The Game of Trading Jobs for Emissions

I. Arto, J. M. Rueda-Cantuche, E. Dietzenbacher, V. Andreoni, I. Mongelli, A. Genty and A. Villanueva

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The European Commission’s in-house science service
Introduction

• We live in a globalized world, where countries produce commodities with **different emission and employment intensities**

• **International trade** increasingly links supply and demand of commodities on a global scale leading to different employment levels and different GHG emissions across countries

• For the first time, a single consistent database allows for analysing the evolution of the links between **trade, employment and environment** for the 27 Member States and their main non-EU trade partners
Agenda

• How many jobs/GHG emissions in the world are linked to international trade?

• To what extent changes in employment/GHG emissions from 1995-2008 across countries can be attributed to international trade?

• **Key issue:** it is true that the current international trade leads developed countries to transfer GHG emissions to other less developed or developing countries; but isn’t it true also that they indeed benefit from employment growth? And to what extent this is relevant for policy making?
Methodology

- **Structural decomposition analysis (SDA)**, following Dietzenbacher and Los (1998), average of polar decompositions

- **Main features of the SDA**: (1) consideration of variations in intermediate and final uses rather than on final demand only; (2) introduction of a new decomposing factor corresponding to variations in the international trade structures across countries (see also Xu and Dietzenbacher, 2012)
Methodology

• We account for changes in embodied GHG emissions and changes in embodied employment using the WIOD database for 1995-2008.

• We use the Leontief quantity model within a Multi-Regional framework for the calculation of embodied GHG emissions and embodied employment, both in exports and imports separately.
Factors driving changes in GHG emissions and changes in employment

- **Technological change:**
  - Changes in the domestic technology
  - Changes in emission coefficients

- **Domestic final demand**

- **International trade:**
  - Changes in foreign technology
  - Changes in foreign final demand
  - Changes in the trade structures
Main drivers of the change in GHG emissions

Some preliminary facts in 2008

- World GHG emissions amounted to 39.3 GtCO$_2$e (29% increase from 1995); of which:

  - CHN - 21% (*)
  - US - 16% (*)
  - EU - 13% (-)
  - RUS - 6%
  - IND - 6% (*)

> 60% of world’s emissions

NOTE: (*) = contributed most to GHG emission growth; (-) = decrease
Main drivers of GHG emission changes

- **Domestic technology**
- **Domestic final demand**
- **Trade**
- **Total**

### Countries
- CHN (China)
- IND (India)
- TWN (Taiwan)
- IDN (Indonesia)
- TUR (Turkey)
- BRA (Brazil)
- RoW (Rest of the World)
- KOR (South Korea)
- MEX (Mexico)
- World
- AUS (Australia)
- CAN (Canada)
- USA (United States)
- RUS (Russia)
- JPN (Japan)
- EUR (European Union)

### Positive Changes
- 1
- 2
- 3
- 4

### Negative Changes
- -24%
- Neg
- -41%
- Neg
- Neg

**Legend**
- Domestic technology
- Domestic final demand
- Trade
- Total
GHG emissions embodied in exports

*Some preliminary facts 1995-2008*

- World GHG emissions linked to trade amounted up to 9.6 GtCO$_2$e (100% increase from 1995); of which in 2008:

  - CHN $\rightarrow$ 30.0%
  - RUS $\rightarrow$ 8.1%
  - RoW $\rightarrow$ 26.0%
  - US $\rightarrow$ 7.7%
  - EU $\rightarrow$ 8.4%

- Largest shares of embodied GHG emissions in exports out of total GHG national emissions:
  - TW (50%);
  - CAN (38%);
  - KOR (35%)...
Emissions embodied in exports, 1995-2008
Emissions embodied in exports, by destination 2008
Trade balance on GHG emissions, 1995-2008

- 31% for EU
- 32% for CHN
- 16% for USA
- 25% for RoW
Employment embodied in exports

Some preliminary facts 1995-2008

- World employment linked to trade amounted up to 605 Mio. jobs (81% increase from 1995); of which in 2008:
  - CHN -> 37.2%
  - EU -> 5.0%
  - RoW -> 33.2%
  - BRA -> 2.8%
  - IND -> 10.4%

- Largest shares of embodied employment in exports out of total national employment: TW (39%); CHN (29%); KOR (24%)...
Employment embodied in exports, 1995-2008
Employment embodied in exports, by destination - 08
The link between GHG emissions and employment

• Give priority to policy measures involving actions (e.g. taxes, market based instruments) affecting the commodities with the greatest potential to reduce emissions and the least impact on employment...

