World Input-Output Tables and Competitiveness

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Prepared for panel at Fifth World KLEMS meeting, Cambridge, June 4-5, 2018
The disintegration of industries

A – Cost share of final production stage

Notes: Kernel distribution plots of cost shares in final output. Shares calculated according to Equation (4). Observations have been included for 240 manufactures value chains, identified by 12 manufacturing industries of completion in 20 countries.

Source: Calculations based on WIOD.
OLD: Traditional view on production (one stage):

\[ \text{Value added} = F[K_A, L_A] \]

NEW: Task-based approach (multi stage):
Vertically integrated production function where a product is the end-result of a series of tasks \( T \) (e.g. R&D, marketing, assembly, logistics)

\[ \text{Final output} = G[T_1; T_2; \ldots; T_z] \]

The tasks can be carried out by varying combinations of labour and capital, in any country (Autor and Acemoglu, 2011).

\[ \text{Final output} = H[T_1(K_A, L_A); T_2(K_B, L_B); \ldots; T_z(K_N, L_N)] \]

Factors are located around the world and earn income “global value chain”

Unresolved issue: how to define tasks?
## Tasks in a GVC (defined by occupations of workers): Illustration

Table 1. Functions in the German transport equipment GVC

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>All HQ activities, of which:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td>6.5</td>
<td>6.4</td>
<td>-0.2</td>
</tr>
<tr>
<td>Back office</td>
<td>17.1</td>
<td>11.9</td>
<td>-5.2</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>15.6</td>
<td>17.3</td>
<td>1.6</td>
</tr>
<tr>
<td>Logistics</td>
<td>4.5</td>
<td>5.9</td>
<td>1.4</td>
</tr>
<tr>
<td>Marketing</td>
<td>8.7</td>
<td>8.3</td>
<td>-0.4</td>
</tr>
<tr>
<td><strong>Production activities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>31.0</td>
<td>21.8</td>
<td>-9.2</td>
</tr>
<tr>
<td><strong>Total value added by workers in Germany</strong></td>
<td>83.5</td>
<td>71.6</td>
<td>-11.9</td>
</tr>
<tr>
<td><strong>Total value added by workers abroad</strong></td>
<td>16.5</td>
<td>28.4</td>
<td>11.9</td>
</tr>
</tbody>
</table>

*Source: De Vries, Miroudot and Timmer (2018)*

*Notes:* Decomposition of final output of the transport equipment manufacturing industry in Germany (ISIC rev. 3 industries 34 and 35) based on equation (4). Numbers may not sum due to rounding. *Sources:* Authors’ calculations based on World Input-Output Database (November 2013 release) and occupation database.
Tasks in exports

Advanced economies

Emerging economies

Source: De Vries, Mirodott, and Timmer (2017, Table 3)

Notes: The figure shows the share of labor income in domestic value added exports from different activities, identified by the occupational composition of the workforce.
Source: De Vries, Miroudot and Timmer (2017, Table 3)
Notes: The figure shows the share of labor income in domestic value added exports from different activities, identified by the occupational composition of the workforce.
(Revealed) Comparative Advantage looks rather different from a task-perspective

### Table 1 RCA based on value added, Chemical products

<table>
<thead>
<tr>
<th>Industries</th>
<th>Value added</th>
<th>Fabr task</th>
<th>R&amp;D task</th>
<th>Mgmt task</th>
<th>Mark task</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>1.15</td>
<td>2.02</td>
<td>0.35</td>
<td>0.36</td>
<td>1.08</td>
</tr>
<tr>
<td>France</td>
<td>1.10</td>
<td>0.88</td>
<td>1.47</td>
<td>0.75</td>
<td>1.01</td>
</tr>
<tr>
<td>Japan</td>
<td>0.88</td>
<td>0.99</td>
<td>0.47</td>
<td>0.16</td>
<td>0.77</td>
</tr>
<tr>
<td>Korea</td>
<td>1.19</td>
<td>1.23</td>
<td>0.57</td>
<td>0.31</td>
<td><strong>1.29</strong></td>
</tr>
<tr>
<td>US</td>
<td>1.02</td>
<td>0.54</td>
<td>0.75</td>
<td><strong>1.12</strong></td>
<td>0.90</td>
</tr>
</tbody>
</table>

*Note: Exports of value added in Fabrication task (Fabr), Research and Development task (R&D), Management (Mgmt) and Marketing (Mark). Highest entry in each row is in bold.*
Figure 1 Global value chain decomposition

Defining the (net) income to intangibles as a residual:

Final output \( \text{minus} \)
Gross cost of tangible capital \( \text{minus} \)
Labour costs
Income by intangible capital (INTAN) is twice the cost of tangible capital (TAN).

Note: the remainder is the labour share which is declining over this period.
Final remarks: towards a task based model of production

From $\text{Value added} = F [K_A, L_A]$

To $\text{Final output} = H [T_1(K_A, L_A); T_2(K_B, L_B); \ldots; T_z(K_N, L_N)]$

Open issues:

How to define tasks? As output from industries, occupations, business functions, \ldots Are they measurable?

How to identify the “GVC”: what tasks belong together?

Production factors and final output are measurable: how to link tasks to particular sets of production factors?

$\textit{NB Old tools from productivity literature still useful!}$
More on global value chain approach


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