

Consumption and production footprints in the EU; a comparison of different accounting approaches to national greenhouse gas emissions

Topic: Input-Output Analysis: Sustainable Production and Consumption Policies - I

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In order to reduce the national contribution to global warming, national climate policies typically focus on reducing greenhouse gas (GHG) emissions domestically. Apart from addressing direct emissions of companies and consumers, opportunities to reduce emissions abroad through companies' and consumers' supply chains have started to receive more attention from policy makers. To measure the impact of their supply chain policies, policy makers need indicators at the national level. Footprint analysis integrates supply chain emissions into such useful indicators. However, the well-known consumption footprint only partially addresses foreign emissions by accounting for supply chain emissions from production for domestic final demand. In this paper, we show that by using so-called production footprints foreign emissions related to production for exports can be captured as well. These production footprints have received little attention in the scientific literature until now.

Environmentally extended multi-regional input-output (EE-MRIO) analysis provides various emission accounting approaches that include supply chain emissions by re-allocating industry emissions across countries in different ways. Based on the production-based emissions, which reflect the direct emissions of all producers in a country, an EE-MRIO model enables the calculation of consumption-based and final production-based emissions that account for the emissions related to domestic final demand and domestic production for all final demand, respectively. Consumption and production footprints can be seen as extensions of these accounting approaches. Consumption footprints include the consumption-based emissions extended by consumer direct emissions that are not included in the transactions in an MRIO table. The production footprint extends the final production-based accounting approach by also considering supply chain emissions from production for intermediate exports, as well as from production for final exports and domestic final demand. Production footprints therewith consider all imports from industries regardless of the final destination of their production.

In this paper, we illustrate the different accounting approaches, including footprints, by analysing GHG emissions related to consumption and production in all 27 countries of the European Union (EU) for the year 2015. We used the OECD Inter-Country Input-Output (ICIO) tables extended with GHG emission data from Eurostat and additional data sources for non-EU countries to populate the MRIO model to perform the calculations. Our analysis reveals that different accounting methods lead to rather similar rankings of EU countries in terms of their emissions. Countries in north-western Europe show large GHG emissions per capita, while countries in eastern Europe show the largest emissions per 1000 euro of GDP regardless of the accounting approach used. A comparison of accounting approaches within countries shows that the production footprint was larger than the consumption footprint in all EU countries except two of the largest, France and Italy. These two countries have relatively large direct emissions from consumers compared to other EU countries. Furthermore, consumption and production footprints identify different industries as main contributors to total emissions per country. An analysis that focuses only on consumption footprints and not on production footprints misses between 22% and 69% of the GHG emissions associated with imports. This complements the consumption and production footprints as national indicators of consumer and company supply chain emissions, capturing all imports from a country.

As different accounting approaches lead to different insights, we recommend that policy makers

consider consumption and production footprints side by side together with production-based emissions, as they may lead to different reduction opportunities.