A Global Multi-sector Multi-region Foreign Direct Investment Database for GTAP

By

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Introduction
A global bilateral multi-region multi-sector foreign direct investment (FDI) stocks and flows database was contributed to the Center for Global Trade Analysis by Houssein Guimbard, Christophe Gouel and David Laborde from CEPII (Centre d'Etudes Prospectives et d'Informations Internationales) as a result of a project initiated by DG Trade of the European Commission. Contrary to other data sources on FDI this database is fully consistent, balanced and suitable for use in CGE work. The construction of this database is entirely documented in Guimbard, Gouel and Laborde (2007).

This document describes the steps used to convert this database into GTAP v7 sectoral and regional aggregation format. Accordingly, the final FDI stocks and flows database is bilateral with 113 regions and 57 sectors and base year 2004.

Source data
The contributed bilateral FDI stocks and flows database had 226 regions and 26 sectors with 2004 as the base year. The database has been built using several sources such as IMF, UNCTAD, OECD, Eurostat and wiw (The Vienna Institute for International Economic Studies). The construction process involved two main stages: first, missing values have been replaced with econometric estimates that originate from a gravity equation with respect to FDI relations and second, the FDI matrix is balanced and the different sources are reconciled using entropy techniques. For further details on the construction of the database refer to Guimbard, Gouel and Laborde (2007).

Regional aggregation and sectoral disaggregation
Our goal is to convert the contributed FDI database into a regional/sectoral format that is consistent with the current version of the GTAP Data Base.

First, the initial 226 regions have been aggregated into GTAP regions 113 using the concordance https://www.gtap.agecon.purdue.edu/databases/regions.asp?Version=7.21.

Second, we disaggregate the original 26 sectors into 57 GTAP sectors based on a simple share-based allocation using the capital part of GTAP Data Base variable EVFA, i.e. the value of purchase of capital by firms at agent’s prices. Alternatively, other variables could be used but in our sectoral disaggregation we assume that the capital part of EVOA is a proxy of the sectoral capital stock of the FDI recipient country. In version 1, the database was disaggregated using the variable VOM, i.e the value of output at market prices, which is a proxy of the output and the sales/cost share of foreign affiliates. The use of capital rental instead is based on the idea that investors are most likely to invest in the disaggregated sectors which account for a higher share of the capital of the aggregated sector. One noticeable impact of this change was to raise the share of FDI in the forestry sector in line with the higher capital rentals.
Table 1 presents the sectoral breakdown of the contributed FDI database, while Table 2 summarizes the sectoral concordance between the 57 GTAP sectors and the original 26 sectors. Sectors of the original data that do not have a direct mapping to a GTAP sector (such as CHEM and OMAN) have been disaggregated using shares provided by Philippa Dee (Australian National University).

