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Research on Green Development Efficiency of Regional Economy in Gansu Province

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ABSTRACT. The three-stage DEA model is used to measure the economic green development efficiency of 14 prefectures and cities in Gansu Province from 2010 to 2017, and study the efficiency level, change trends and internal differences of the economic green development of 14 prefectures and cities. The research results show that: in terms of overall efficiency level, the overall efficiency of green development in Gansu Province is relatively low; in terms of internal differences, Gannan Prefecture has higher economic green development efficiency than other regions, while Jiayuguan City and Jinchang City are lower, and There are large internal differences; in terms of distribution characteristics, there are fewer cities with a high level of economic green development efficiency, and they are distributed in dots.

KEYWORDS: Regional economy, Green development, Efficiency measurement

1. Introduction

Green development is the proposition of the times in China's development today. Concerning the improvement of the efficiency of economic green development is related to the welfare of the people and the future of the nation. As an important window for China's opening to the west, Gansu Province is also an important node city in the construction of the "Belt and Road". It bears the burden of the development of ecological and environmental protection industries and the transformation of industrial enterprises. It is currently facing problems such as excessive consumption of resources, environmental pollution and ecological imbalance. . Therefore, quantifying and coordinating the efficiency of the green development of the economy of various cities in Gansu Province will play an important role in promoting the sustainable development of resources, environment and economic society in Gansu Province, in order to promote the green development of the economy of Gansu Province and reduce the level of green economic development in all cities Has important guiding significance.

Economic green development efficiency, as an important research content of green development, introduces natural resource factors and social environmental factors into the process of economic development, and has gradually matured in recent years. In the choice of methods, scholars mainly use SBM-Undesirable model, four-stage DEA model, global super-efficiency SBM model and SBM directional distance function to study the efficiency of green development, and accordingly combine the ML index model and mean cluster analysis With spatial Dubin model SDM, spatial panel measurement model and other analysis methods, the calculated efficiency values are summarized and analyzed, the efficiency spatial distribution characteristics are constructed, and the existing problems are analyzed [1-4]. Regarding the research on green efficiency, Liu Haiying and Liu Qingqing measured the green total factor energy efficiency of 30 provinces, autonomous regions and municipalities in China from 2006 to 2016 based on the consideration of the heterogeneity of production technologies in different regions [5]; Liu Jian and Liu Hongfu, etc. The green development efficiency model including economic efficiency and green efficiency was studied, and the green development efficiency of China's coal industry was studied [6]; Xiao Ming and Huang Sen introduced undesirable factors to modify the three-stage DEA model, and studied 30 China from 2010 to 2014 Green development efficiency of tourism in provinces and cities[7]; Ding Xianyou and Xiao Wen etc. used the global super-efficiency SBM model to measure the green development efficiency, innovation development efficiency and green innovation synergy degree of 18 important cities in the Yangtze River Delta urban agglomeration [8].

In order to more accurately measure the economic green development efficiency of the 14 prefectures and cities in Gansu Province, the article adopts a three-stage DEA model, taking into account the economic development level of each region in Gansu Province and the differences in social policies and other macro factors, so as to avoid real

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efficiency The value produces a large error, and social environmental factors such as industrial structure development, urbanization level and human resources are excluded, and the economic green development efficiency of Gansu Province is measured and analyzed, in order to provide references and suggestions for the overall regional economic green development of Gansu Province.

2. Model Construction

Fried et al. (2002) earlier began to study how to introduce environmental factors and random noise into the DEA model. Because the model is divided into three steps, it is called a three-stage DEA model by scholars. Compared with the traditional DEA model, it eliminates In addition to the interference of environmental factors and random factors, the efficiency of DMU can be evaluated more accurately [6].

3. Index System Construction and Data Sources

3.1 Indicator Selection

3.1.1 Selection of Input-Output Indicators

(1) Labor. The employment population of the whole society in the region. (2) Land. Built-up area in the area. (3) Resources. The total amount of water used in the area. (4) Technology. The number of wastewater treatment facilities in the area. (5) Innovation. Internal expenditure of R&D funds. (6) Capital. The amount of investment in fixed assets of the whole society.

3.1.2 Selection of Environment Variables

For the selection of environmental indicators, this article draws on the research results of Bu Shudi on the efficiency of economic green development, and selects the corresponding indicators of industrial structure, urbanization level and human capital as environmental variables.

