Slides - Africa in the World Trade Network

Luca De Benedictis

Available at: https://works.bepress.com/luca_de_benedictis/17/
Africa in the World Trade Network
Persistence and Change
at the aftermath of the Global Financial Crisis

Luca De Benedictis¹

¹University of Macerata - Italy

ETSG 2010
University of Lausanne, September 9-11, 2010
An overview of the paper

- The paper has two main objectives
  (1) Describing bilateral trade flows of African countries during the 2008 crisis;
  (2) Exploring a methodology to represent countries’ multilateral proximity.

- Result 1: Africa’s involvement in World Trade flows follows a "N shape"

- Result 2: There is evidence that the 'cause' of that trade "N shape" is the up and down in effective demand and trade-related finance (affecting Africa’s Exports) more than the volatility in income transfers, i.e. Aid, remittances, (affecting Africa’s Imports).

- Result 3: Africa is not closer to Asia (China) than it was before the crisis. As far as multilateral trade proximity, Africa is moving far apart, from all other regions.
Where is Africa?

A.06  Major trade flows: volumes 2009

Tonnes (millions)

1) In contrast to the 2008 Annual Report, volumes are presented excluding any effects related to pricing.

Source: IHS Global Insight, Global Trade Navigator, as at 15 January 2010.

Luca De Benedictis

Africa in the World Trade Network
Africa covers less than 3% of World trade.
Africa covers less that 3% of World trade.
Africa: from tragedy to miracle

**Until the 1990s:** Africa was characterized by slow growth, political instability and high vulnerability to shocks. The trade counterpart of all that was minimal participation to global exchanges. Africa was too far, too specialized in ‘the wrong goods’, too institutionally unreliable, too risky. The exceptions to this view are sporadic [Behar (2008)].

**The U-turn in the 2000s:** Africa grew at a yearly average of 3%.

- In many SSA countries exports grew steadily, following the rise in commodity prices, more liberal trade policies, and a new phase in African regional integration.

- Also the emergence of Asia (and China) contributed to a new phase in African trade. Exports from Africa to Asia grew by 20 per cent annually, between 2000 and 2007, imports by 18 percent, transforming Asia (and China) in a major trading partner for African countries.

- Notwithstanding, China accounted for 7.7 per cent of Africa’s total exports at the beginning of 2007, still a relative low share with respect to what is generally perceived, much below the 39.80 percent and 20.65 percent of the EU and US shares of Africa’s exports.
Part I

The Global Financial Crisis and Trade in Africa
### Trade flows Africa, 2007-2009: Exports - Imports

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>Angola</td>
<td>Benin</td>
<td>Burkina Faso</td>
<td>Burundi</td>
<td>Cameroon</td>
<td></td>
</tr>
<tr>
<td>Cape Verde</td>
<td>Central African Republic</td>
<td>Chad</td>
<td>Comoros</td>
<td>Congo Dem Republic</td>
<td>Congo Republic of</td>
<td></td>
</tr>
<tr>
<td>Cote d'Ivoire</td>
<td>Egypt</td>
<td>Equatorial Guinea</td>
<td>Ethiopia</td>
<td>Gabon</td>
<td>Gambia</td>
<td></td>
</tr>
<tr>
<td>Ghana</td>
<td>Guinea</td>
<td>Guinea-Bissau</td>
<td>Kenya</td>
<td>Liberia</td>
<td>Libya</td>
<td></td>
</tr>
<tr>
<td>Madagascar</td>
<td>Malawi</td>
<td>Mali</td>
<td>Mauritania</td>
<td>Mauritius</td>
<td>Morocco</td>
<td></td>
</tr>
<tr>
<td>Mozambique</td>
<td>Niger</td>
<td>Nigeria</td>
<td>Rwanda</td>
<td>São Tomé and Príncipe</td>
<td>Senegal</td>
<td></td>
</tr>
<tr>
<td>Seychelles</td>
<td>Sierra Leone</td>
<td>Somalia</td>
<td>South Africa</td>
<td>Sudan</td>
<td>Tanzania</td>
<td></td>
</tr>
<tr>
<td>Togo</td>
<td>Tunisia</td>
<td>Uganda</td>
<td>Zambia</td>
<td>Zimbabwe</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Trade Flows (indices - 2007 = 100)**

**Time span 2007-2009 (quarterly data)**

Luca De Benedictis

Africa in the World Trade Network
The $N$ shape
Trade flows in Angola, 2007-2009: Exports - Imports

- The $N$ shape: trade was growing since 2008.3, the path is reverted since 2009.1, and it recovers afterwards.
- Impressive resilience.
- Higher effect of the Crisis on Exports (Effective Demand + trade-related finance) than on Imports (Aid).
- This evidence is largely common to SSA countries ... with exceptions.

