The Impact of Productivity on Welfare of Nations through Global Value Chains

Topic: Input-Output Analysis
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Total Factor Productivity (TFP) growth has long been recognized as a pivotal driver of welfare expansion. However, the precise impact of global TFP growth on national welfare growth remains poorly understood both theoretically and empirically. To bridge this gap, we developed a simple yet potent model for the TFP-welfare analysis. We measure the gap between GDP growth and welfare growth of a nation, and further elucidate how this disparity, i.e. terms of trade (TOT) effect, is influenced by global TFP growth by integrating the concept of global value chain (GVC) TFP into the growth accounting framework. With the growing geopolitical instability and the restructuring of GVCs in recent years, including the shift from globalization to "slowbalization", the welfare effects from other countries' TFP growth have gained increasing significance in shaping the trade and technology policies.

Our contribution to the literature is manifold and can be delineated in three primary aspects. Firstly, we delve into the effects of global total factor productivity (TFP) growth on national welfare, a topic that has traditionally been explored through the lens of domestic TFP growth's contribution to national welfare, as highlighted by works such as Basu et al. (2022). These studies explore the welfare implications of TFP by employing the concept of revenue TFP instead of the conventional measure of physical TFP. However, they do not account for the nuances of international production fragmentation. While Kleinman et al. (2023) attempt to quantify the impact of both domestic and foreign TFP growth on national welfare growth. However, their approach, rooted in quantitative trade models, does not adequately capture the complexities of production networks due to the assumption that elasticities of substitution across different country origins are uniform. This overlook simplifies the intricate dynamics of global production and its influence on national welfare.

Secondly, unlike quantitative trade models, our model streamlines the assumptions and parameters needed, facilitating the comprehensive integration of production networks. Our model is grounded in growth accounting, thereby necessitating minimal assumptions and foregoing the need for parameters. For example, our approach obviates the need to estimate parameters critical to quantitative trade models, such as the elasticity of substitution. Estimating this parameter typically relies on stringent assumptions, which faces challenges in accounting for the heterogeneity across all countries and sectors. This issue persists despite trade economists' endeavors to estimate elasticities of substitution in detailed dimensions.

Thirdly, our research advances the understanding of the TOT effect by elucidating its origins in the TFP of individual countries. Prior investigations into TOT typically culminate in its quantification (Feenstra et al., 2015). Moreover, certain studies have utilized TOT as an explanatory factor for TFP growth. Contrary to these perspectives, our findings reveal that the causal relationship is inverted; it is TFP that influences TOT, not the other way around. This insight reshapes our understanding of the dynamic interplay between TOT and global TFP growth.

Through the application of our model to the World Input-Output Database, we have uncovered some novel findings. Our estimated TOT effect exhibits substantial similarity to the TOT effect calculated using the Penn World Table. We present the results of selected countries: U.S., Japan, Germany, China, India, as well as the rest of the world, including the welfare growth, components of TOT, country origins of TOT, direct and indirect TOT, and provide policy suggestions on promoting welfare growth. This approach affords us valuable insights into the intricate interplay between global productivity and national welfare growth.