Comparison among EXIOBASE-, GLORIA- and CEDA-based USEEIO model with import emission factors

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The research question, the method used
Accurate representation of import factors is crucial for ensuring the reliability of the U.S. Environmentally Extended Input-Output (USEEIO) model in assessing the environmental impacts of goods and services in global supply chains. Import factors, which account for the environmental impacts of goods and services produced abroad and consumed domestically, are derived from multi-regional Input-Output (MRIO) databases. These import factors play a pivotal role in capturing the trade-related environmental impacts, making them integral to both national-level modeling and corporate-level carbon accounting. However, variations in MRIO data can significantly influence model outcomes, particularly in sectors with high levels of international trade. The research question of this study is how do the three prominent MRIO databasesâ€”EXIOBASE, GLORIA, and CEDAâ€”affect the estimation of import factors in USEEIO and what are their implications for MRIO modeling, corporate carbon accounting, and global supply chain GHG management.
Our methodology involved harmonizing these three MRIO databases to the sectoral structure of USEEIO and applying them to generate import factors for key sectors, including electricity, cement, steel, and agriculture. Harmonization ensured comparability while preserving the unique strengths of each dataset. Through this integration, we systematically analyzed the differences in emission factors across the databases, emphasizing regional variations, sectoral trends, and overall alignment with real-world trade flows. Additionally, we explored how these variations influence the corporate carbon accounting conducted using the USEEIO model.

The data used (if any)
In this study, we systematically compared the USEEIO model with import factors generated from EXIOBASE, GLORIA, and CEDA when integrated into the USEEIO framework. These MRIO databases differ in their regional and sectoral resolutions, data sources, and methodologies for allocating emissions. EXIOBASE provides detailed global environmental extensions and allows assessment of environmental impacts associated with consumption of European and other countries across time series data with a high level of product and industry detail. GLORIA is a database with a homogenous multi-regional supply-use table (MR-SUT) structure, offering harmonized sector labels for both industry and commodity sectors and specializing in resource flow analysis. CEDA offers comprehensive coverage of the U.S. economy and global trade, while maintaining a high resolution for key economic sectors and emission categories, making it well suited for both national and international supply chain assessments.

The novelty of the research
Our findings reveal differences in import factors across the three MRIO databases, driven by variations in their sectoral detail, geographic resolution, and data assumptions, highlighting the trade-offs associated with each MRIO database. We underscore the importance of database selection in ensuring robust environmental modeling outcomes and offer guidance on aligning data choices with specific research or policy objectives. We also offer actionable insights for researchers and policymakers seeking to adopt the USEEIO model and other related tools.
This research contributes to the ongoing discourse on improving the accuracy and transparency of environmental impact assessments within Input-Output modeling frameworks. By bridging methodological gaps and providing clarity on database selection, this study paves the way for enhancing the USEEIO modelâ€™s applicability to global trade and environmental policy. It also

supports more informed decision-making in corporate sustainability reporting, resource management, and climate change mitigation strategies.