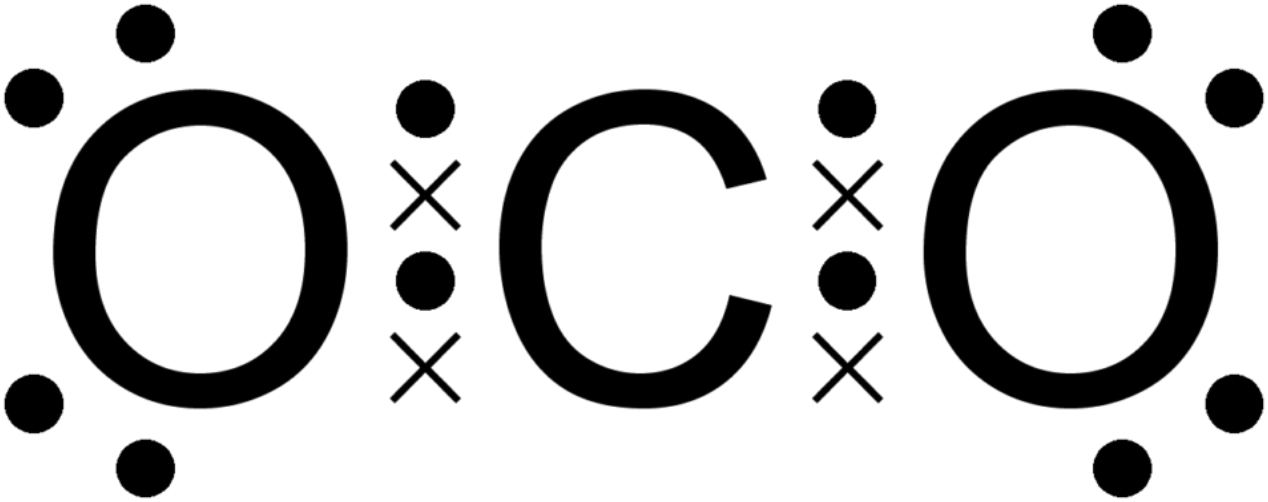
The Carbon Dioxide Embodied in Imports: A Different Way to Measure CO2 Emissions

Regulating for Globalization
14/11/2018

Robert Ireland (U.S. International Trade Commission)

Please refer to this post as: Robert Ireland, 'The Carbon Dioxide Embodied in Imports: A Different Way to Measure CO2 Emissions', Regulating for Globalization, 14/11/2018, http://regulatingforglobalization.com/2018/11/14/the-carbon-dioxide-embodied-in-imports-a-different-way-to-measure-co2-emissions/



Global carbon dioxide (CO2) emissions increased 1.4% to 32.5 gigatonnes in 2017, a new and dubious record. According to environmental organizations such as the International Energy Agency (IEA), China continues to be the largest annual CO2 emitter, with the United States in second place (the United States is still the largest cumulative or historic CO2 emitter).

The wrong formula?
What if, however, the national measurement methodology used by the IEA and all other environmental organizations are not considering the purpose of a significant portion of the goods that caused the purported Chinese CO2 emissions? A large amount of these supposed Chinese CO2 emissions come from the production of goods that are not intended to be consumed within China—these goods are intended for export where they will be consumed by people in other countries, mostly developed countries such as the United States. Moreover, many of the goods exported from China are energy intensive and emit a lot of CO2 to produce.

A reasonable question to ask is, why are these CO2 emissions allocated to China and not countries such as the United States, the European Union, and Japan that import the goods? Are these importing countries in essence outsourcing some of their CO2 emissions to China?

Outsourcing CO2 emissions is similar to the concept of 'carbon leakage,' which occurs when one country—the abating country—adopts rigorous climate policies (such as a carbon tax) and another country—the non-abating country—does not. The abating country then may see high-emission industries shift to the non-abating country.

Embodied carbon

CO2 emitted during a good's entire production process (particularly manufacturing and transport) is called 'embodied carbon' (Wyckoff and Roop, 1994) and entails all CO2 emitted from conception of the good to receipt by the consumer.

Embodied carbon analysis has parallels to 'life-cycle assessment' (LCA for lovers of acronyms), which is used to measure the carbon footprint of a process, such as energy generation, from 'cradle-to-grave.' For instance, nuclear energy is zero-carbon during power plant energy generation, but its carbon life-cycle total is more than zero because carbon is emitted during other activities, from mining uranium ore to disposal of spent fuel. Life cycle assessment is particularly important, and controversial, for biomass energy production.

To explore embodied carbon further, we can build a simple model by assuming there are only two countries that trade internationally—let's call them the United States and China—and that their CO2 emissions are allocated by who consumes the goods. Thus, total national CO2 emissions is equivalent to 'production of embodied carbon' plus 'imports of embodied carbon' minus 'exports of embodied carbon:' $CO2 = P + I - E$. Or, even more simply, 'production of embodied carbon for domestic usage' plus 'imports of embodied carbon:' $CO2 = Pd + I$.

This concept is called 'consumption-based emission accounting' (Lininger, 2015) and is an alternative to the standard 'production-based emission accounting.' Under consumption-based emission accounting, goods that are consumed but not produced in the United States are allocated to the U.S. carbon account, not China's carbon account where the goods were produced. Consumption-based emission accounting is thus an alternate method of quantifying CO2 emissions by specifically incorporating international trade into the calculation.

If China is not credited with the CO2 emissions triggered by their manufacture of goods that are intended for export, their CO2 emissions score becomes lower. The United States, which has experienced reductions in domestic energy-intensive industrial manufacturing in recent decades—and imports goods that it makes less of or no longer makes—would have their CO2 emissions score increase because their consumption becomes part of the assessment. Ideally, this should motivate the United States to take aggressive action to reduce their CO2 emissions.

The implications of consumption-based emission accounting
By using consumption-based emissions accounting, the United States would be conceding that their CO2 emissions are higher than under the current norm of production-based emissions accounting. Under this new scenario, if the United States wanted to meaningfully reduce its consumption-based CO2 emissions, it would necessitate implementing various policies on a unilateral basis or as part of a 'climate club' of several countries.

First, and it should do this regardless, the United States should adopt a rigorous carbon tax to incentivize lower CO2 emissions from its domestic production. Second, it should adopt carbon tariffs targeted at imports of goods with high embodied carbon, in order to ensure all goods consumed in the United States are subject to the same carbon tax. This would also protect the competitiveness of domestic industries now subject to more robust climate policies and make the policy more politically feasible. The November 6 defeat of a carbon tax in blue Washington State, however, does not bode well for a national U.S. carbon tax anytime soon.

The views expressed in this blog are those of the author and not of any institution he is or was affiliated with.