3.2 Data Sources

The time span is 2010-2017, and the sample length is 8. The data mainly come from the 2011-2018 “Gansu Development Statistical Yearbook”, the national economic and social development statistical bulletin of each prefecture and city.

4. Economic Green Development Efficiency of Cities in Gansu Province

4.1 Analysis on the Efficiency of Economic Green Development in Various Prefectures and Cities in Gansu Province

The three-stage DEA model is used to measure the economic green development efficiency of 14 prefectures and cities in Gansu Province, and finally obtain the efficiency value of 2010-2017 excluding the influence of environmental factors and other random disturbances, from which 5 time nodes are selected and used GeoDa software and ArcGis software draw the spatial distribution map of the economic green development efficiency of 14 prefectures and cities, as shown in Figure 1.

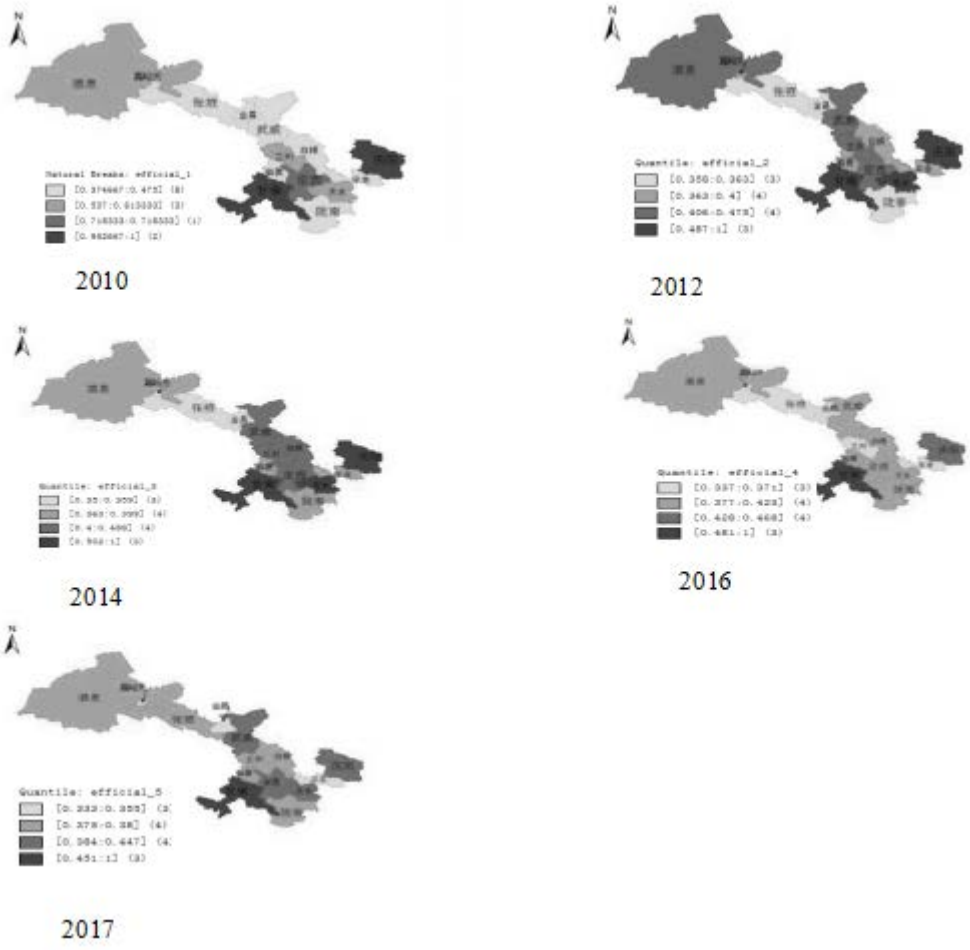

Fig.1 The Spatial Distribution of Economic Green Development Efficiency in 2010, 2012, 2014, 2016 and 2017

(1) Only Gannan Prefecture has maintained the optimal level of economic green development efficiency. Gannan Prefecture is a prefecture with strong economic green development and has always maintained a high level of efficiency. But this kind of coordinated development with a low level of economic development and relatively high green development does not meet the efficiency standards of economic green development.