**Table 1 Original sectoral aggregation**

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AGR</td>
<td>Agriculture and fishing</td>
</tr>
<tr>
<td>2</td>
<td>MING</td>
<td>Mining and quarrying</td>
</tr>
<tr>
<td>3</td>
<td>FOOD</td>
<td>Food products</td>
</tr>
<tr>
<td>4</td>
<td>TEXT</td>
<td>Textiles and wearing apparel</td>
</tr>
<tr>
<td>5</td>
<td>WPPP</td>
<td>Wood, publishing and printing</td>
</tr>
<tr>
<td>6</td>
<td>P.C</td>
<td>Refined petroleum and other treatments</td>
</tr>
<tr>
<td>7</td>
<td>CHEM</td>
<td>Chemical products</td>
</tr>
<tr>
<td>8</td>
<td>RPP</td>
<td>Rubber and plastic products</td>
</tr>
<tr>
<td>9</td>
<td>METP</td>
<td>Metal products</td>
</tr>
<tr>
<td>10</td>
<td>OME</td>
<td>Mechanical products; Medical, precision and optical instruments, watches and clocks</td>
</tr>
<tr>
<td>11</td>
<td>ELE</td>
<td>Office machinery and computers; Radio, TV and communications equipment</td>
</tr>
<tr>
<td>12</td>
<td>MVH</td>
<td>Motor vehicles</td>
</tr>
<tr>
<td>13</td>
<td>OTN</td>
<td>Other transport equipments</td>
</tr>
<tr>
<td>14</td>
<td>OMAN</td>
<td>Manufacturing nec</td>
</tr>
<tr>
<td>15</td>
<td>EGW</td>
<td>Electricity, gas and water</td>
</tr>
<tr>
<td>16</td>
<td>CNS</td>
<td>Construction</td>
</tr>
<tr>
<td>17</td>
<td>TRD</td>
<td>Trade and repairs; Hotels and restaurants</td>
</tr>
<tr>
<td>18</td>
<td>OTP</td>
<td>Land transport; Supporting and auxiliary transport activities; activities of travel agencies</td>
</tr>
<tr>
<td>19</td>
<td>WTP</td>
<td>Water transport</td>
</tr>
<tr>
<td>20</td>
<td>ATP</td>
<td>Air transport</td>
</tr>
<tr>
<td>21</td>
<td>CMN</td>
<td>Post and telecommunications</td>
</tr>
<tr>
<td>22</td>
<td>OFI</td>
<td>Financial intermediation, except insurance and pension funding; Activities auxiliary to financial intermediation</td>
</tr>
<tr>
<td>23</td>
<td>ISR</td>
<td>Insurance and pension funding, except compulsory social security</td>
</tr>
<tr>
<td>24</td>
<td>OBS</td>
<td>Real estate and business services</td>
</tr>
<tr>
<td>25</td>
<td>OSER</td>
<td>Other services</td>
</tr>
<tr>
<td>26</td>
<td>DWE</td>
<td>Dwellings</td>
</tr>
</tbody>
</table>
Table 2 Sectoral concordance: GTAP to original sectors

