Patterns of variability in the structure of global value chains: a network analysis

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Summary

Network construction:

▶ Build the Global Value Network (GVN) from WIOD 2005-2015

▶ The GVN is constructed backward starting from a target country-sector up to its tier 1, 2, 3... suppliers

▶ The GVN provides a valuable network representation of the backward GVC linkages of a given country-sector

Network analysis:

▶ Structure and changes according to global measures:
  - Average distance (d)
  - Total network communicability (TC)

▶ Also use geo-integrated weights (i.e. trade value $\times$ distance) to study physical length of GVC

▶ Focus on specific country-sector cases

Network construction

- ▶ 3 alternative filterings to focus on the most important links

  - ❶ **sector contribution:** keep flows above 0.3% of total country-sector output (right?)
    PRO: large flows only; CON: may have low coverage

  - ❷ **total incoming weight:** keep flows from the largest up a coverage of 80% of total country-sector output (right?)
    PRO: high pre-determined coverage; CON: may include minor flows

  - ❸ **backbone extraction:** more complex, basically keeps "significant" in/out links, requires to set two thresholds
    PRO: considers in/out nodes; CON: less intuitive, two thresholds

- ▶ Similar results, but unclear how/why you set these thresholds

- ▶ Trade-off between coverage and noise, but I would like to see what you get with only a few top links
  - perhaps this can only be done in the network graphs for readability
  - also you could try a layered visualization to highlight tier 1 and 2 suppliers

Units

- Normalization to get manageable values is ok, but the units are economically meaningful and should be clearly specified (mln? dollars?)

- The intuition of geo-integrated weights is clear: I wonder whether the units can be expressed in a more readable way (e.g. trade weighted average distance in km)

- Calling *sector* a country-industry pair is confusing (for me)

What part of GVC?

- By starting from a target country-sector and moving backward, you seem to only track backward GVC participation

- Unclear how you get values for 2nd, 3rd, etc. tier suppliers (what calculations?)

- How the N of suppliers escalates from tier 1 to tier 2 is informative, maybe you can get an indicator of that

- It would be nice to get a measure of specificity or substitutability of suppliers: are they from same sector from different countries? Exposure to country vs. sectoral shocks to suppliers...

- What about forward GVC? Position?

Network indicators

▶ Why do you pick distance and communicability?

▶ Figure 1 is clear. Less clear is the role of the simulations with Erdös-Rényi and Barabàsi-Albert networks: what information do we get from the (negative) correlation between shortest path distance and communicability?

▶ I wonder whether it can be useful to normalize the network indicators so that networks of different sizes are comparable (so maybe you can separately study size and structure)

Case studies

- ▶ How do you select case studies?

- ▶ The studies largely focus on the size of the network. You might think of separating a size effect from a structure effect (e.g. topological changes holding size constant)

- ▶ For some results it is unclear what is the advantage of using complex network indicators

  e.g. do we need networks to say that China reduced trade with distant countries?

- ▶ For other results networks are essential: focus more on what can only be captured with networks, e.g. indirect suppliers. What do we miss if we do not use networks?

Conclusion

▶ Interesting work, the network approach is crucial to capture complexity and indirect effects

▶ Shortest path and communicability capture one important part of GVC, but they need to be motivated and explained (information flow, spillovers, shock transmission)

▶ Looking at tiers of suppliers can give a meaningful representation of the information gap; you could give a measure of how fast they escalate

▶ To what extent firms are capable of endogenizing exposure to indirect suppliers that they don't even know exist? Individual incentives may not adequately incorporate systemic risk... (room for policy)