CURRENT DEVELOPMENTS AND FUTURE EXPANSIONS OF TRADE IN VALUE-ADDED PROJECT IN OECD

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Primer Foro sobre Model de Insumo Producto aplicado a la Economía Costarricense
San Jose, Costa Rica
27-28 November 2014
• Interconnectedness
• Direct and indirect economic effects of trade
• Alternative presentation of trade relationship across countries
• Policy areas: trade, industrial activity, services, employment, education and training, and environmental footprint
Production networks

Capital and Labour (value-added)

Parts and components

Final products (e.g. Machines)

Consumers

Business service activities are linking and supporting each production stages

Utility

Transportation

Financial and insurance

Real estate

Telecommunications

Product designs

Wholesale & retail
**OECD National Input-Output database**

### Domestic table

<table>
<thead>
<tr>
<th></th>
<th>Intermediate demand</th>
<th>Personal expenditure</th>
<th>Other final expenditures</th>
<th>Exports</th>
<th>Imports cif</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ind 1</td>
<td>ind 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry 1: Goods</td>
<td>$Z_{11}$</td>
<td>$Z_{12}$</td>
<td>$HC1$</td>
<td>$FE1$</td>
<td>$EX1$</td>
<td>$-IM1$</td>
</tr>
<tr>
<td>Industry 2: Services</td>
<td>$Z_{21}$</td>
<td>$Z_{22}$</td>
<td>$HC2$</td>
<td>$FE2$</td>
<td>$EX2$</td>
<td>$-IM2$</td>
</tr>
<tr>
<td>Imports</td>
<td>$IM_Z_1$</td>
<td>$IM_Z_2$</td>
<td>$IM_HC$</td>
<td>$IM_FE$</td>
<td>Re-Exports</td>
<td>Total IM</td>
</tr>
<tr>
<td>Taxes less subsidies on products</td>
<td>$NTZ_1$</td>
<td>$NTZ_2$</td>
<td>$NTHC$</td>
<td>$NTFE$</td>
<td>$NTEX$</td>
<td>$NTIM$</td>
</tr>
<tr>
<td>Value-added (total)</td>
<td>$V_1$</td>
<td>$V_2$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor compensation</td>
<td>$VL_1$</td>
<td>$VL_2$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating surplus</td>
<td>$VO_1$</td>
<td>$VO_2$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net taxes on production</td>
<td>$VT_1$</td>
<td>$VT_2$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output at basic price</td>
<td>$X_1$</td>
<td>$X_2$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Import matrix in c.i.f.

<table>
<thead>
<tr>
<th></th>
<th>Intermediate demand</th>
<th>Personal expenditure</th>
<th>Other final expenditures</th>
<th>Re-exports</th>
<th>Imports cif</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ind 1</td>
<td>ind 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product p1: Goods</td>
<td>$ZM_{11}+TMZ_{11}$</td>
<td>$ZM_{12}+TMZ_{12}$</td>
<td>$HCM_1+TMHC_1$</td>
<td>$FEM1+TMFE1$</td>
<td>REX1+TMREX1</td>
</tr>
<tr>
<td>Product p2: Services</td>
<td>$ZM_{21}+TMZ_{21}$</td>
<td>$ZM_{22}+TMZ_{22}$</td>
<td>$HCM_2+TMHC_2$</td>
<td>$FEM2+TMFE2$</td>
<td>REX2+TMREX2</td>
</tr>
</tbody>
</table>
Bilateral Trade by industry and end-use: Exports (Costa Rica, 1995-2012)

OECD BTDIxE 2014ed
Imports by end-use (Costa Rica, 1995 & 2012)
International production networks

Business service activities are linking and supporting each production stages

- Capital and Labour (value-added)
- Parts and components
- Final products (e.g. Machines)
- Consumers

- Utility
- Transportation
- Financial and insurance
- Real estate
- Telecommunications
- Product designs
- Wholesale & retail
Gross trade balance $A - B = 100 - 110 = -10$

VA trade balance $A - B = 100 + 20 - 10 = 10$
Core of the TiVA database is an economic model based on Inter-country Input-Output table (ICIO). These ICIO models allow us to analyse
- Intermediate trade flows of goods and services
- Harmonised (mirror) bilateral trade balances
- Sectoral GDP and output at global level
- Value-added contents by source country and industry of additional unit demand (exports and domestic demand)
- Consumption and investment activity by type of goods and services
What does ICIO look like?

