

## **Structural Decomposition Analysis Using Spectral Graph Theory and Its Application to the Energy Issue in Japan**

Topic: Structural change

Author: Yuko Oshita

Co-Authors: K. Nansai, Shigemi Kagawa

For energy policies, Japanese government has proposed the “Sectoral Approaches” which are tools to improve energy efficiency and reduce carbon dioxide emissions with a focus of energy intensities or carbon dioxide intensities of the particular sectors in question. However, the “Sectoral Approaches” do not afford an incentive to cooperate with other sectors on the carbon mitigations. In contrast, the “Cluster Approach” is clearly one of the alternatives. The objective of this study is to detect industrial energy-intensive clusters in Japan for the period between 1990-2000 by using both Input-Output Theory and Spectral Graph Theory. The structural decomposition analysis using the cluster information from the spectral graph theory enables us to not only visualize the changes in the energy intensive clusters (i.e. environmentally-influenced industrial clusters) , but also to examine the effects of the changes in energy intensities, production technologies and final demands within the core energy-intensive clusters on the primary energy consumption. The empirical results using the 1990-1995-2000 linked Input-Output Tables of Japan reveal the contribution of improved energy efficiency over ten years period in shaping evolution in the industrial energy network in Japan.