An Empirical Study on the Relationship between Carbon Emissions and Economic Growth in the River Basin

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Keywords: The elastic decoupling model, The river basin, The carbon emissions

Abstract: In order to study the relationship between carbon emissions and economic growth of provinces (regions) in the Yellow River Basin, an elastic decoupling model was constructed to reflect the temporal evolution characteristics of the relationship between carbon emissions and economic growth of provinces (regions) in the Yellow River Basin. Through to the provinces (regions) of carbon emissions and economic growth of elastic decoupling state analysis and comparison, decouple the long-term trend judgment between the two, for the Yellow River basin and the high quality low carbon transformation development decision-making to provide the reference, and for how to in as little as possible on the basis of energy consumption and carbon emissions, realize the Yellow River basin make low carbon and high quality development of the planning and guidance. The analysis results show that the GDP of the Yellow River Basin increases year by year, but the carbon emissions increase and decrease year by year, and the decoupling state of carbon emissions and economic growth of the Yellow River Basin also changes constantly. Overall, the decoupling state gradually changed from negative to strong, and the decoupling trend was generally good.

1. Introduction

The Yellow River Basin runs through the east, middle and west of China. Not only can it play a role in “steady growth”, it can also coordinate the balanced development of regional economies. The energy resources of the Yellow River Basin are rich and concentrated. Shanxi, Inner Mongolia, and Shandong are all major energy provinces, and their economic development is largely driven by energy. However, the Yellow River Basin is far inferior to the Yangtze River Economic Belt in terms of low-carbon economy and green economic development. There are also significant differences in the degree of economic development, energy structure, and industrial structure. The elements of the Yellow River Basin are among many provinces (regions). Both endowment and environmental carrying capacity are facing severe pressure to reduce carbon emissions. In September 2019, the ecological protection and high-quality development of the Yellow River Basin formally rose to the national strategic level, and the promotion of the coordinated development of energy and economy in the Yellow River Basin provinces (regions) has attracted more and more attention from the government and scholars.

At present, problems such as unreasonable energy structure, high energy intensity, arising negative externalities of energy production and consumption have become increasingly prominent. Reasonably controlling and reducing carbon emissions from energy consumption and developing a low-carbon economy can not only accelerate China’s sustainable development path. Construction can also promote the development and transformation of the world economy. The foundation of developing a low-carbon economy is to reduce carbon emissions as much as possible without affecting economic development. This paper analyzes the decoupling relationship between carbon emissions and economic growth in the provinces (regions) of the Yellow River Basin, and judges the decoupling statu of each province (region) and the overall state, aiming to provide a decision-making basis for the low-carbon development of the Yellow River Basin.

  DOI: 10.25236/ermss.2021.035

First, through the research of this article, we can put forward countermeasures and suggestions for the realization of low-carbon economy and energy saving and emission reduction in the Yellow River Basin, and provide reference for policy formulation and implementation. As we all know, when dealing with economic environmental issues, the government needs to play a key guiding role. The research in this article on carbon emissions and economic development in the Yellow River Basin can provide a basis for the provincial government to understand the actual situation and formulate reasonable policies. Only by formulating policies that are consistent with the actual situation in the region can it play a role in the sustainable and coordinated development of the region. Second, the Yellow River Economic Belt is rich in energy resources and has huge carbon emissions. The successful completion of carbon emission reduction tasks in this region will have a direct impact on the realization of national emission reduction targets. It can also provide reference for other high-emission regions to complete emission reduction tasks.

2. Research Ideas and Methods

2.1 Main Ideas

This paper collects and organizes panel data from 2001 to 2019 to study the relationship between economic growth and carbon emissions in the nine provinces (regions) of the Yellow River Basin. First, specifically calculate the carbon emissions of each province (region) during the observation period and analyze the regional differences in carbon emissions. Then use the STIRPAT extended model to decompose the driving factors of carbon emissions into 6 parts, use Stata to perform regression and test the regression results to determine the effect and degree of impact of each factor on carbon emissions. After that, the Tapio decoupling model was used to calculate the decoupling index between carbon emissions and economic growth in the provinces (regions) along the Yellow River and conduct empirical analysis. Finally, policy recommendations are put forward to provide decision-making basis for the development of green economy in the Yellow River Basin.

