

## Gravity Models, Interregional Input-Output, and Trade in Value Added: A New Approach Applied to Brazil Internal and International Trade

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(i) Under the light of the recent debate on “supply chains” or “trade in tasks”, the traditional measure of trade in gross value terms is increasingly questioned and, in order to find the “real origin” and the “final destination” of the exported value-added, Input-Output (I-O) methods are frequently used nowadays. In 2013, OECD and WTO have published new results of Trade in Value-Added (TiVA) based on I-O methodology. However, empirical works are still based on the traditional measures in gross terms and the gravity models continue to estimate the trade structure in terms of bilateral gross exports. Will results be different for different determinants of trade (GDP, distance, etc.) if the analysis substitutes an analysis in terms of local value added exported? This paper proposes a re-estimation of the gravity model for the exports of each Brazilian state with a comparison between a gross and a value-added measure of trade.

(ii) Exports in value-added are estimated from the Brazilian inter-state input-output system for 27 regions (26 states and the Federal District) for the year 2008. Using the information available in the Brazilian System of National Accounts (IBGE, 2010), we could estimate an input-output system for Brazil for 2008 based closely on the Brazilian input-output systems released by the IBGE. The estimated national input-output system was then used as the basis to estimate the inter-state system for Brazil based on the methodology presented in Guilhoto et al. (2010). The inter-state IO system makes it possible to decompose the states’ gross exports into their value-added through the domestic supply chain and points the “origin” state of the exported value-added (Yücer & alii, 2014). And finally, we estimated the structure of Brazilian states’ exports with to the rest of the world with a database on the exports of 27 states with 81 countries in 2008 in value-added terms. In order to analyze Brazilian states’ trade structure with the rest of the world and the impact of states’ characteristics, we have then estimated a gravity model, taking into account the more recent econometrical methods and the suggestions about the adaptability of the gravity model to the measure of international trade in value-added (Baldwin and Taglioni, 2011). Different models, specification and methods of estimation (OLS, PPML) are used for compare the results when we estimate the exports in gross or in value-added terms.

(iii) At first glance, results seem quite similar between the two measures, what is not so surprising because at the aggregated level, Brazil exports mainly primary products with a high share of domestic value-added. However, we find some interesting differences concerning the role of the distance on bilateral exports, which can contribute to resolve one economic puzzle, the high and amazing negative impact of distance on trade.

This paper is one the first that proposes a new specification of gravity models with the use of bilateral trade in value added and, to our knowledge, the first one applied to a regional level.

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