

ANALYSIS ON CHINA'S SECTORAL AND REGIONAL ENERGY REBOUND EFFECT

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Overview

Energy is one of the most important production factors in economy. For now, exhaustible resources, such as oil, coal and natural gas, still takes a large part of the overall energy use in the world. Demand for economic development and the pressure of environment degradation are urging us to control the total energy use amount. One possible approach is to improve the energy efficiency as we usually assumed. However, when the energy efficiency is improved, the actual price for the energy input will drop respectively. Under certain conditions, it might trigger a chain reaction which would result in more energy use. When energy efficiency improvement leads to an increase in the total energy use then we call such phenomenon as rebound effect.

This paper is aimed at evaluating the degree of China's rebound effect. A Constant Elasticity of Substitution Production Function (CES) is used to set up the structure for China's sectoral and regional production model. Based on the estimation results of the parameters, we can calculate the rebound effect of each sector and region.

The paper is organised as follows: The first chapter lays out the background for the paper, followed by the literature review in the second chapter. The third part illustrates the modelling settings and how the rebound effect is calculated. A detailed data description is given in the fourth chapter. Then the fifth part shows the data analysis results. And the last part summarizes the whole paper and provides several pieces of policy implication.

Methods

Non-linear regression (Levenberg-Marquardt Method)

Results

First, China's overall rebound effect is over 100%, no matter in short or long term, which means that raising energy efficiency would increase the overall energy use. However, the intensity effect is negative, meaning that raising energy efficiency would reduce the energy intensity in China.

Second, China's industrial sectors' overall rebound effect kept stable before 2004, while it has risen since 2005, resulting in backfire effect by now, which means that improving energy efficiency will not cause the energy use to reduce but to increase. There is a negative intensity effect in China's industrial sectors as well.

Finally, the rebound effects vary from sector to sector and region to region. Long term rebound effect is always higher than that in the short term. All of the sectors and most of the regions in this study have shown negative intensity effects.

Conclusions

With a higher than 100% and ever increasing rebound effect, it is very likely that improving energy efficiency would result in even more energy use in China. However, the rebound effect consists of output effect and intensity effect. In China, a negative intensity effect means it is possible to reduce the energy intensity by raising the energy efficiency. For different sectors and regions, one should consider the production structure separately in order to decide whether to set raising energy efficiency as a policy means. In general, China should continue to urge on the industrial restructuring, accelerating the development of tertiary industry.