Integration Assessment of China's Energy Efficiency: Index Decomposition and DEA Method

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Energy efficiency policies are one of the most effective ways to solve the contradiction between supply and demand of energy and to relieve environmental pressures for the Chinese Government. Because of several indicators to measure energy efficiency, resulting in different evaluation effects of policy implementation. First, this paper compares the energy efficiency measures from the supply side and demand side of energy, that is, a single element of energy efficiency and energy efficiency based on total factor productivity (TFP) estimates. In order to study the effects of energy efficiency change and its driving factors, this paper adopts index decomposition and DEA method, the former implies that production is effective, and the later is a kind of frontier estimation methods, non-parametric estimation of data envelopment analysis (DEA).

Based on China's latest available statistical data, this paper applies Divisia index decomposition to two different definition of energy intensity, e.g. final energy consumption per unit value added of industries, per capita primary energy consumption. The result shows that the economic level (per capita GDP) effect is the main driving factor of per capita energy consumption increase with the contribution rate of 210%. Energy efficiency improvement is the best energy saving way, about equivalent to accumulative decrease energy consumption 8900 Mtce, reduce 2.79 billion CO_2 during 1996-2012 in China.

The second application is to use DEA of the total factor productivity to estimate across-sector energy efficiency and empirical research on the driving factors of energy efficiency. The model presents that impacts of environmental regulation and policies on economic efficiency in production process is clear and have different opportunity costs in different sectors, most obvious affect is industry and transportation. Energy efficiencies of 30 provinces in China are different significantly, and energy efficiency of most regions in East China are better than others.