SOURCES OF CHANGE IN ENERGY USAGE PATTERNS IN THE ECONOMY: THE JAPANESE CASE

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Overview

There has been renewal of interest in the energy demand analysis, incited by the recent escalation in energy prices. Economic analyses often focus on price changes, which lead to the price substitution effect affecting the overall economy. On the other side, change in the patterns of energy use is clealy caused by a multitude of factors, including autonomous technological development. A decomposition method is required to assess the contribution of these various explanatory factors to change in energy use and, by the same token, structural change of the economy.

The purpose of this paper is to introduce a methodology for decomposing structural change of the economy in a multisector general equilibrium framework. A distinguishing feature of this method is to separate structural change due to price substitution from that due to technological change by capturing the interdependence among economic sectors or factor inputs in a general equilibrium framework. This paper first presents the theoretical properties of the method and then applies it to an empirical case - the changes in energy use and carbon dioxide emissions in the Japanese economy following the oil crises. This paper also addresses the sensitivity of the results to the substitution elastisity.

Methods

A decomposition methodology for evaluating sturactural change of the economy in a multisector general equilibrium framework (the Multiple Calibration Decomposition Analysis, MCDA).

Results

First, the results quantitatively show that technological change is the principal factor in diminishing energy use and carbon dioxide emissions in Japan.

Second, this study also performs a sensitivity analysis of the results with regard to the substitution elasticity in the model and shows that most of the results are qualitatively robust.

Conclusions

This paper introduces a new methodology, the Multiple Calibration Decomposition Analysis (MCDA). The MCDA serves as an elementary but powerful tool for empirical studies. The analysis illustrates the methodology’s forte, which is to provide a better understanding of how much the economy was affected by price substitution or technological change. The results indicate that technological change is important in the context of curtailing energy use and carbon dioxide emissions in Japan.