(2) The prefectures and cities in the rising stage of economic green development efficiency include Baiyin City, Tianshui City, Wuwei City, Zhangye City, Longnan City and Linxia Prefecture. The economic green development efficiency of the six prefectures and cities was at the lowest level in 2010, but was in a growth trend from 2010 to 2017. Among them, Baiyin City, Wuwei City and Tianshui City achieved the best economic green development efficiency in 2014, and then the efficiency value fell to a medium level; Zhangye City, Longnan City and Linxia Prefecture have slowly increased their economic green development efficiency during 2010-2017. In 2017, it rose to a better state.

(3) The prefectures and cities where the efficiency of economic green development remains basically stable at a relatively low level include Jiuquan City and Dingxi City. The economic green development efficiency of Jiuquan City and Dingxi City has been maintained at a medium level from 2010 to 2017, and the efficiency values have been maintained at the level of 0.4. There is a lot of room for further improvement.

(4) Pingliang City, Qingyang City and Lanzhou City showed a downward trend in the efficiency of economic green development. Coal is a pillar of Pingliang's economic development, Qingyang City is Gansu's main petrochemical base, and Lanzhou, as an old industrial zone, pollutes the environment and lacks corresponding ecological restoration measures, with too much input and relatively little output, It is difficult to improve the efficiency of economic green development. Among them, Lanzhou City has experienced a process of first decline and then rise. The efficiency of 2010-2016 was in a state of decline. After 2017, the efficiency value began to slowly rise again.

(5) Jiayuguan City and Jinchang City are the cities with relatively low green economic development efficiency. The economic green development efficiency of Jiayuguan City and Jinchang City was at the bottom of Gansu Province from

2010 to 2017, and the efficiency value has been maintained at the level of 0.3 without significant changes. There is great room for improvement and development potential.

4.2 Analysis on the Spatial Difference of Economic Green Development Efficiency in Various Cities in Gansu Province

(1) The distribution pattern of economic green development efficiency. It can be seen from Figure 1 that areas with high levels of economic green development efficiency are gradually infiltrating from both sides to the central region, and in the past few years, they showed a point-like distribution, and after 2014, a patchy distribution; The area has gradually changed from the original sheet-like distribution to the point-like distribution. By 2017, only a few areas have low-level economic green development efficiency and are distributed in points, but high-efficiency areas are still distributed in points. It shows that regions with better economic green development have a certain driving effect on the surrounding regions, and the green development between regions gradually has a certain correlation.

(2) The efficiency of economic green development in various prefectures and cities as a whole shows that the economic green development at the two ends is better, and the economic green development in the middle Hexi Corridor is weak. Mainly because the desert and Gobi in the Hexi area occupy a certain area, economic growth and environmental changes are not coordinated, and the overall efficiency of economic green development is slightly lower than other regions. Compared with other regions, the southern part of Gansu consumes less resources and has relatively little damage to the environment. The efficiency of economic green development is slightly higher than that of other regions.

5. Conclusions and Recommendations

5.1 Conclusion

(1) From the overall efficiency level, the overall economic green development efficiency of the 14 prefectures and cities in Gansu Province is low, but the economic green development efficiency has greater growth potential in the future, showing a gradual improvement trend. (2) From the perspective of various prefectures and cities, Gannan Prefecture has the best economic green development efficiency, Jiayuguan City and Jinchang City are relatively low, and other regions have varying degrees of fluctuation from 2010 to 2017, and the regional differences are relatively relatively Big. (3) In terms of spatial distribution characteristics, there are fewer cities with a high level of economic green development efficiency, which are distributed in dots. The areas with low efficiency gradually shift from flaky distribution to dot distribution, and areas with low efficiency are gradually decreasing.

5.2 Recommendation

First, areas with a high level of economic green development efficiency should strengthen the development of science and technology and innovation capabilities; areas with medium efficiency should actively learn from the green development experience of high-level areas; low-efficiency areas should combine their own resource and environmental advantages and transform traditions Mode of economic development. Secondly, for all prefectures and cities, Lanzhou must further promote the development of green industries; for Wuwei and Baiyin cities, it must actively encourage the development of environmental protection and conservation-oriented industries; for Linxia and Gannan Prefectures, it must give full play to its advantageous resources Environmental advantages, coordinate the rational development of primary, secondary and tertiary industries. Finally, the 14 prefectures and cities in Gansu Province have actively expanded the radiation effect through the establishment of a coordinated development mechanism, and promoted the improvement of the overall economic green development efficiency of Gansu Province through regional common development.

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