

## **A Cross-country Analysis of Material and Energy Implications of Structural Change**

Topic: 516E Environmental Analysis for Development (2)

Author: Kayoko SHIRONITTA

Co-Authors: Shigemi Kagawa, Keisuke NANSAI, Sangwon SUH

In this study, we analyze the effects of changes in material and energy input structure on the CO<sub>2</sub> emissions embodied in consumption. Previous studies demonstrated the connection between domestic structural change—such as the shift toward a service economy—and the increase in greenhouse gas (GHG) emissions embodied in consumptions of a specific country (United States or Japan) (Suh, 2006; Nansai et al., 2009). This study is a follow-up research that examines the effects across countries and evaluates whether or not the development levels of countries explain the structural effects on CO<sub>2</sub> embodied in consumption. Specifically, we employed a multiplicative structural decomposition analysis based on the World Input-Output Database (WIOD) during 1995 to 2009 (Dietzenbacher et al., 2013) and decomposed life-cycle CO<sub>2</sub> emissions of 40 nations into the following four inducement sources: (i) inputs from material goods (including energy) to material goods, (ii) inputs from material goods to services, (iii) inputs from services to material goods, and (iv) inputs from services to services. The results show that in Japan the CO<sub>2</sub> emissions embodied in consumption that are associated with the inputs from energy and material goods to services increased during the study period (1995-2009), whereas countries like U.S. and U.K. show the opposite effects. Thus, the effects of structural change on CO<sub>2</sub> embodied in consumption vary across countries, and the panel data analysis using the results did not show any statistically significant relationship between the structural effect and the development levels. Finally, this study highlights the increasing importance of energy and materials consumption by services in the context of climate change policy.