Honduras

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Gonzalo R. Véliz Marin, and Carlos Ludeña

1. Introduction
This document details the steps taken to create the first Honduras input-output matrix (IOM) for the Global Trade Analysis Project (GTAP). This IOM is based on the Social Accounts Matrix (SAM) developed by IFPRI (International Food Policy Research Institute) in June 2009, which is based on 2004 data.

2. Source of Data
The Social Accounts Matrix (SAM) for Honduras has been developed by the IFPRI (International Food Policy Research Institute), considering information from the Central Bank of Honduras. This source is particularly useful because of the number of similarities and flexibility to convert it into an IOM, according to the specifications required by GTAP.

This SAM, used as source, is distributed in the format industry (activity) by commodity (product), considering 81 commodities and 81 activities, valued at producer prices. Furthermore, it presents the factors of production, households, public sector and industry, investment and the rest of the world.

3. Adaptation of the IOM for GTAP
The various stages undertaken to adapt the I-O table for GTAP are illustrated in Annex 1.

To begin the conversion from the original SAM, the accounts were rearranged, obtaining a compact IOM (see Annex 2). This matrix is characterized by the following information:

- Use Matrix, commodity-by-industry format, which also includes investment, private consumption and government spending, the change in stocks and exports
- Vector of imports, excluding rates
- Vector of taxes, which contains tariffs, VAT, other taxes, subsidies, trade margins and transport margins
- Value added, which considers the capital, labor, taxes and land factor (for which no information was available, subsequently, it was set to 0)
- Make matrix, already diagonalized in the 2004 SAM

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The matrices above were relocated into a new array to check the consistency of the data, specifically that the column totals were equal to the totals of the rows. This means that the production was equal to the costs.

This information was previously handled in Microsoft Excel and then introduced into GEMPACK, using as an example, the case of Guatemala previously sent to GTAP (Ludena, Duran and Schuschny, 2008) whose source code and data were modified to meet the requirements of Honduras’ economic structure. Note that the original SAM had 81 industries, each producing a commodity, which simplified the concordance between industries and commodities. Segments of the original matrix can be found in Annex 3 with their respective correlations to GTAP sectors. This allowed the identification of sectors that needed to be split later (see 4) for a square matrix of the 83 industries.

3.1 Make Matrix
This matrix, which is characterized by a commodity by industry format, has been obtained directly from the Honduras SAM. Note that this matrix was already in diagonal form, which simplified the calculations and subsequent checks.

3.2 Value Added to Factors of ORANI-G (Labor, Capital and Land)
The data source categories had capital and other taxes, which were replicated under the categories of ORANI-G. The work merged the 8 categories of laborers presented, which were specifically:

- Labor formal sector, urban skilled
- Labor formal sector, urban unskilled
- Labor formal sector, rural, skilled
- Labor formal sector, rural, unskilled
- Labor, self employed, urban, skilled
- Labor, self employed, urban, unskilled
- Labor, self employed, rural, skilled
- Labor, self employed, rural, unskilled

No information was available of the land item, so it remained at zero to keep the consistency of the data. The correlations between the data applied to the SAM 2004 and GTAP requirements are in Annex 4.

3.3 Trade and Transport Margins
The trade and transport margins were included as vectors which were then redistributed by GEMPACK so that trade margins were included in the trade sector and transport margins were added in the category transport services.

3.4 Separation of Locally Produced and Imported Goods
The 2004 Honduras SAM used as a source, presented the imports as a separate vector. For this reason it was necessary to create an import share matrix which was used to obtain domestic and import use. This methodology has been applied in several contributions to GTAP, including the case of Guatemala (used as main reference).

3.5 Taxes: Building Tax Matrix
The original SAM matrix had the following types of taxes: taxes on imports, VAT value added tax, indirect taxes and subsidies.
It was necessary to redistribute the various categories of taxes to distinguish between tariffs, VAT, other taxes and subsidies; the categories used in input-output matrices previously provided to GTAP. The import tax rates were considered as tariffs, the VAT was taken without changes, indirect taxes were added to the category other taxes and subsidies were left unchanged.

From this information it was possible to create an array of taxes on domestic goods, and an array of tariffs (or taxes on imports). These matrices were used to obtain duty-free domestic production and imports without tariffs.

