'Made in the World': Measuring the Productivity of Global Value Chains

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Given the rise of global value chains (GVCs) over the past two decades, the "made in" label, typical of manufactured goods, which attributes them to a specific economy, has become an archaic symbol of a bygone era as most manufactured goods are now "made in the world." As an additional approach to the traditional Jorgenson's accounting method based on the sectoral total factor productivity (TFP), this paper aims to measure GVC-based TFP by explicitly considering intermediate inputs as an endogenous variable.

Based on the theoretical derivations, simulations, and a recursive approach, we first clarify the distinction between the Domar- and Leontief-based GVC TFP. We further point out the knife-edge feature of Domar aggregation based on the sectoral TFP, as well as the "missing productivity" of the conventional approach based on the share-weighted sectoral TFP or aggregate production function. Finally, we unify the Domar- and Leontief-based GVC TFP within Jorgenson's accounting framework and decompose it into five parts. Using the world input–output database, we show that the new GVC TFP helps better understand the nature and structure of international fragmentation production (e.g., snake vs. spider) and the evolution of global resource allocations.

We aim to contribute to productivity accounting theory in the following three ways: (1) We clarify the gap between the Domar- and Leontief-based GVC TFPs, which remains ambiguous in the literature; however, understanding the differences is critical to comprehending the relationship between sectoral TFP and GVC TFP, and also the micro-foundations of aggregate TFP. Domar aggregation based on sectoral TFP has been a widely used way of calculating aggregate TFP in the literature. However, few scholars have noticed that Domar approach can also be used to analyze GVC TFP, and the difference between Domar-based GVC TFP and Leontief-based GVC TFP remains unclear.

(2) We integrate GVC TFP into the accounting framework of Jorgenson and provide a symmetrical interpretation of GVC TFP as the traditional Jorgenson's accounting method based on sectoral TFP. Jorgenson provides a classical framework for decomposing aggregate sectoral TFP growth. Based on this framework, APF-based APG (Solow type) and PPF-based APG (Jorgenson type) can be decomposed into different components with value chain connections.

(3) We point out the knife-edge feature of PPF-based APG (with Domar aggregation based on sectoral TFP). In other words, PPF-based APG is valid only in a closed economy. When it comes to the national TFP in an open economy, it fails to capture the foreign value chains in a proper way. Furthermore, we figure out the "missing productivity" of conventional approach based on share-weighted sectoral TFP or aggregate production function, because of their failure in solving the endogeneity issue.

Besides the theoretical findings above, we also have some interesting empirical findings. For example, anti-globalization does more harm for developing countries than developed countries in terms of GVC TFP growth and the foreign contribution to GVC TFP. The contribution from China grows dramatically to the GVC TFP of the U.S. and Japan. Furthermore, in terms of the sector of computer, electronic and optical products, China, rather than India or Russia, where final goods are produced, is better for promoting global productivity.

In sum, this paper answers not only â€œwhich country, where final goods are produced, is better for promoting global productivity?â€•, but â€œwhich country contributes more to the international competitiveness of a specific country?â€• These are all significant issues for the development of the world and a country.