Luca De Benedictis
Africa in the World Trade Network

Luca De Benedictis
Africa in the World Trade Network
No substitution effect

- China as an 'emerging market' since the Crisis.
- Exports towards the EU and US drop during the Crisis. But also exports to China (and Asia) drop.
- Only intra-African trade is marginally affected.
- There is no evidence of a substitution between the EU and even the US and China as the major export market for Africa.
- China as an 'emerging market' once again.
Part II

Graph visualization and multilateral proximity
Force-directed algorithms: Kamada-Kawai (1989)

- A very popular force-directed algorithm for graph layout is the Kamada-Kawai (KK) algorithm.
- It is based on the idea of a balanced spring system and energy minimization.

In KK-Layout the global energy $E$ is defined as:

$$E = \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \frac{1}{2} k_{i,j} (|p_i - p_j| - l_{ij})^2$$

where $p_k$ is the position of vertex $k$, and $l_{ij} = c \cdot d_{ij}$ is proportional to the topological distance $d_{ij}$ of vertex $i$ and $j$. 
Force-directed algorithms: Kamada-Kawai (1989)

Solving the minimization problem on $E$

\[ E = \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \frac{1}{2} k_{i,j} (|p_i - p_j| - l_{ij})^2 \]

the same equation can be written as:

\[ E = \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \frac{1}{2} k_{i,j} [((x_i - x_j)^2 + (y_i - y_j)^2 + l_{ij}^2 - 2 l_{ij} \cdot ((x_i - x_j)^2 + (y_i - y_j)^2)^{1/2}] \]

For a minimum we must have

\[ \forall j \quad \frac{\partial E}{\partial x_j} = \frac{\partial E}{\partial y_j} = 0 \]

\[ \frac{\partial E}{\partial x_j} = \sum_{i \neq m} k_{im} \left[ (x_m - x_i) - \frac{l_{mi} \cdot (x_m - x_i)}{((x_m - x_i)^2 + (y_m - y_i)^2)^{1/2}} \right] \]

\[ \frac{\partial E}{\partial y_j} = \sum_{i \neq m} k_{im} \left[ (y_m - y_i) - \frac{l_{mi} \cdot (y_m - y_i)}{((x_m - x_i)^2 + (y_m - y_i)^2)^{1/2}} \right] \]
Force-directed algorithms: Kamada-Kawai (1989)

Solving the minimization problem on $E$ (cont.)

- These equations are not independent, therefore they cannot independently be brought to zero.
- In the KK-Layout only a single vertex is moved at a time.
- Once the vertex to be moved is chosen all other vertices are fixed and the energy is (locally) minimized by only moving vertex the chosen vertex, using a single-sided, two-dimensional Newton-Raphson iteration.
- The minimization problem does not have a unique solution.

- But we can obtain a distribution of possible equilibria.
Part III

Africa in the World Trade Network
Change in the network structure during the Crisis?

(a) 2007.1
(b) 2008.1
(c) 2009.1
(d) 2009.3

No evidence of dramatic structural change.

Luca De Benedictis
Africa in the World Trade Network
Evolution of Africa’s Proximity (2007.1 – 2009.3)

- ASIA
- EUROPE
- AMERICA
- AUSTRALIA
- EU
- CHINA
- USA

Luca De Benedictis
Africa in the World Trade Network
Africa’s Multilateral Proximity with the EU, 2007-2009
Africa’s Multilateral Proximity with the US, 2007-2009

Proximity between Africa and USA

Luca De Benedictis
Africa in the World Trade Network
Africa’s Multilateral Proximity with China, 2007-2009

Proximity between Africa and China

Luca De Benedictis

Africa in the World Trade Network
Part IV

Summing up
You know them already

- **Result 1**: Africa’s involvement in World Trade flows follows a "N shape"
- **Result 2**: There is evidence that the ’cause’ of Africa’s trade "N shape" is the up and down in **effective demand and trade-related finance** (affecting Africa’s Exports) more than the volatility in income transfers, i.e. Aid, remittances, (affecting Africa’s Imports).
- **Result 3**: Africa is not closer to Asia (China) than it was before the crisis. As far as **multilateral trade proximity**, Africa is moving far apart, from all other regions.