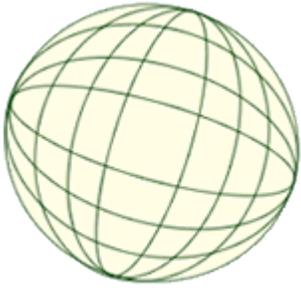


Emissions Embodied in US International Trade

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Background

One of the most well-studied aspects of the life cycle assessment (LCA) and sustainability literatures has been the energy and environmental emissions associated with household goods and services. While this research has been done since the 1970's, it remains of active interest due to changing energy, emissions, and consumption patterns around the world and increasingly refined and varied modeling techniques.

At the same time, there has been increasing interest in studying the effects of rapid globalization and escalating international trade on environmental impacts at the national level. Besides empirical evidence of increased global trade, a large literature exists theoretically explaining the motivation of international trade and firm-level location decisions. These decisions, driven largely by global differences in the prices of capital, labor, and materials, have profound consequences for the environment given international differences in economic efficiency, production methods, and energy/emissions structures. In general, each nation will produce the goods or services it has a competitive advantage in making, potentially leading to high-value goods being made in the developed world and low-value or pollution-intensive goods being made in developing nations. This has driven substantial research on the issue of embodied emissions in trade (EET) and the potential for 'carbon leakage' outside the regulatory control of the Kyoto Protocol, despite the many uncertainties in calculating exact values for these quantities.

Statement Of Work

We leverage a multiregional input-output LCA model (MRIO-LCA) to estimate the extent of US "outsourcing"/"leakage" of pollution to both developed and developing countries over the last decade. We find that increased import volume and shifting trade patterns during this time period led to a large increase in the U.S.'s embodied emissions in trade (EET) for CO₂, SO₂, and NO_x.

Methodological uncertainties, especially related to uncertainties of international currency conversion, lead to large differences in estimation of the total EET, but we estimate that the overall embodied CO₂ in US imports has grown from between 0.5-0.8 Gt CO₂ in 1997 to between 0.8 – 1.8 Gt of CO₂ in 2004, representing between 9-14% and 13-30% of US (2-4% to 3-7% of global) CO₂ emissions in 1997 and 2004, respectively.

Results and Conclusions

This work underscored the importance of carbon leakage and international responsibility of greenhouse gas emissions. The US has come under increasing criticism and pressure to return to international climate negotiations, and movement at state and local levels indicate that such a return may be likely. This would benefit global climate policy, though this work and others show the importance of bringing all parties to the table. For instance, although the US is responsible for producing 22% of estimated world fossil CO₂ emissions in 2004, the amount the US is responsible for consuming, is between 25-26%. This shows the issue of carbon leakage on a grand scale: though the US's share of production-based CO₂ emissions shrank between 1997 and 2004, the share of consumption-based CO₂ emissions increased, due to increased trade volume and shifting toward more-carbon intensive trading partners. Shifting to less CO₂-intensive energy in the US could be negated by increased trade with CO₂-intensive economies.

For more information:

Weber, C., and Matthews, H. S. (2007). "Embodied Emissions in U.S. International Trade: 1997-2004." *Environmental Science & Technology*, 41 (14), 4875 -4881, 2007.

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