Unequal Pollution Flows: Brazil's Role in Global Emission Trade (1995-2018)

Topic: Environmental Input-Output Modelling (2)
Author: Patieene Alves Passoni
Co-Authors: Raynan Rocha Porto, Marcelo Resende Tonon, Gilberto Tadeu Lima, Pedro Romero Marques

This study quantifies the net balances of value-added, COâ,, emissions, and employment embedded in Brazilian international trade with the Global South and Global North from 1995 to 2018. It examines the evolution of these balances to assess the applicability of the Environmental Terms of Trade Deterioration Hypothesis to Brazilian trade during the period, particularly in the context of export reprimarization (Alves-Passoni, 2023; Nassif et al., 2020).
A central theoretical framework in this debate is the Pollution Haven Hypothesis (PHH), which posits that, under conditions of free trade, pollution-intensive and resource-heavy industries in developed countries (Global North) relocate to developing countries (Global South) to evade stringent environmental regulations (Copeland & Taylor, 1994). This geographical shift in environmental burdens occurs through both trade in goods and services and foreign direct investment (FDI). As a result, the Global South may experience increased environmental degradation, while the Global North benefits from lower domestic emissions.
In parallel, the Environmental Terms of Trade Deterioration Hypothesis posits that economies specializing in primary products are susceptible to long-term declines in the value of their exports relative to their imports (PÃ©rez-RincÃ³n, 2006; RÃ¸pke, 1994). This hypothesis builds on the Terms of Trade Deterioration Theory advanced by Prebisch (1950) and Singer (1950), which argues that developed countries specialize in the export of capital- and knowledge-intensive goods, while developing countries export resource-intensive and low-skilled labor products. Over time, this pattern of specialization leads to a decline in the terms of trade for developing countries, requiring them to export increasing volumes to maintain their import capacity.
To test this hypothesis, the study uses the Pollution Terms of Trade (PTT) metric (Antweiler, 1996) to evaluate whether the environmental cost of Brazil's exports exceeds that of its imports, offering a comprehensive assessment of the sustainability of Brazil's trade patterns.
The analysis employs a multi-regional input-output (MRIO) model to examine the direct and indirect effects of trade flows on value-added, COâ,, emissions, and employment. This approach captures global production network interdependencies, providing a holistic perspective on the environmental and economic implications of international trade.
The empirical analysis utilizes the OECD Inter-Country Input-Output (ICIO) database (November 2021 version), which includes inter-regional input-output tables for 66 countries and the Rest of the World (RoW) category, disaggregated into 45 sectors for the period from 1995 to 2018. By integrating OECD ICIO data with additional sources, the study estimates COâ,, emissions, employment, and value-added embedded in Brazilian trade, categorizing countries into two regions: Global South (developing countries) and Global North (developed economies). Sector-specific impacts on the examined variables are also analyzed.
The study contributes to the literature by providing empirical evidence on the environmental consequences of Brazil's export reprimarization and its implications for environmental terms of trade. It examines the evolving nature of Brazil's international trade and its environmental and economic impacts, offering critical insights for trade and environmental policy debates, and highlighting challenges and opportunities for sustainable development.
The findings reveal that emissions associated with Brazilian exports to the Global South are approaching those directed to the Global North, especially after 2010. Additionally, Brazilian exports to the Global North are consistently more carbon-intensive than those to the Global South, supporting the Environmental Terms of Trade Deterioration Hypothesis. This indicates that exporting primary products to developed economies results in higher environmental costs per unit of value

added.
A central concern is the uneven distribution of environmental impacts, particularly regarding emissions responsibilities. The study emphasizes the ongoing debate on whether emissions burdens should be placed on producing or consuming countries, a critical issue for Brazil given its increasing specialization in primary product exports. This disparity underscores the need for more nuanced discussions about global emissions responsibility and the effectiveness of trade-based emissions accounting methods.
The study concludes by highlighting the significant disparities in emissions between the Global North and Global South, with the Global North consistently having higher average COâ„‚ emissions. It notes a reversal of emission flows from Brazil to the Global South after 2010, driven by Brazilâ€™s growing export specialization in primary products, particularly from resource-intensive sectors such as Agriculture, Forestry, and Fishing.