr>
</tbody>
</table>

• Vries, G.J. de, S. Miroudot and M.P. Timmer (2018), Functional Specialisation in Trade, mimeo