2.2 Research Methods

(1) Documentary data method

Through the domestic and foreign literature on the relationship between energy consumption carbon emissions and economic growth and summarized. Learn the current research status, research perspectives, and research methods at home and abroad, and use existing literature as a reference to maximize strengths and avoid weaknesses, and provide certain guidance for the topic selection and research ideas of this article.

(2) Combination of qualitative and quantitative analysis

First through qualitative analysis to predict the relationship between carbon emissions and economic growth, and then select the corresponding model according to the forecast to conduct quantitative analysis through a large amount of data collection, model testing, and get the final conclusion.

3. Conclusion

First, improve the energy consumption structure. Since coal consumption has always been the largest part of the energy consumption of the Yellow River Basin, accounting for more than 80% of the energy consumption of the Yellow River Basin, the carbon emission coefficient of coal is greater than that of other fossil energy sources, so a lot of carbon dioxide will be generated during the use of coal. Reducing carbon emissions should start from reducing the amount of coal used as a breakthrough. In view of this, all provinces should reduce coal consumption and replace traditional energy with high-quality clean energy to achieve emission reduction targets under the premise that the current economic development speed and scale are not affected. All provinces should rely on their unique location advantages, adapt measures to local conditions, vigorously develop clean energy with location advantages, and form an energy structure conducive to sustainable development. For high-carbon industries, the transformation and upgrading of the industrial

structure can be completed through the transformation of new and old kinetic energy. By replacing old ones with new forms of business and replacing old ones with new energy, the energy intensity is controlled within a certain range to ensure reasonable carbon emissions while also promoting the efficient and sustainable development of enterprises. At present, the economic development of the Yellow River Basin mainly relies on fossil energy. This kind of economic development mode has insufficient stamina. To achieve long-term economic development in the Yellow River Basin, it is necessary to quickly promote economic transformation and development, and encourage enterprises to convert new and old kinetic energy.

Second, rationally arrange the industrial structure. The economic development of the Yellow River Basin mainly depends on the secondary industry. Relatively speaking, the tertiary industry, which consumes less energy and has high income, has a small proportion. Compared with the development of the tertiary industry in the Yangtze River Economic Zone, there is still a certain gap. Therefore, optimizing the industrial structure is the only way to develop a low-carbon economy in the Yellow River Basin. The government vigorously develops the tertiary industry and strategic emerging industries. Under the current development background of “Internet+”, “Big Data+”, and “Culture+”, the government should promote the active integration of various industries into the current development background, make rational use of Internet platforms and high-tech information and communication technologies, and realize inter-industry cooperation Develop, maximize strengths and avoid weaknesses, and build a new, reasonable and efficient industrial structure.

Third, carry out technological innovation. In view of the current reduction in energy resources in the Yellow River Basin and the increase in labor costs, it is not advisable to rely on old kinetic energy to maintain economic development. Traditional energy industries are required to upgrade the technology industry, and enterprises are required to give play to their own technological advantages and continue to create new technologies. Eliminate outdated production capacity, research and develop new energy sources, improve energy efficiency and the innovative position of enterprises.

Fourth, strengthen the coordinated development of the Yellow River Basin. In the future, carbon emission reduction in the Yellow River Basin should fully consider the development of regional cooperation and mutual assistance, and strengthen the spatial linkage of different provinces. Upstream low-emission regions should give full play to their own advantages to form industrial cooperation with high- and medium-emission regions, and help high- and medium-emission regions achieve carbon emission reductions while achieving their own economic development. The middle and lower reaches should use their own resources and technological advantages to help the upper reaches achieve economic growth and promote the coordinated development of the economic environment of the Yellow River Basin.

Fifth, pay attention to regional differences. Due to the different actual conditions of various provinces, the driving factors of carbon emissions are different. Based on the joint development of the Yellow River Basin, the government should adapt to local conditions and comprehensively consider the location advantages, resource endowments and development of each province to formulate emission reduction policies that meet the actual conditions. Ensure the feasibility and effectiveness of the policy.

Sixth, raise the environmental awareness of citizens and enterprises. Abandon the outdated production concept of “pollution first, control later “. On the one hand, government agencies and other institutions must play a leading role in the low-carbon transformation of office institutions and public facilities, formulate relevant reward and punishment policies, and make a difference in carbon emission reduction. Individuals and companies who have made contributions will be rewarded to act as an encouragement and punished individuals and companies that do not comply with emission regulations. On the other hand, it is necessary to focus on cultivating and enhancing citizens' awareness of low-carbon environmental protection, and create a social atmosphere for energy conservation and emission reduction.

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