

## The consequences of global reshoring trends in the EU carbon emissions

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

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In this article, we use an environmentally extended multi-regional input-output model to assess how the new reshoring, nearshoring and greenshoring trends, which are shortening global production chains, affect the carbon footprint of the European Union. The identification of reshoring-intensive sectors is produced from the analysis of observed reshoring trends between 1995 and 2018 and the sectors identified as strategic in terms of reshoring in the EU's Open Strategic Autonomy (European Commission et al., 2021).

Input-output sub-systems analysis has been used to study the production structure of different sectors of the economy (Alcántara and Padilla, 2009). In our case, we will apply the sub-systems analysis technique to assess the importance of a sector or set of sectors in the economy as a supplier of intermediate goods and final goods. First, we isolate the intermediate goods sub-system and the final goods sub-system for a sector. After that, we apply the hypothetical extraction methodology (Dietzenbacher et al., 2019; Zhang et al., 2020; Hertwich, 2021) to study the impact of the removal of these sectors on the overall carbon emissions of the European Union. The hypothetical extraction procedure is useful for quantifying the upstream emissions impact of the reduction in imports of intermediate and final goods. However, relocation processes do not imply a reduction in imports, but rather their substitution by production in the EU or other trading partners. Therefore, the source-shifting technique (Arce et al., 2016; de Boer et al., 2019; Giammetti, 2020; Gilles et al., 2021) is used to assess the net effect that relocation processes have on emissions, both at a global level and on specific sectors under the assumption that the production of the importing country is substituted.

The input-output model proposed here relies on the 2021 edition of OECD Inter-Country Input-Output (ICIO) Tables. This dataset contains multi-regional input-output tables with detail for 45 unique industries based on ISIC Revision 4 and 66 countries for the years 1995 to 2018 (<http://oe.cd/icio>). The data for carbon dioxide emissions is retrieved from the OECD Indicators on Carbon dioxide (CO<sub>2</sub>) emissions embodied in international trade.

The hypotheses to be assessed in this research will evaluate the so far unknown implications of reshoring processes in terms of EU climate and trade policies. For example, we will determine whether reshoring strategies are more (or less) effective than nearshoring strategies in reducing the EU's total carbon footprint and whether these policies will mainly affect CO<sub>2</sub>-intensive industries or relatively low-carbon industries. We will also be able to quantify the trade-offs caused by new trade trends, which are expected to increase direct emissions within the EU (reshoring) and its close partners (nearshoring), while achieving reductions in indirect emissions along EU's supply chain. Assessing the heterogeneous impacts on EU territorial emissions and indirect emissions will allow us to quantify the net effects that these new trade trends will have on global emissions.

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