



17th International Input-Output Conference

TITLE: STRUCTURAL DECOMPOSITION ANALYSIS USING SPECTRAL GRAPH THEORY AND ITS APPLICATION TO THE ENERGY ISSUE IN JAPAN

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COUNTRY: JAPAN

KEYWORDS: INPUT-OUTPUT ANALYSIS

PAPER CONFERENCE CODE: 160

FULL PAPER IN CD?: NO

ABSTRACT:

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 sectoral energy intensities or sectoral carbon dioxide intensities. However, the "Sectoral Approaches" do not afford an incentive to cooperate with other sectors on the energy-saving strategy and carbon mitigation. In contrast, the "Cluster Approach" is clearly one of the alternative approaches. The objective of this study is to detect energy-intensive industrial 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 obtained 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 the study period in shaping evolution in the industrial energy network in Japan.