Visual Network Decomposition of the Leontief Inverse: TiVA, Environmental Footprint, Ownership, Endogenized Capital

Topic: Input-Output Analysis: Trade and Global Value Chains policies (1)
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Global Value Chain indicators based on the Leontief inverse such as TiVA or carbon footprints offer a highly condensed view of complex global and national supply chain networks. For a better understanding of these indicators it is often important to look at the underlying global value chains.

Such a value chain decomposition can help to explain results of Input-Output research to certain stakeholders. Policy measures intended to affect these summary indicators often need to be targeted at specific stages of the global value chain in particular countries. For Input-Output analysts, such a GVC detail view helps to validate results, including the bias due to aggregation and certain simplifying assumptions. It is a valuable source for intuitive in-depth analysis of the results of complex matrix operations.

An interactive real-time application will be presented that was developed precisely for this purpose. It has already been implemented for several MRIO such as FIGARO or OECD ICIO and for national IO data like the detailed US BEA table. In the MRIO case, the analysis usually starts with a country-by-country table, e.g., of carbon footprints, followed by a product-by-product table for a country pair selected in the first chart. For any pair of input and output products in this table, the linking value chains can be displayed immediately as a flowchart.

For each value chain, the contribution to the summary indicator in the product by product table is calculated and displayed. This kind of â€œarithmeticâ€• visualization is a distinguishing feature of the application. The recursive algorithm together with all preparational stages is running in a single spreadsheet workbook with seamlessly integrated Python scripts.

This approach can also be used for extensions of Input-Output analysis like

1) the distinction between foreign-owned and domestic-owned enterprises in the OECD-AMNE database: the parts of each country assigned to foreign-owned and domestic-owned enterprises are technically handled like separate countries

2) capital endogenization: when using the flow matrix method, the matrix of capital requirement coefficients is included in the recursive scan algorithm in addition to the material requirement coefficients, with value added and final demand reduced by the column and row totals of the capital flow matrix respectively

3) stressors other than air emissions: stressors like labor by gender or skill level can be technically handled in the application in the same way like air emissions