Abstract

In order to reinforce the environmental protection, China needs to promote sustainable energy plan. This study compares the Returns to Damage (RTD) under Undesirable Congestion (UC) in natural disposability and Damages to Return (DTR) under Desirable Congestion (DC) in managerial disposability. After the methodology to Chinese provinces on energy planning for sustainable development, two facts are found. Environment protection has been historically ignored in China and Chinese government focused on large cities especially municipalities in terms of energy policy concerns. But China tries to improve the economy and environment at the same time. Therefore, Chinese government should proceed the privatization so that the linkage between government and energy firms will be broken. It will reinforce the power of energy management and GDP can be increased due to increased economic efficiency.

Introduction

In order to avoid the irreversible outcome from rapid economic development and duplication of UK’s development mistake, China should seek social sustainability on economy and environment before the air quality goes worse. And the energy planning plays an important role in controlling air pollution.

DEA environmental assessment is used to overcome the difficulty on global warming and climate change by combining the technology development with managerial challenges.

After finding the serious environmental pollution and imbalanced economy in China, Chinese government should proceed privatization in near future to reinforce the monitoring power.

Methods and Materials

\[ \text{Maximize} \quad \sum_{i=1}^{n} \sum_{j=1}^{m} \alpha_i \beta_j - \sum_{i=1}^{n} \sum_{j=1}^{m} \gamma_i \delta_j \]

where all the dual variables are identified on the optimality of Original Model.

Model (1), (2) are under natural disposability and Model (3), (4) are under managerial disposability. a. if \( W_i \geq 0, U_j \leq 0 \) for some (at least one) f, then “strong UC”/”Strong DC” occurs on the \( k \)-th DMU, b. if \( W_i \geq 0, U_j \leq 0 \) for all f, then “no UC”/”no DC” occurs on the \( k \)-th DMU, and c. in the others, including \( W_i \geq 0, U_j \leq 0 \) for some (at least one) f, then “weak UC”/”weak DC” occurs on the \( k \)-th DMU.

\[ \text{DgRTD}_{UC} = \left( \frac{\sum_{i=1}^{n} \beta_i}{\sum_{i=1}^{n} \alpha_i} \right) - \left( \frac{\sum_{j=1}^{m} \delta_j}{\sum_{j=1}^{m} \gamma_j} \right) \]

\[ \text{DgRTD}_{DC} = \left( \frac{\sum_{i=1}^{n} \alpha_i}{\sum_{i=1}^{n} \beta_i} \right) - \left( \frac{\sum_{j=1}^{m} \gamma_j}{\sum_{j=1}^{m} \delta_j} \right) \]

Equation (5) & (6) are degrees of RTD and DTR. They are classified by rules below:

a. Increasing RTD/DTR-W_U\( i \geq 0, U_j \leq 0 \) and E(7)/E(8)=0
b. Constant RTD/DTR-W_U\( i \geq 0, U_j \leq 0 \) and E(7)/E(8)=0
c. Decreasing RTD/DTR-W_U\( i \geq 0, U_j \leq 0 \) and E(7)/E(8)<0
d. Negative RTD/DTR-W_U\( i \geq 0, U_j \leq 0 \) <0
e. No RTD/DTR-All other cases excluding a-d.

Results

- Most provinces in east coast China and four municipalities belonged to no or weak in UC and decreasing or no in RTD and even though Hainan had weak or no UC, but increasing RTD in year 2006, 2010 and 2012. Therefore, the Chinese government should invest and develop Hainan in terms of economy.
- Most of the central provinces had weak or no UC with no decreasing RTD except Hebei.
- Even though some of the northeast and north provinces had some UC with increasing RTD before 2008, all of the provinces had weak or no UC with no or decreasing RTD.
- Even if the UC of all western provinces such as Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang is weak or no, all of them had no UC with increasing RTD. The Chinese government should reinforce the development of western China.
- Most provinces all over the China including east coast China, central China, northeast and north China have strong potential to reduce the pollution with green technology innovation because they have strong DC with negative DTR. The Chinese government should invest green technology to provinces in east coast, central China, northeast and north China, as well as Xinjiang in western China.
- There are two types of provinces having weak DC with no DTR, which indicates the low level of potential for pollution mitigation. One type is big municipalities such as Beijing, Tianjin and Shanghai. The other type is western China.

Discussion

- The Chinese government has ignored environmental protect for a long time. As a result, the environment is not good to attain sustainability.
- The economic imbalance exists in China because the government always paid attention to big cities such as municipalities.
- The Chinese government tries to improve environment protection and economic growth at the same time. Previous studies talked about resource allocation from big cities to small cities, fuel mix shift from coal to renewables energy, this study focuses on energy planning and the role of government.

Conclusions

This study tries to find a way for China to deal with the environment pollution. After analyzing the Chinese data in province level, this study finds out two facts. First, the Chinese government has been historically ignoring environment protection and paid attention to economic growth. Second, the Chinese government has focused on large cities such as municipalities so the economic imbalance exists. China tries to improve both concerns. This study suggests privatization should be proceeded in China to reinforce the energy management and increase economic efficiency.

References


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