

Errors due to domestic import assumption in corporate carbon accounts

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The research question, the method used

Environmentally-extended input-output models are the dominant source of data for estimating and reporting supply chain greenhouse gas (GHG) emissions by corporations. According to CDP, a UK-based, investor-backed GHG disclosure platform, about 70% of the companies that are reporting their GHG emissions use so-called, “spend analysis,” which refers to the application of environmentally extended input-output tables. However, the most widely used of such models employ the “domestic import” assumption, which assumes that the structure of supply chains and the emissions intensity of the products imported to a country match those of the importing country—usually the U.S. or the U.K. The use of domestic import assumption may introduce over- and under-estimation of corporate GHG emissions, depending on the relative GHG intensities of the exporting countries compared to those of the domestic counterparts. Therefore, the research question of this study is: “what are the scale and pattern of emissions that may be missed when using these single-region models?”

We used contribution analysis and sector-specific emissions intensity distribution to analyze the potential for a single-region IO model to mischaracterize the GHG intensities of imported goods under domestic import assumption.

The data used (if any)

We use multiregional and single-region versions of the Comprehensive Environmental Data Archive (CEDA) EEIO model, which was first published in year 2000 and has been regularly updated since, to evaluate differences in sector-specific emissions factors, and then assess the aggregate effect on both the emissions inventories and reduction priorities of various types of companies. Based on publicly available input-output tables and macroeconomic statistics, the CEDA model we use here maintains similar sectoral resolution to the USEEIO model (400 sectors), but adds multiregional resolution of 65 countries and a “rest of world” region (n.b. a condensed version of the full 148 country model). The emissions intensities estimated by the multiregional model are much more consistent with published country- and industry-specific values than a single-region (U.S.) model.

The novelty of the research

We find that the upstream emissions of companies who report to CDP are in the aggregate 2.0 GtCO₂e greater when estimated by a multiregional model instead of a U.S.-based single-region model, with especially substantial differences related to manufacturing sectors of moderate emissions intensity (i.e., 0.4-0.8 kgCO₂e/\$). Although the magnitude of emissions embodied in international trade is well-recognized in the context of national inventories, our results underscore the importance of international differences in emissions for corporate carbon accounting. For example, international supply chains and higher emissions-intensities of production in China lead to much greater emissions in China (+973 MtCO₂e), and somewhat lower emissions in areas which rely more heavily on low-carbon sources of energy (e.g., France, Brazil, and the U.K.). High-resolution, multiregional models can both improve the accuracy of corporate emissions inventories and help companies to prioritize both primary data collection and emissions reduction efforts.