

# ***Dynamic Correlation Analysis of Key Factors Influencing Renewable Energy Development***

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## **Overview**

In recent years, China's renewable energy has grown rapidly. China has become the largest country of the installed wind and photovoltaic capacity at the end of 2017 (BP, 2017). However, the rapid development of renewable energy in China has regional characteristics. On the other hand, the development of renewable energy in China shows significant level characteristics, which can be roughly divided into three levels: (1) Starting stage (1986-2005); (2) Rapid development stage (2006-2010); (3) Development bottleneck (2011-2015). So, how to target the regional and level characteristics of China's renewable energy development, reveal the key factors affecting the development of renewable energy in different regions and stage, and further promote the sustainable development of renewable energy in China, is a practical issue which is worth researching.

By sorting out the results of scholars' research on renewable energy, we can obtain that the key factors affecting the development of renewable energy are the following four major categories: economic factors (Romano et al, 2017); environmental factors (Cherni et al, 2017); technical factors (Kim et al, 2017) and policy factors (Zhao et al, 2016). Although the existing literature provides a more comprehensive analysis of the impact of renewable energy, there are few studies on in-depth impact factors, such as, correlation analysis of different factors, heterogeneity of different factors in different areas. For this reason, the main research contents of this paper are as follows: (1) Based on previous research, DEA and SML methods are used to analyze the dynamic relationship between key factors affecting the development of renewable energy at different stages in China; (2) Analyze the heterogeneity of key factors affecting the development of renewable energy in national and provincial levels.

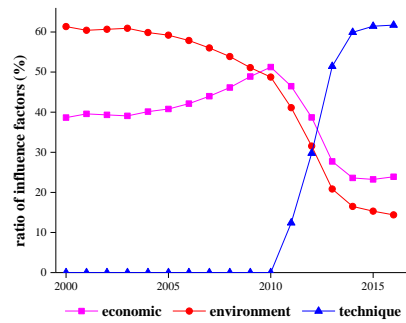
## **Methods**

In this paper, we use the sequential Malmquist-Luenberger (SML) by combining the concept of the sequential production possibility set and the directional distance functions (Dong et al, 2010) to represent the development of the renewable energy. The directional distance functions can be calculated in a data envelopment analysis (DEA)-type linear programming approach (Färe et al, 2007, etc).

As for empirical study, we use Gansu province as an example to analyze the dynamic correlation among key factors affecting the development of renewable energy from 2000 to 2016. We will take GDP, pollutant emissions ( $SO_2$ ), and the number of patents related to renewable energy as input variables, representing economic factors, environmental factors, and technological factors that affect the development of renewable energy, respectively. Renewable energy generation and installed capacity are chosen as output variables.

## **Results**

First, we use standardized sequential PPS (Dong et al, 2010) to analyze the main factors that influenced the development of renewable energy from 2000 to 2016 in Gansu province (see Fig. 1). Then, we calculate the SML productivity index from 2000 to 2016 which represent the development of the renewable energy in Gansu province.



**Fig 1 Ratio of influence factors from 2000 to 2016 in Gansu province.**

## Conclusions

In this paper, we use SML productivity index to calculate the development of the renewable energy and analyze the dynamic correlation analysis of key factors. By empirical study, we can obtain the following conclusions: (i) from 2000 to 2010, environmental factors were the main factors that affect the development of renewable energy and technique had no influence; (ii) with the development of economy, economic factors become dominant factors, the influence of environmental factors gradually decrease and technique factor start to influence the development of renewable energy; (iii) technique beyond economic became the dominant factor after 2013.

Next, we will analyze the dynamic correlation of key factors influencing renewable energy development in national level and the heterogeneity of key factors affecting the development of renewable energy in different areas.

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