### 3.6 Matrix of Use, Including Tax (UP) and No Tax (UF)

The matrix included taxes that were obtained directly from the SAM, for which trade and transport margins were transposed to be added later in trade and transport sectors. After this adjustment, the balance between sales and cost still holds.

The taxes and tariffs matrices were subtracted from Imports and Domestic Use, generating Imports free of tariffs (MUF) and Domestic use, tax free (DUF).

### 3.7 Re-exports

GTAP does not support re-exports, so the export vector of imported goods was equal to zero. This held the consistency of the data with respect to the balance between sales and costs.

### 3.8 Output (OP) and Imports, Net of Tax (MF)

The vector of production (output) of sector i, including indirect taxes, involved the sum of domestic and imported intermediate production, value added and indirect taxes on production. Moreover, the matrix that excludes taxes (MF) has been generated by subtracting the tax vector to the import matrix that originally included taxes.

### 4. Adaptation of the IOM for GTAP

The 81 sectors that had the original Matrix Honduras SAM provided a sufficient level of disaggregation. Nevertheless, to meet the mandatory splits, the original sectors "water" and "mine" required a special treatment. The information used to split them from the point of view of production is in Annex 5. By the supply side, the Central Bank of Honduras provided supply and use tables that were used to separate costs, preserving the industrial structure. The consistency of the total was achieved through the distribution of differences between value added, inventories and imports. The details of the methodology are shown in Annex 6.

The process described implied the extension of the SAM from 81 to 83 sectors, which were then aggregated in 41 sectors - GSC2 (see Annex 7). A correlation between these and the 57 GTAP sectors were also established (Annex 8).
Annex 1: Steps in the construction of the SAM

1. Honduras SAM, 2004 (81 x 81)
2. Sectoral disaggregation (agua and mine) based on 2004 Supply and Use Tables (83 x 83)
3. Split of domestic and import use (83 x 83)
4. Obtaining UPmatrix (with tariffs and taxes), UF (excluding tariffs and taxes) and production vector(output)
5. Split of taxes on domestic production and tariffs to imports
6. Matrix aggregation, according to GTAP, obtaining a 41x41 IO table
### Annex 2: MIP compact, Input for Gempack

#### Industries

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>C</th>
<th>G</th>
<th>S</th>
<th>X</th>
<th>M</th>
<th>IVA</th>
<th>OthrTaxes</th>
<th>Subs</th>
<th>MargCom</th>
<th>MargTransp</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Commodities

<table>
<thead>
<tr>
<th></th>
<th>1..</th>
<th>N</th>
<th>USE matri x</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1..</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>N</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Value added

