

Using consumption-based emissions for policy analysis: the difference between average and marginal consumption-based emissions

Topic: 516F Environmental IO Modelling (2)

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The methodology for estimating CO₂ and greenhouse gas emissions on a consumption basis, using a combination of input-output and bilateral trade data, is now well established. Several previous studies have used the approach to allocate historical emissions to the consumers of final products, typically showing that the US and Europe account for a larger share of total global emissions when measured on a consumption basis.

While the method provides a robust way with which to allocate historical emissions, it is not able to suggest policies which could be used to reduce a country's consumption-based emissions. For this we must turn to macroeconomic models and a scenario-based analysis. We find that, as the macroeconomic models relax some of the relatively fixed assumptions in standard IO analysis (e.g. constant returns to scale, fixed trade shares), we can estimate marginal changes in consumption-based emissions resulting from policy using the endogenous IO tables in the models. Furthermore, the difference between marginal changes and the average changes that have been estimated previously can be quite large.

The paper uses the results from a large number of simulations from two macroeconomic models (E3ME and Fidelio) to illustrate the issue. In both cases unit shocks are applied across a range of final products in the models to estimate the marginal changes in emissions. The results are compared to the average changes in emissions that are estimated using the standard approach.

The final section of the paper discusses the potential implications for policy makers and how they should interpret the model results, with the aim of developing the concept of consumption-based emissions to something that is more useful in the policy formation process.