Time Series Datasets of the Embodied Energy and Emission Intensity Data for Japan Using Input-Output Tables

Topic: Structural Decomposition Analysis (Chair: Bart Los, University of Groningen)
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The 3EID database (i.e., Embodied Energy and Emission Intensity Data for Japan Using Input-Output Tables) provided by the National Institute for Environmental Studies of Japan has been widely used in many hybrid LCA studies. Although researchers can use the embodied sectoral CO2 emission intensities in t-CO2 per million JPY in different years (e.g., 2005, 2011, and 2015) from the 3EID database, it is meaningless to evaluate temporal changes in the embodied CO2 emission intensities. In doing it, we firstly need to estimate input-output tables in constant prices using survey or non-survey method. Secondly, the embodied CO2 emission intensities at sector level are calculated by multiplying direct CO2 emission intensities vector by Leontief inverse matrix in constant prices. This study estimates time series input-output tables (IOTs) with 368 commodity sectors for 2005, 2011, and 2015 using double deflation (DD) method as a survey method and GRAS method as a non-survey method and provides time series datasets of embodied sectoral CO2 emission intensities in constant prices (i.e., 2015 prices). It is important to note that the DD method employed in the statistical bureau of Japan implicitly assumes sectoral price homogeneity in the sense that intermediate and final demand of a particular sector are deflated at a single price index. On the other hand, the GRAS method allows us to deflate intermediate and final demand of a particular sector at different price indexes. A comparison in the embodied CO2 emission intensities in constant prices estimated by using the DD and GRAS approaches shows that the price homogeneity assumption in the DD approach brought about an underestimation of the embodied CO2 emission intensities in many sectors. Looking at aggregated industry groups, the price homogeneity assumption caused significant fluctuations in the embodied CO2 emission intensities in nonferrous metals sector. We suggest that physical input-output data of those sectors with higher uncertainty identified in this study should be incorporated into a mixed-units input-output approach and then structural decomposition analysis should be conducted.