- Labor
- Capital
- Land

#### Production or indirect taxes

- Prodtax

#### TOTAL
Annex 3: Matches between the 2004 SAM and GTAP sectors

<table>
<thead>
<tr>
<th>SAM Sector</th>
<th>Description</th>
<th>GSC 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>maiz</td>
<td>Maize</td>
<td>gro</td>
</tr>
<tr>
<td>frij</td>
<td>Beans</td>
<td>pfbwhtocr</td>
</tr>
<tr>
<td>cere</td>
<td>Cereals</td>
<td>gro</td>
</tr>
<tr>
<td>palm</td>
<td>Oil palm</td>
<td>osd</td>
</tr>
<tr>
<td>taba</td>
<td>Snuff unprocessed (raw) leaves and snuff</td>
<td>pfbwhtocr</td>
</tr>
<tr>
<td>cana</td>
<td>Sugarcane</td>
<td>c_b</td>
</tr>
<tr>
<td>hort</td>
<td>Vegetables, tubers and other plant products</td>
<td>pfbwhtocr</td>
</tr>
<tr>
<td>frut</td>
<td>Fruit and Plants Drinkables</td>
<td>pfbwhtocr</td>
</tr>
<tr>
<td>bana</td>
<td>Bananas</td>
<td>v_f</td>
</tr>
<tr>
<td>café</td>
<td>Coffee Grape</td>
<td>pfbwhtocr</td>
</tr>
<tr>
<td>gana</td>
<td>Cattle and other animals / include Milk</td>
<td>ctrlmk</td>
</tr>
<tr>
<td>avic</td>
<td>Poultry, Eggs and fertilizers</td>
<td>woloap</td>
</tr>
<tr>
<td>silv</td>
<td>Wood &amp; Wood Products</td>
<td>for</td>
</tr>
<tr>
<td>pesc</td>
<td>Fish and Seafood</td>
<td>fsh</td>
</tr>
<tr>
<td>cama</td>
<td>Farmed shrimp and shrimp larvae</td>
<td>fsh</td>
</tr>
<tr>
<td>nmmnfm²</td>
<td>Mining products</td>
<td>nmmnfm</td>
</tr>
<tr>
<td>coloilp_c</td>
<td>Mining products</td>
<td>coloilp_c</td>
</tr>
<tr>
<td>carn</td>
<td>Meat and edible offal and other animal products / except Poultry</td>
<td>cmt</td>
</tr>
<tr>
<td>cavic</td>
<td>Meat and edible offal of poultry (fresh, chilled or frozen)</td>
<td>omt</td>
</tr>
<tr>
<td>pcar</td>
<td>Sausages and other meat products</td>
<td>omt</td>
</tr>
<tr>
<td>ppes</td>
<td>Frozen fish</td>
<td>ofd</td>
</tr>
<tr>
<td>pveg</td>
<td>Pulses fruits and nuts, cooked in water, frozen and canned juices and concentrates</td>
<td>ofd</td>
</tr>
<tr>
<td>acei</td>
<td>Oil, butter and other fats</td>
<td>vol</td>
</tr>
<tr>
<td>lact</td>
<td>Dairy products</td>
<td>mil</td>
</tr>
<tr>
<td>parr</td>
<td>Gold and husked rice</td>
<td>pdrpcr</td>
</tr>
</tbody>
</table>