November 2014 release
• 34 Industry (ISIC rev3)
• 61 countries and regional average e.g. 34 OECD, BRIICS, G20, EU28, NAFTA, ASEAN*, APEC*)
• Year: 1995,2000,05,08,09,10, 2011*
• Format: industry-by-industry, basic price
What does ICIO look like (2 country example)

<table>
<thead>
<tr>
<th></th>
<th>Country A</th>
<th></th>
<th>Country B</th>
<th></th>
<th>Country A</th>
<th></th>
<th>Country B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ind 1</td>
<td></td>
<td>Ind 1</td>
<td></td>
<td>CP</td>
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<td>GFCF</td>
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<td></td>
<td>Ind 2</td>
<td></td>
<td>Ind 2</td>
<td></td>
<td>GFCF</td>
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<tr>
<td>Country A</td>
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<td>Ind 1</td>
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<td>Ind 2</td>
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<tr>
<td>Country B</td>
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<td></td>
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<tr>
<td>Ind 1</td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Ind 2</td>
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<td></td>
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<tr>
<td>VA</td>
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<td></td>
</tr>
<tr>
<td>Output</td>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Domestic input by Country A**
- **Imports of intermediates from B**
- **Exports of intermediates to B**
- **Exports of final goods to B**
- **Imports of intermediates from B**
Country and industry/product dimensions

**Country**
- VA source country
- Exporting country
- Importing country
- Final expenditure country

**Industry / Product**
- VA source industry
- Products form exporting industry
- Importing industry
- Final expenditure products
Value-added embodied in foreign final demand

$$VAFD = v (I-A)^{-1} FD$$
Decomposition of gross exports

Value-added embodied in exports

- Domestic VA (Direct)
- Domestic VA (Indirect)
- Re-imported Domestic VA
- Foreign VA

Import partners

Export

Foreign Industry and Households

VAEX = v (I-A)^(-1) EX
Destinations of Intermediate Imports

- Import partners
- Intermediate imports (REI)
- Domestic customers
- Foreign customers

Intermediate imports:
- Export

Flow:
- Import partners to Intermediate imports (REI)
- Intermediate imports (REI) to Export
- Export to Domestic customers and Foreign customers
Development flow

• Collection of national data sources
• Harmonisation and filling gaps
  – National Accounts main components
  – Sectoral constraints of value-added and output
  – National I-O and Use tables
  – Bilateral trade in goods and services
• Numerical adjustment for solving asymmetries in bilateral trade coefficients
• Global use table and ICIO
• Indicator calculations & Dissemination
• Collection of data sources (NA, IO, SUT, BOP, Trade statistics)
• Use table at pur’s prices + NA constraints
• Filling gaps (National Use tables)
• Bilateral trade coefficients in pur’s and basic prices including non-crossing border (non-residents expenditures) for intermediate and final products
• Estimation of domestic Use (ind x ind) and export columns by industry
• Estimation of international use table with constraints
• Merge above to create international I-O table for reference year to estimate global Leontief Inverse
• Calculate set of TiVA indicators for Global Leontief Inverse
1) Ideal I-O/SUT to build an ICIO

- Both in purchasers’ prices and basic price
- Domestic and import tables
- Enough sectoral details to aggregate to harmonised sector classification
- Compatible with BoP / SNA (at least definitions)
2) Ideal trade statistics to build an ICIO

For combining with national SUTs or IOTs:

- best estimates of bilateral trade in goods and services by industry (product group) and by end-use (intermediate and final consumption) …