• In other words, those commodities with highest “labour emission intensities”
<table>
<thead>
<tr>
<th>Sector</th>
<th>Share of GHG emissions embodied in exports</th>
<th>Share of employment embodied in exports</th>
<th>Employment in exports / Emissions in exports (jobs / 1000 tCO₂e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good / Sector</td>
<td>Good / Sector</td>
<td>Good / Sector</td>
<td>Good / Sector</td>
</tr>
<tr>
<td>Electrical and Optical Equipment</td>
<td>12.4% / 0.8%</td>
<td>11.7% / 4.1%</td>
<td>55 / 297</td>
</tr>
<tr>
<td>Mining and Quarrying</td>
<td>11.6% / 13.6%</td>
<td>6.3% / 6.6%</td>
<td>52 / 29</td>
</tr>
<tr>
<td>Basic Metals and Fabricated Metal</td>
<td>10.9% / 10.0%</td>
<td>4.5% / 2.9%</td>
<td>24 / 17</td>
</tr>
<tr>
<td>Chemicals and Chemical Products</td>
<td>9.6% / 7.0%</td>
<td>4.3% / 1.7%</td>
<td>26 / 14</td>
</tr>
<tr>
<td>Agriculture, Hunting, Forestry and Fishing</td>
<td>6.3% / 12.6%</td>
<td>13.8% / 34.9%</td>
<td>129 / 163</td>
</tr>
<tr>
<td>Coke, Refined Petroleum and Nuclear Fuel</td>
<td>5.8% / 4.0%</td>
<td>2.0% / 0.2%</td>
<td>20 / 3</td>
</tr>
<tr>
<td>Transport Equipment</td>
<td>4.6% / 0.4%</td>
<td>4.0% / 1.3%</td>
<td>51 / 188</td>
</tr>
<tr>
<td>Textiles and Textile Products</td>
<td>4.5% / 0.7%</td>
<td>10.8% / 5.1%</td>
<td>140 / 448</td>
</tr>
<tr>
<td>Machinery, Nec</td>
<td>4.4% / 0.4%</td>
<td>3.8% / 1.8%</td>
<td>51 / 278</td>
</tr>
<tr>
<td>Food, Beverages and Tobacco</td>
<td>4.3% / 0.5%</td>
<td>8.7% / 1.6%</td>
<td>118 / 180</td>
</tr>
<tr>
<td>Water Transport</td>
<td>3.3% / 3.9%</td>
<td>1.0% / 0.5%</td>
<td>18 / 7</td>
</tr>
<tr>
<td>Manufacturing, Nec; Recycling</td>
<td>2.8% / 1.2%</td>
<td>4.5% / 2.6%</td>
<td>94 / 127</td>
</tr>
<tr>
<td>Inland Transport</td>
<td>2.7% / 4.0%</td>
<td>1.7% / 3.6%</td>
<td>37 / 52</td>
</tr>
<tr>
<td>Renting of M&amp;Eq and Other Business Activities</td>
<td>2.6% / 0.8%</td>
<td>4.6% / 4.2%</td>
<td>104 / 317</td>
</tr>
<tr>
<td>Other Non-Metallic Mineral</td>
<td>2.1% / 3.5%</td>
<td>0.6% / 0.7%</td>
<td>18 / 11</td>
</tr>
<tr>
<td>Air Transport</td>
<td>2.0% / 2.2%</td>
<td>0.8% / 0.3%</td>
<td>23 / 8</td>
</tr>
<tr>
<td>Rubber and Plastics</td>
<td>1.8% / 1.2%</td>
<td>1.8% / 1.9%</td>
<td>58 / 94</td>
</tr>
<tr>
<td>Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles</td>
<td>1.4% / 0.3%</td>
<td>2.4% / 3.4%</td>
<td>99 / 582</td>
</tr>
<tr>
<td>Electricity, Gas and Water Supply</td>
<td>1.3% / 28.7%</td>
<td>0.1% / 0.7%</td>
<td>6 / 1</td>
</tr>
<tr>
<td>Other Community, Social and Personal Services</td>
<td>1.0% / 2.0%</td>
<td>2.4% / 6.3%</td>
<td>141 / 188</td>
</tr>
<tr>
<td>Rest</td>
<td>4.5% / 2.2%</td>
<td>10.3% / 15.5%</td>
<td>135 / 423</td>
</tr>
<tr>
<td>Total</td>
<td>100.0% / 100.0%</td>
<td>100.0% / 100.0%</td>
<td>59 / 59</td>
</tr>
</tbody>
</table>
Summary of conclusions

- Importing countries gain environmental benefits due to displacements of production outside their countries; Exporting countries also benefit from the employment needed to produce such exported commodities;

- From a global perspective, we argue that policy instruments restricting imports of emission intensive commodities and/or sectors need to keep an eye on the employment impacts on the exporting country, so that it would be at the minimum cost level for both.
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Thanks for your attention!!!

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