² This sector and coloilp_c used to be included originally into “mine”. They were separated to met the mandatory splits
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hari</td>
<td>Flour and other meals</td>
</tr>
<tr>
<td>pana</td>
<td>Bakery</td>
</tr>
<tr>
<td>azuc</td>
<td>Sugar and Molasses</td>
</tr>
<tr>
<td>canim</td>
<td>Preparation of feed concentrates</td>
</tr>
<tr>
<td>choc</td>
<td>Cocoa, chocolate and sugar confectionery</td>
</tr>
<tr>
<td>past</td>
<td>Macaroni, noodles and similar farinaceous products</td>
</tr>
<tr>
<td>pcaf</td>
<td>Gold Cafe</td>
</tr>
<tr>
<td>potros</td>
<td>Coffee and Other Food Products</td>
</tr>
<tr>
<td>beba</td>
<td>Ethyl alcohol, distilling, rectifying, fermentation and blending of spirits, wines</td>
</tr>
<tr>
<td>cerv</td>
<td>Beer made from malt</td>
</tr>
<tr>
<td>bebn</td>
<td>Bottled water and other nonalcoholic drinks</td>
</tr>
<tr>
<td>ptab</td>
<td>Snuff Products</td>
</tr>
<tr>
<td>hila</td>
<td>Yarn and thread, textile fabrics</td>
</tr>
<tr>
<td>text</td>
<td>Textiles, Knitting and Crochet Garment Exc</td>
</tr>
<tr>
<td>vest</td>
<td>Clothing and fur</td>
</tr>
<tr>
<td>cuer</td>
<td>Leather &amp; Leather Goods</td>
</tr>
<tr>
<td>calz</td>
<td>Footwear and footwear parts</td>
</tr>
<tr>
<td>made</td>
<td>Treated lumber and</td>
</tr>
<tr>
<td>pmad</td>
<td>Wood products, cork, straw and plaiting materials, except furniture</td>
</tr>
<tr>
<td>pape</td>
<td>Newsprint, other paper and paperboard, processed, and corrugated paper and paperboard packaging</td>
</tr>
<tr>
<td>impr</td>
<td>Products of the publishing and printing</td>
</tr>
<tr>
<td>farm</td>
<td>Pharmaceuticals and medicines</td>
</tr>
<tr>
<td>quim</td>
<td>Basic Chemicals and Other Chemicals</td>
</tr>
<tr>
<td>neum</td>
<td>Tires and inner tubes</td>
</tr>
<tr>
<td>plas</td>
<td>Plastic</td>
</tr>
<tr>
<td>vidr</td>
<td>Glass and glass products</td>
</tr>
<tr>
<td>ceme</td>
<td>Cement and Other</td>
</tr>
<tr>
<td>omet</td>
<td>Other fabricated metal products</td>
</tr>
<tr>
<td>meta</td>
<td>Base metals</td>
</tr>
<tr>
<td>pmel</td>
<td>Structural metal products and parts</td>
</tr>
<tr>
<td>maqu</td>
<td>Machinery, Transport Equipment and appliances</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>mueb</td>
<td>Furniture &amp; Other Furniture Parts</td>
</tr>
<tr>
<td>oman</td>
<td>Other manufactured goods (jewelry, musical instruments, sporting goods, games and toys)</td>
</tr>
<tr>
<td>elygasgdt³</td>
<td>Drinking water</td>
</tr>
<tr>
<td>wtr</td>
<td>Drinking water</td>
</tr>
<tr>
<td>const</td>
<td>Construction</td>
</tr>
<tr>
<td>scom</td>
<td>Trade services</td>
</tr>
<tr>
<td>sman</td>
<td>Maintenance and repair</td>
</tr>
<tr>
<td>shot</td>
<td>Services of hotels and accommodation analagos</td>
</tr>
<tr>
<td>sres</td>
<td>Services catering and beverages</td>
</tr>
<tr>
<td>strc</td>
<td>Road transport</td>
</tr>
<tr>
<td>svia</td>
<td>Travel Agencies and Other Additional Services</td>
</tr>
<tr>
<td>spos</td>
<td>Postal and Courier Services</td>
</tr>
<tr>
<td>scmn</td>
<td>Equipment, radios, television and communication equipment and parts and pieces</td>
</tr>
<tr>
<td>sfin</td>
<td>Financial Services</td>
</tr>
<tr>
<td>sinm</td>
<td>Nonresidential real estate services and real estate agencies</td>
</tr>
<tr>
<td>sarr</td>
<td>Leasing Services</td>
</tr>
<tr>
<td>sinf</td>
<td>Computer and related services</td>
</tr>
<tr>
<td>sjur</td>
<td>Legal Services</td>
</tr>
<tr>
<td>scon</td>
<td>Accounting, auditing, bookkeeping, consulting, market research, architecture, engineering, research and development, etc..</td>
</tr>
<tr>
<td>sens</td>
<td>Education services</td>
</tr>
<tr>
<td>ssal</td>
<td>Health Services</td>
</tr>
<tr>
<td>sasc</td>
<td>Organization services</td>
</tr>
<tr>
<td>scin</td>
<td>Services for film, radio and television and other entertainment</td>
</tr>
<tr>
<td>sesp</td>
<td>Entertainment Services</td>
</tr>
<tr>
<td>ssoc</td>
<td>Social and personal services</td>
</tr>
<tr>
<td>sgov</td>
<td>Public administration</td>
</tr>
</tbody>
</table>

³ Along to wtr, it was included into the “agua” sector. It was splitted, because it also contained electricity and gas.
### Annex 4: Correlation between sectors of the SAM 2004 and the factors ORANI-G

