

Global Structural Change and Its Implication for CO2 Emissions

Topic: Environmental input-output modeling II

Author: Kayoko Shironitta

Co-Authors: Keisuke Nansai, Sangwon Suh, Shigemi Kagawa, Shunsuke Okamoto

Recent studies using multi-regional input-output (MRIO) models focused on the increasing role of international trade in global CO2 emissions. Under the decreasing cost of international trade and increasing vertical specialization, however, the global economy is increasingly operating as a single entity, and the emphasis on international trade may misdirect attention to the symptoms from the causes of global changes and their implications for CO2 emissions. In this study, we used a two-tier approach to analyze the role of underlying drivers in global CO2 emission changes over the last two decades. First, we aggregated the World Input-Output Database (WIOD) into a single-region global input-output (SGIO) model and decomposed the changes in global CO2 emissions over the last two decades into underlying changes in (1) population, per capita consumption (2) volume and (3) composition (in both, distinguishing between low-, mid-, and high-income countries), (4) global economic structure, (5) energy intensity of production, and (6) carbon intensity of energy use. Structural decomposition analysis (SDA) was used to quantify the contributions by these underlying drivers to the changes in CO2 emissions. Second, major drivers identified using SGIO were further decomposed into more detailed, regional-level changes using WIOD. Our analysis highlights the importance of global-level changes such as the growing middle class and global economic structural change for explaining changes in global CO2 emissions.