<table>
<thead>
<tr>
<th>Nr.</th>
<th>GTAP code</th>
<th>GTAP sector description</th>
<th>Original sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PDR</td>
<td>Paddy rice</td>
<td>AGR</td>
</tr>
<tr>
<td>2</td>
<td>WHT</td>
<td>Wheat</td>
<td>AGR</td>
</tr>
<tr>
<td>3</td>
<td>GRO</td>
<td>Cereal grains nec</td>
<td>AGR</td>
</tr>
<tr>
<td>4</td>
<td>V_F</td>
<td>Vegetables, fruit, nuts</td>
<td>AGR</td>
</tr>
<tr>
<td>5</td>
<td>OSD</td>
<td>Oil seeds</td>
<td>AGR</td>
</tr>
<tr>
<td>6</td>
<td>C_B</td>
<td>Sugar cane, sugar beet</td>
<td>AGR</td>
</tr>
<tr>
<td>7</td>
<td>PFB</td>
<td>Plant-based fibers</td>
<td>AGR</td>
</tr>
<tr>
<td>8</td>
<td>OCR</td>
<td>Crops nec</td>
<td>AGR</td>
</tr>
<tr>
<td>9</td>
<td>CTL</td>
<td>Bovine cattle, sheep and goats, horses</td>
<td>AGR</td>
</tr>
<tr>
<td>10</td>
<td>OAP</td>
<td>Animal products nec</td>
<td>AGR</td>
</tr>
<tr>
<td>11</td>
<td>RMK</td>
<td>Raw milk</td>
<td>AGR</td>
</tr>
<tr>
<td>12</td>
<td>WOL</td>
<td>Wool, silk-worm cocoons</td>
<td>AGR</td>
</tr>
<tr>
<td>13</td>
<td>FRS</td>
<td>Forestry</td>
<td>AGR</td>
</tr>
<tr>
<td>14</td>
<td>FSH</td>
<td>Fishing</td>
<td>AGR</td>
</tr>
<tr>
<td>15</td>
<td>COA</td>
<td>Coal</td>
<td>MING</td>
</tr>
<tr>
<td>16</td>
<td>OIL</td>
<td>Oil</td>
<td>MING</td>
</tr>
<tr>
<td>17</td>
<td>GAS</td>
<td>Gas</td>
<td>MING</td>
</tr>
<tr>
<td>18</td>
<td>OMN</td>
<td>Minerals nec</td>
<td>MING</td>
</tr>
<tr>
<td>19</td>
<td>CMT</td>
<td>Bovine meat products</td>
<td>FOOD</td>
</tr>
<tr>
<td>20</td>
<td>OMT</td>
<td>Meat products nec</td>
<td>FOOD</td>
</tr>
<tr>
<td>21</td>
<td>VOL</td>
<td>Vegetable oils and fats</td>
<td>FOOD</td>
</tr>
<tr>
<td>22</td>
<td>MIL</td>
<td>Dairy products</td>
<td>FOOD</td>
</tr>
<tr>
<td>23</td>
<td>PCR</td>
<td>Processed rice</td>
<td>FOOD</td>
</tr>
<tr>
<td>24</td>
<td>SGR</td>
<td>Sugar</td>
<td>FOOD</td>
</tr>
<tr>
<td>25</td>
<td>OFD</td>
<td>Food products nec</td>
<td>FOOD</td>
</tr>
<tr>
<td>26</td>
<td>B_T</td>
<td>Beverages and tobacco products</td>
<td>FOOD</td>
</tr>
<tr>
<td>27</td>
<td>TEX</td>
<td>Textiles</td>
<td>TEXT</td>
</tr>
<tr>
<td>28</td>
<td>WAP</td>
<td>Wearing apparel</td>
<td>TEXT</td>
</tr>
<tr>
<td>29</td>
<td>LEA</td>
<td>Leather products</td>
<td>OMAN</td>
</tr>
<tr>
<td>30</td>
<td>LUM</td>
<td>Wood products</td>
<td>WPPP</td>
</tr>
<tr>
<td>31</td>
<td>PPP</td>
<td>Paper products, publishing</td>
<td>WPPP</td>
</tr>
<tr>
<td>32</td>
<td>P_C</td>
<td>Petroleum, coal products</td>
<td>P_C</td>
</tr>
<tr>
<td>33</td>
<td>CRP</td>
<td>Chemical, rubber, plastic products</td>
<td>0.7CHEM + 0.3RPP***</td>
</tr>
<tr>
<td>34</td>
<td>NMM</td>
<td>Mineral products nec</td>
<td>OMAN</td>
</tr>
<tr>
<td>35</td>
<td>I_S</td>
<td>Ferrous metals</td>
<td>METP</td>
</tr>
<tr>
<td>36</td>
<td>NFM</td>
<td>Metals nec</td>
<td>METP</td>
</tr>
<tr>
<td>37</td>
<td>FMP</td>
<td>Metal products</td>
<td>METP</td>
</tr>
<tr>
<td>38</td>
<td>MVH</td>
<td>Motor vehicles and parts</td>
<td>MVH</td>
</tr>
<tr>
<td>39</td>
<td>OTN</td>
<td>Transport equipment nec</td>
<td>OTN</td>
</tr>
<tr>
<td>40</td>
<td>ELE</td>
<td>Electronic equipment</td>
<td>ELE</td>
</tr>
</tbody>
</table>
41 OME Machinery and equipment nec 0.75OME+0.25OMAN***
42 OMF Manufactures nec OMAN
43 ELY Electricity EGW
44 GDT Gas manufacture, distribution EGW
45 WTR Water EGW
46 CNS Construction CNS
47 TRD Trade TRD
48 OTP Transport nec OTP
49 WTP Water transport WTP
50 ATP Air transport ATP
51 CMN Communication CMN
52 OFI Financial services nec OFI
53 ISR Insurance ISR
54 OBS Business services nec OBS
55 ROS Recreational and other services OSER
56 OSG Public Administration, Defense, Education, Health OSER
57 DWE Dwellings DWE

***We would like to thank Philippa Dee (Australian National University) for providing us estimates for the sectoral breakdown

The final FDI stocks and flows database is consistent with the current regional and sectoral aggregation of the GTAP Data Base.

References
Guimbard, Gouel and Laborde (2007). Forthcoming