- Bilaterally consistent (mirror trade)
- cif/fob margin allocation to origin transport support activities
- Reflect recent production activities
- Complete (by product and partners)
- Compatible with BoP / SNA (SUTs and IOTs)
- Reexports and reimports by origin & destination
Our approach

• Official *published* I-O/SUT, National Accounts and Trade databases used for
  – Institutional long-term
  – Recognized starting point
• Benchmarked to National Accounts (final expenditures, value-added, output, definitions of exports and imports)
• Benchmarked to Balance of Payment trade balances
• Rest of the world (closed model)
Adjusting merchandise trade statistics to NA framework (goods exports)

Merchandise trade (fob)
- Retained by partner
- Re-export
- Re-import

SUT / IO / NA export
- Retained by partner
- Re-export (in import matrix)
- Non-resident
- Trade margin
- Other services

Goods
SVC

21
Data sources for
OECD Inter-country inter-industry model

**Data sources**

- Supply-use and Input-Output tables (National sources/ Eurostat / Asian Dev Bank)
- Bilateral trade statistics for goods and services (OECD / UN)
- National Accounts: main aggregate and satellite (NSIs, OECD, UN)
- Balance of Payments (National source / IMF)

**Intermediate analytical data products at OECD**

- Harmonised symmetric Input-Output tables (OECD I-O)
- Bilateral Trade Database by Industry and by End-use for goods (BTDIxE)
- Sectoral Value-Added (STAN)
- Harmonised Bilateral Trade in Services (OECD-WTO)
- Adjusted National Accounts (currency, discrepancy and re-exports)
## Coverage

57 economies + RoW, 1995-2009

<table>
<thead>
<tr>
<th>Category</th>
<th>Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>OECD</td>
<td>All OECD 34 countries</td>
</tr>
<tr>
<td>BRIICS</td>
<td>Brazil, China, India, Indonesia, Russian Federation, South Africa</td>
</tr>
<tr>
<td>Other EU27</td>
<td>Bulgaria, Cyprus, Latvia, Lithuania, Malta, Romania</td>
</tr>
<tr>
<td>Other G20</td>
<td>Argentina, Saudi Arabia</td>
</tr>
<tr>
<td>Other South Eastern Asia</td>
<td>Brunei Darussalam, Cambodia, Malaysia, Philippines, Singapore, Thailand, Viet Nam</td>
</tr>
<tr>
<td>Other Eastern Asia</td>
<td>Chinese Taipei, Hong Kong China</td>
</tr>
<tr>
<td>Other Eastern Asia</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>Rest of the World</td>
</tr>
</tbody>
</table>

2014 release: Croatia, Costa Rica, Columbia, Tunisia
## Industry

<table>
<thead>
<tr>
<th>ISIC Rev 3</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>01-05 Agriculture, hunting, forestry and fishing</td>
</tr>
<tr>
<td>2</td>
<td>10-14 Mining and quarrying</td>
</tr>
<tr>
<td>3</td>
<td>15-16 Food products, beverages and tobacco</td>
</tr>
<tr>
<td>4</td>
<td>17-19 Textiles, textile products, leather and footwear</td>
</tr>
<tr>
<td>5</td>
<td>20-22 Wood, paper, paper products, printing and publishing</td>
</tr>
<tr>
<td>6</td>
<td>23-26 Chemicals and non-metallic mineral products</td>
</tr>
<tr>
<td>7</td>
<td>27-28 Basic metals and fabricated metal products</td>
</tr>
<tr>
<td>8</td>
<td>29 Machinery and equipment, nec</td>
</tr>
<tr>
<td>9</td>
<td>30-33 Electrical and optical equipment</td>
</tr>
<tr>
<td>10</td>
<td>34-35 Transport equipment</td>
</tr>
<tr>
<td>11</td>
<td>36-37 Manufacturing nec; recycling</td>
</tr>
<tr>
<td>12</td>
<td>40-41 Electricity, gas and water supply</td>
</tr>
<tr>
<td>13</td>
<td>45 Construction</td>
</tr>
<tr>
<td>14</td>
<td>50-55 Wholesale and retail trade; Hotels and restaurants</td>
</tr>
<tr>
<td>15</td>
<td>60-64 Transport and storage, post and telecommunication</td>
</tr>
<tr>
<td>16</td>
<td>65-67 Financial intermediation</td>
</tr>
<tr>
<td>17</td>
<td>70-74 Real estate, renting and business activities</td>
</tr>
<tr>
<td>18</td>
<td>75-95 Community, social and personal services</td>
</tr>
</tbody>
</table>

