Input-output calculus of international trade

Topic: The Value of Trade
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As is known, gross trade statistics attribute the origin of traded products wholly to the exporting countries and, likewise, their destination to the importing countries. It is also known that, with the advent of the international fragmentation of production, imported products may be used as intermediate inputs in the production of exports. The product life cycle may therefore extend far beyond the national borders of the exporting and importing countries. Behind the observed gross trade flows between the reported origins and destinations, there is a web of the unobserved value added flows that link the producers and users of traded and even non-traded products. Researchers familiar with the IO methods addressed the need of accounting for the unobserved value added behind the gross trade flows, first proposing simple measures of vertical specialisation in trade based on national IO tables. The availability of experimental inter-country IO tables engendered the elaboration of new frameworks for much more profound decomposition of value added in international trade flows, or gross exports accounting. Important contributions have been made by G.Daudin, C. Rifflart and D. Schweisguth, R.C.Johnson and G.Noguera, R.Koopman, W.Powers, Z.Wang, S.-J.Wei and K. Zhu, R.Stehrer.

Although significant progress has been made in capturing value added behind the reported gross trade statistics, there is room for improving the computational and analytical foundations of the proposed frameworks. In pursuit of such improvements, this paper proposes a new generalised framework for value added and gross exports accounting. It is closely related to previous work and is thought to be easily customisable for policy analysis. The contributions of this paper can be summarised as follows. First, all accounting identities work in block matrix formulation which is fully consistent with the structure of the global IO tables with K countries and N economic sectors. This allows the user to simultaneously decompose all bilateral flows at the country and/or sector level with any matrix computation software. The second contribution is the derivation of an accounting relationship that is central to the subsequent itemised decompositions. It shows that the cumulative (direct and indirect) value added flows between the country and sector of origin and the country of destination are equal to the sum of value added that "ends up", or is finally absorbed, in partner country and value added that only "lands" in partner country to be further re-exported. These and various other terms are block matrix equivalents to some measures known from the literature on trade in value added. An additional breakdown by sector at the partner country side leads to the derivation of two matrices of the inter-sectoral transfer of value added which, to the author's knowledge, did not explicitly appear in previous studies. These are the inter-sectoral flows of value added before the product leaves the exporting country and after it arrives at the importing country. Excluding these two matrices or respective matrix elements from the value added accounting equations at the bilateral sector level makes them incomplete. This is the third contribution.

The decomposition discussed so far is capable of identifying the ultimate origin and destination of value added, irrespectively of trade flows where it is embodied. It allows the analyst – and, hopefully, policymaker – to address the question "who produces what and for whom" and, hence, who derives income and where jobs are created in the globalised economy. However, policy-relevant applications may require that the value added flows be confined to the gross trade flows actually crossing national borders. The fourth contribution is the derivation of another type of accounting framework where the nucleus is the exporting sector, not the sector that contributes value added. Now, the decomposition is capable of identifying the direct and eventual use of exports by the importing country. It is shown that, after infinite series of trade interactions, exports of

intermediates embodied in partner exports is fully split between eventual exports of final products and indirect exports of intermediates eventually embodied in partner final demand. This brings about the notion and the equation of the gross exports reallocated according to the ultimate destination. Such â€œexports embodied in exportsâ€• decomposition is thought to be helpful for trade policy analysis which applies to gross trade flows, not to value added contain therein. The next step is to compute accumulated international trade costs faced by a particular exporting sector. Finally, the proposed accounting framework is tested with the data from the WIOD database. The numerical illustration is expected to help better understand the new analytical capabilities.