Identifying emission hotspots for technology transfers using an extended version of the inverse important coefficient methodology

Topic: (3.7) Techniques for Identifying Important I-O Coefficients and Sectors
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Analyses using global multi-regional input-output models such as EORA1, EXIOBASE2, the OECD ICIO3 or WIOD4 show that there is a significant global imbalance of where in the world final demand for products occur, where these products and their intermediate inputs are produced and where most of the pollution along global production chain occurs.
This global imbalance of consumption, production and CO2 emissions could be substantially reduced by employing state-of-the-art low-carbon technologies around the globe5,6. This, however, needs to be initiated. Data on consumption-based or â€“ a slightly different concept â€“ final-product-based CO2 emissions raise the awareness of the link between final goods and the environmental pollution caused by upstream production processes. Consumption-based emissions allocate the emissions to those countries where the final product is consumed, while final-product-based emissions allocates the emissions to the country and industry where the final product is produced. With this data, consumers and producers of final products learn where in the world CO2 was emitted along the upstream production chain.
Using multi-regional supply-and-use tables from EXIOBASE and extending the inverse important coefficient methodology7 by emission factors enables us to identify â€œemission hotspotsâ€•, i.e. countries/industries where a bulk of the upstream emissions of final products occur. The interaction of input coefficients with CO2 intensity coefficients adds a term to the original optimization problem that finds the inverse important coefficients. This new methodology enables us to identify for which industries in which countries changes in emission-relevant inputs have the largest impact on final-product based emissions. This knowledge can be used for well targeted technology transfers from CO2-consuming to CO2-emitting countries. If industries care about the CO2 footprints of their final products, these technology transfers can provide a cost-effective way of reducing their footprint.
The research at hand presents this analysis using, as an example, Germanyâ€™s consumption of final products and final products produced by Germanyâ€™s automobile industry. The analysis suggests that technology transfers to both industrialized and developing countries in different industries, mainly energy intensive industries, could imply a significant reduction in CO2 emitted in upstream production processes.
References

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