Analyzing Global Value Chains using the World Input-Output Database

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Figure 1 Trade in goods and services (as percentage of global GDP)
Source: own calculations on WIOD (Timmer et al., RoIE 2015), 2016 release;
Question: “The Global Trade Slowdown: A New Normal?”

Hoekman (ed., 2015): two types of explanations

- **Changes in structure of global demand** towards categories with lower trade elasticity (*e.g. to consumption of domestic services, or away from investment in machinery*)

- **Changes in structure of global production** such that trade elasticities decline (*e.g. international de-fragmentation of global value chains due to protection, reshoring or industrial upgrading in emerging countries*)

- These two streams of literature are not integrated and lack a common framework of analysis
AIM: Mapping final demand $F$ into trade flows. So find function $f$ such that:

$$m = y \cdot f(A, F)$$

with $m =$ global imports, $y =$ global GDP, $F =$ structure of global final demand (products and countries), $A =$ structure of global value chains (intermediate inputs).

Then change in $m/y$ can be decomposed into effects of change in production structure and change in final demand

$$\Delta(m/y) = f(\Delta A, F) + f(A, \Delta F)$$

(Structural Decomposition Analysis, Dietzenbacher and Los, 1998)
Measuring the global import intensity of final demand

**Direct imports by A**

- Final demand
  - Final Demand by A
- Last stage of production
  - B
  - A
- Other stages of production

**Data needs**

<table>
<thead>
<tr>
<th></th>
<th>Trade data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final demand</td>
<td></td>
</tr>
<tr>
<td>Last stage of production</td>
<td></td>
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<td>Other stages of production</td>
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Measuring the trade elasticity of final demand

Direct imports by A

+ Indirect imports by A

Data needs

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<th>National IO-tables</th>
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</table>

This was introduced by Bussière et al. (2011, AEJ Macro).
Measuring the full import intensity of final demand (new in this paper)

Data needs

<table>
<thead>
<tr>
<th>Direct imports by A</th>
<th>+ Indirect imports by A</th>
<th>+ GVC imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Demand by A</td>
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</table>

Last stage of production

Other stages of production

Global Value Chain

<table>
<thead>
<tr>
<th>Data needs</th>
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<th>National IO-tables</th>
<th>World IO-tables</th>
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</table>
**Stylized World Input-Output Table**

**Built in WIOD project (funded in FP7)**

Based on official, publicly available data only

**Inputs:**
- National Accounts
- Benchmark Supply and Use Tables/IO Tables
- Bilateral Trade Data
- Market Exchange Rates

- All data benchmarked on (revised) National Accounts
- Intermediate output of construction process made available for users (see, e.g. work by Statistics Netherlands)
- WIOTs in current prices and in prices of the previous year
- First release in Spring 2012, revisions in Fall 2013, second release in Fall 2016

### Table

<table>
<thead>
<tr>
<th>Country A</th>
<th>Country B</th>
<th>Rest of World (RoW)</th>
<th>Country A</th>
<th>Country B</th>
<th>Rest of World</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>Intermediate use of domestic output</td>
<td>Industry</td>
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<td>Industry</td>
<td>Intermediate use of domestic output</td>
<td>Industry</td>
</tr>
<tr>
<td>Country A</td>
<td>Intermediate use by A of imports from B</td>
<td>Intermediate use by B of imports from A</td>
<td>Intermediate use by RoW of imports from A</td>
<td>Final use by A of exports from RoW</td>
<td>Final use by B of exports from RoW</td>
<td>Final use by RoW of exports from B</td>
</tr>
<tr>
<td>Country B</td>
<td>Intermediate use by A of imports from RoW</td>
<td>Intermediate use by B of imports from RoW</td>
<td>Intermediate use by RoW of imports from RoW</td>
<td>Final use by A of exports from RoW</td>
<td>Final use by B of exports from RoW</td>
<td>Final use by RoW of exports from B</td>
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</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>Value added</td>
<td>Industry</td>
<td>Value added</td>
<td>Industry</td>
<td>Value added</td>
<td>Industry</td>
</tr>
<tr>
<td>Output in A</td>
<td>Output in B</td>
<td>Output in RoW</td>
<td>Output in A</td>
<td>Output in B</td>
<td>Output in RoW</td>
<td>Output in A</td>
</tr>
</tbody>
</table>
World Input-Output Database (Timmer et al., 2015, RIIntEc), updated from release of November 2013

- 43 countries (85% of world GDP), plus RoW (Norway, Switzerland and Croatia added compared to old release)
- 56 industries (35)
- Based on SNA08 information for most countries (SNA93)

NOTES:
- Tables in current US$, currency conversions
- We cover all international trade between these regions, but not within (no intra-RoW trade).
- Data available at www.wiod.org
## Alternative measures of Global Import Intensity (GII) of Production

<table>
<thead>
<tr>
<th>Product group</th>
<th>Last stage of production</th>
<th>All tiers of production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-durable consumption goods (C-NDur)</td>
<td>0.136</td>
<td>0.288</td>
</tr>
<tr>
<td>Durable consumption goods (C-Dur)</td>
<td>0.181</td>
<td>0.401</td>
</tr>
<tr>
<td>Services consumption products (C-Serv)</td>
<td>0.042</td>
<td>0.107</td>
</tr>
<tr>
<td>Investment goods (I-Mach)</td>
<td>0.113</td>
<td>0.259</td>
</tr>
<tr>
<td>Construction (I-Con)</td>
<td>0.089</td>
<td>0.242</td>
</tr>
<tr>
<td>Other final demand</td>
<td>0.056</td>
<td>0.132</td>
</tr>
</tbody>
</table>

Notes: Imports measured as global imports related to final products as ratio of FD (by final demand category, 2007)

NB1: Exports is not a final demand category as we analyze global final demand.

NB2: Services (business, financial) are also indirectly traded through GVC imports.
Figure 11. Global import intensity of final demand by country

Note: in $ of global trade per $ of final demand
**Period averages**

### Notes

Change in trade elasticity decomposed into contribution from change in GVC structure \( f(\Delta A, F) \) and change in FD structure \( f(A, \Delta F) \). Annual log-points change times 100, period averages.

### FINDING 1

Global trade recovered after great trade collapse, but elasticity stagnant since 2011.

### FINDING 2

Decline in global import intensity is equally due to changes in GVC structure as to changes in FD structure.
Main findings:
- Decline in growth of global import intensities about equally strongly driven by changes in the GVC structure of production processes and changes in the structure of final demand.

Peak Trade?
- Still opportunities for much more international production fragmentation (Baldwin), but will these be used and remain (Brexit, Trump, disasters, robotization)?
- As long as China grows faster than the world average, this will have a downward effect on the global trade to GDP ratio.
Future work:

- Use of WIOTs at constant prices, to isolate “real” effects from effects of changes in relative prices.

- Relaxing of assumption that all firms in a country-industry produce according to the same technology (heterogeneity due to differences between exporters/non-exporters, small firms/large firms, etc.; see work by OECD)

- Analyzing trade in activities rather than gross trade (‘functional specialization’). Current efforts aimed at linking employment by occupation and industry data to World Input-Output Tables

- Spatial disaggregation of EU countries to study regional heterogeneity (e.g. analysis of effects of Brexit on Northern England)
More on GVC approach and WIOD