The GTAP-MRIO version 11 Data Base and Environmental Extensions

Topic: Input-Output Analysis: Trade and Global Value Chains Policies - VIII
Author: Erwin Corong

The global economy is increasingly organized along value chains which involve production stages being performed in different countries, with intermediate inputs crossing borders multiple times (Koopman et al., 2014). This global fragmentation of production along with deepening economic integration efforts since the 1990s, resulted in 70% of current global trade being associated with value chains (OECD, 2020). Understanding the economic and trade implications of global value chains (GVCs) has become an important research agenda since the early 2000s (Hummels et al. (2001); Baldwin (2011); Baldwin and Venables (2013); Backer and Miroudot (2013); (Koopman et al., 2014); Kowalski et al. (2015); Blanchard et al. (2016)). The preferred method for GVC analysis relies on multi-regional input-output (MRIO) frameworks. An MRIO harmonizes input-output (IO) tables for multiple regions and links trade flows directly from producers or firms in each region to importing firms (hence, GVCs) and consumers in other regions.

In this paper, we provide an overview of the GTAP Multi-Region Input Output (GTAP-MRIO) version 11 Data Base. While the Standard GTAP Data Base accounts for bilateral trade for each product, it assumes that domestic agents in each economy have the same mix of imports from different countries. To address this, the GTAP-MRIO extends the standard GTAP version 11 Data Base (Aguiar et al., 2023) by additionally distinguishing bilateral trade and tariff flows by agents or so-called end-users, namely: firms, private household, government and investors. To construct the GTAP-MRIO, we use the International Trade Centreâ€™s (ITC) MAcMap database and the United Nations Statistics Division (UNSD) 6-digit Harmonized System (HS) to Broad Economic Categories (BEC) concordances to System of National Accounts (SNA) end-use framework and the GTAP Centerâ€™s HS to GTAP concordances. We then aggregate over GTAP commodities, the trade and tariff data by end-users in MAcMap and consequently use these to disaggregate their associated flows in the standard GTAP Data Base. Finally, we employ constrained optimization procedures to ensure that the GTAP-MRIO trade and tariff flows, when summed over end-users, aggregate back to the trade and tariff flows in the standard GTAP Data Base.

In this paper, we also present the various environmental indicatorsâ€”e.g., greenhouse gas emissions (CO2, Methane, N2O, F-gas) and air pollutionâ€” that can be calculated using the GTAP-MRIO Data Base. Finally, we illustrate the novelty of using the GTAP-MRIO Data Base as input to the GTAP-MRIO model to conduct policy simulations within a general equilibrium framework, thereby allowing us to capture not only the nuances of agent-specific trade patterns and the degree by which bilateral tariffs differ across agents or end-users, but also to trace the environment emissions/footprint associated with international trade policy changes.