<table>
<thead>
<tr>
<th>Gempack Input</th>
<th>Name in the SAM</th>
<th>SAM code</th>
<th>SAM Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor</td>
<td>Trabajo</td>
<td>flabf-ursk</td>
<td>Labor formal sector, urban skilled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>flabf-urns</td>
<td>Labor formal sector, urban unskilled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>flabf-rusk</td>
<td>Labor formal sector, rural, skilled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>flabf-runs</td>
<td>Labor formal sector, rural, unskilled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>flabc-ursk</td>
<td>Labor cuenta propistas, urban, skilled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>flabc-urns</td>
<td>Labor cuenta propistas, urban, unskilled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>flabc-rusk</td>
<td>Labor cuenta propistas, rural, skilled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>flabc-runs</td>
<td>Labor cuenta propistas, rural, unskilled</td>
</tr>
<tr>
<td>Capital</td>
<td>Capital</td>
<td>fcap</td>
<td>Capital</td>
</tr>
<tr>
<td>DomTax</td>
<td>Impuestos a los bienes domesticos</td>
<td>dtax</td>
<td>Direct taxes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>iva</td>
<td>Value added tax</td>
</tr>
<tr>
<td></td>
<td></td>
<td>itax</td>
<td>indirect tax</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sub</td>
<td>Subsidies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>atax</td>
<td>Activity tax</td>
</tr>
<tr>
<td>Mtar</td>
<td>Tarifas netas</td>
<td>mtax</td>
<td>Import tariffs</td>
</tr>
<tr>
<td>X</td>
<td>Exportaciones</td>
<td>row</td>
<td>Rest of world</td>
</tr>
<tr>
<td>Mcif</td>
<td>Importaciones</td>
<td>row</td>
<td>Rest of world</td>
</tr>
<tr>
<td>C</td>
<td>Hogares</td>
<td>hur-sk</td>
<td>Household, urban skilled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>hur-ns</td>
<td>Household, urban unskilled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>hru-sk</td>
<td>Household, rural, skilled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>hru-ns</td>
<td>Household, rural, unskilled</td>
</tr>
<tr>
<td>G</td>
<td>Gobierno</td>
<td></td>
<td>Government</td>
</tr>
<tr>
<td>I</td>
<td>Inversion</td>
<td>s-i</td>
<td>Savings-investment</td>
</tr>
<tr>
<td>S</td>
<td>Inventarios</td>
<td>dstk</td>
<td>change in stock</td>
</tr>
<tr>
<td>X</td>
<td>Exportaciones</td>
<td>row</td>
<td>Rest of world</td>
</tr>
</tbody>
</table>
## Annex 5: Information on production and imports used for the splits

<table>
<thead>
<tr>
<th>Sector SAM 2004</th>
<th>Producción</th>
<th>Importaciones</th>
<th>Oferta total (precios básicos)</th>
<th>GSC2 agg</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELECTRICIDAD Y AGUA (agua)</td>
<td>7,719</td>
<td>399</td>
<td>8,117</td>
<td></td>
</tr>
<tr>
<td>Energía eléctrica, gas, vapor y agua caliente</td>
<td>6,838</td>
<td>399</td>
<td>7,237</td>
<td>elygasgd</td>
</tr>
<tr>
<td>Agua potable</td>
<td>881</td>
<td>0</td>
<td>881</td>
<td>wtr</td>
</tr>
<tr>
<td>MINERALES NO METÁLICOS (mine)</td>
<td>1,035</td>
<td>157</td>
<td>1,192</td>
<td></td>
</tr>
<tr>
<td>Piedra de construcción</td>
<td>302</td>
<td>0</td>
<td>302</td>
<td>nmmnfm</td>
</tr>
<tr>
<td>Arena, grava de construcción</td>
<td>632</td>
<td>2</td>
<td>634</td>
<td>nmmnfm</td>
</tr>
<tr>
<td>Otras arenas naturales, arcillas, tierras</td>
<td>61</td>
<td>6</td>
<td>68</td>
<td>nmmnfm</td>
</tr>
<tr>
<td>Sal común</td>
<td>38</td>
<td>19</td>
<td>57</td>
<td>nmmnfm</td>
</tr>
<tr>
<td>Otros minerales no metálicos n.c.p., inc. carbón mineral y petróleo crudo</td>
<td>0</td>
<td>131</td>
<td>131</td>
<td>coloilp_c</td>
</tr>
</tbody>
</table>
Annex 6: methodology for dealing with differences between production and costs

<table>
<thead>
<tr>
<th>Original sector</th>
<th>mine</th>
<th>agua</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Disaggregation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methodology to deal with the difference between production and costs</td>
<td>The difference was distributed proportionally among added value factors</td>
<td>Imports and stocks were modification, because there is no domestic production</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disaggregation</th>
<th>nmmnfm</th>
<th>coloilp_c</th>
<th>elygasgd</th>
<th>wtr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methodology to deal with the difference between production and costs</td>
<td>The difference was distributed proportionally among added value factors</td>
<td>Imports and stocks were modification, because there is no domestic production</td>
<td>The difference was distributed proportionally among added value factors</td>
<td></td>
</tr>
</tbody>
</table>
Annex 7: Aggregation of sectors

<table>
<thead>
<tr>
<th>No.</th>
<th>Sector</th>
<th>No.</th>
<th>Sector</th>
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Annex 8: Concordance between the 57 GTAP sectors and 41 sectors aggregated from Honduras

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