2014 Release: 34 Industry
Results

- Exports require more imports
- Services matter (business services)
- New trade patterns emerge
- Global value chains v. Regional production chains
New trade patterns emerge
Japan: partner shares of exports/imports gross v. value added, 2009
Exports require imports

Foreign value-added content of gross exports (%)
Electrical and optical equipment (30t33)

Low–Good, High-Bad?  High-Good, Low-Bad?  Neither

2008 1995
Services matter

Services Value-Added: % of exports, 2009

Domestic content  Foreign content  SNA total service export share
Domestic VA share in gross exports (China, 1995)

1995: 141 USD Billion
Domestic VA share in gross exports (China, 2008)

2008: 1527 USD Billion
High foreign content share of exports: lower value-added? lower productivity? and lower skills? Fewer jobs?

1995: 141 USD Billion

2008: 1527 USD Billion

Foreign

Domestic
Issues and extensions

• Data and Model
  – Industry details
  – Procurement of imported goods are assumed to be proportional for all sectors
  – Rest of the world (more developing economies)
  – Heterogeneity within a country (e.g. different production system of exporters and non-exporters)
  – Transition to SNA2008 and new industry classification(NACE2/ISIC4)

• TiVA Indicator Calculation
  – Better presentation and dissemination tools
  – Region-to-Region rather than Country-to-country
Wishlist (short-term)

• Statistics that are *timely* and *nationally consistent* (across sources)
• Statistics with appropriate *detailed breakdowns* (by country and industry/product category) which are *internationally comparable*
• An international trade matrix that is perfectly *symmetrical, complete* (no missing values), *consistent* with data in IO/SUT/NA, and converted to end-use categories
Future extensions (short & medium term)

- Expanding countries and more detail industry level (heterogeneity within industry)
- Quality enhancement
  - Introducing better balancing techniques
  - Estimates based on annual supply-use tables
  - Sectoral value-added and gross output
- Format
  - SNA2008
  - ISIC Rev4 based sector classification
- Improved dissemination tools
How to access TiVA database and related ICIO analyses

• TiVA
http://oe.cd/tiva

• OECD.Stat

• Global value chains

• Carbon footprint
http://www.oecd.org/sti/inputoutput/co2

• Jobs sustained and consumption behaviour indicators, Scoreboard 2013, OECD (Chapter Participating in the global economy)
THANK YOU

www.oecd.org/trade/valueadded
How many jobs sustained by foreign final demand

Selected APEC economies
Source: OECD, Science, Technology and Industry Scoreboard, 2013
Balancing issues: Bilateral trade

Balancing issue: Bilateral trade matrix

<table>
<thead>
<tr>
<th>Exporting country</th>
<th>cou A</th>
<th>cou B</th>
<th>cou C</th>
<th>Total exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>cou A</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>45</td>
</tr>
<tr>
<td>cou B</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>cou C</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>Total imports</td>
<td>30</td>
<td>25</td>
<td>35</td>
<td>90</td>
</tr>
</tbody>
</table>

SNA constraints:

- cou A: 30
- cou B: 35
- cou C: 25

SNA:

- Total exports: 90
Beyond 6digit trade statistics: Used (second-hand) products

Source: Eurostat
Difference: reported imports – sum of key partners’ exports (2011)

Reported Imports from partner world minus sum (partners' exports)

OECD BTDIXE 2013 ed