

Research on the Relationship between Economic Growth Quality and Environmental Pollution in the Yangtze River Economic Belt and its Collaborative Optimization Path

Siwen Huang^{1,*}, Xinyu Yao²

¹School of Finance, Anhui University of Finance and Economics, China

²School of Economics, Anhui University of Finance and Economics, China

Abstract

The Yangtze River economic belt is a highly influential Inland River Economic Belt in China. However, with the continuous acceleration of economic development, the pollution degree of the Yangtze River Delta is gradually deepened, which is unfavorable to environmental protection and economic development. This paper comprehensively establishes the environmental pollution level index system of the Yangtze River Economic Belt from three aspects: content, value and function from the perspective of exploring the selection basis of statistical index data, Exploring the relationship between economic growth and environmental pollution is of great practical significance for us to solve Hanoi pollution and develop river economy in the future.

Keywords

Yangtze River Economic Belt; Collaborative Optimization Path; Environmental Pollution.

1. Introduction

The Yangtze River economic belt is the most influential Inland River Economic Belt in the world. In 2019, the regional GDP of the Yangtze River Economic Belt accounted for more than 46% of the country. However, the rapid development of economy has also brought environmental pollution and other problems to a certain extent. Therefore, it is of great practical significance to strengthen the research on the relationship, impact mechanism and coordinated development path between the quality of economic growth and environmental pollution in the Yangtze River economic belt.

From the perspective of research, Peng Shuijun and Bao Qun (2006) investigated the equilibrium relationship and interaction mechanism between environmental pollution and the change of China's per capita income from the time series dimension, and concluded that per capita GDP is an important reason for the change of pollution emission, but pollution emission is not the reason for the change of per capita GDP. Deng Yuping and Xu Helian (2013) concluded from the perspective of foreign investment and local government competition that the excessive attention of local governments to GDP will aggravate the extensive resource development and worsen the environment. Li Bin, Peng Xing and Ouyang Mingke (2013) measured the green technology efficiency of different industries from the perspective of factor production and concluded that strengthening environmental regulation will have a negative effect on the transformation of industrial development mode. Cai Chuanli and Xu Guihua (2019) calculated the relationship and influence mechanism between environmental total factor productivity and economic growth and believed that environmental regulation should be strengthened to promote a win-win situation between economy and environment. The views of different scholars are compared, which provides a reference for the in-depth study of this topic.

In terms of optimizing the path, Luo nengsheng and Wang Yuze (2017) put forward suggestions on the need for the central government to optimize the fiscal decentralization system from the perspective of fiscal decentralization and environmental regulation. Fan Qingquan and Zhang Tongbin (2019) concluded from the perspective of Taxation and subsidies that the optimal combination of environmental tax and emission reduction subsidies can effectively promote the collaborative optimization between economic growth and environmental protection. Mu Lulu, Zhang Yu and Cheng Wenyan (2020) calculated the decoupling index of economic growth and environmental pollution in provinces and cities in the region by using the Tapio elasticity coefficient method, compared and judged the decoupling state and decoupling trend, which is conducive to providing a theoretical basis for the macro-control policy of the development of the Yangtze River economic belt from the perspective of the combination of the whole and the part of the region.

In terms of research methods, Ma Shucai and Li Guozhu (2006) used the methods of stationary test of variables and cointegration analysis to obtain the Kuznets curve of the relationship between China's economic growth and environmental pollution, which contributed a theoretical model to the coordinated development of economy and environment. Xie mousheng, Liu Weiming and Wang Ming (2019) used PCA method to conclude that the relationship between environmental pollution and economic growth of urban agglomerations in the middle reaches of the Yangtze River shows an "n" type characteristic of first increasing, then decreasing and then increasing. Liu Sha and Liu Ming (2019) used the method of green finance proxy variable to compile the comprehensive index system of environmental quality, and obtained the relationship between green finance, environmental change and economic growth.

2. Methodology

2.1. Theoretical Research on the Quality of Economic Growth and Environmental Pollution

Firstly, this part will summarize and sort out the existing literature research on economic growth and environmental pollution, innovate based on the current theoretical architecture, and determine the research direction and methods used in this paper. At the same time, the definition of the connotation of economic growth and environmental pollution is very important for the study of their coordinated development. In the existing research, the evaluation system of environmental pollution status is relatively perfect, and the selected pollution source indicators roughly come from three parts (industrial source, agricultural source and residents' living source). Based on this, this topic will build a comprehensive index to measure the regional environmental pollution status. In the research field of economic growth quality, the definition of its connotation is diverse and not unified. This paper will build an index system based on the five development concepts proposed by the central government (innovation, coordination, green, openness and sharing).

2.2. Analysis of the Temporal and Spatial Evolution Characteristics of Economic Growth Quality and Environmental Pollution in the Yangtze River Economic Belt

Based on the connotation of economic growth quality and environmental pollution in the first part, five secondary indicators such as scientific and technological innovation level, coordinated development level, environmental development level, opening-up level and social development level are selected to build an economic growth quality evaluation system; At the same time, the corresponding environmental indicators (SO₂ emission, NO_x emission, industrial wastewater emission and industrial dust emission) are selected, and the comprehensive index of environmental pollution is constructed by entropy weight method. Then, through the spatial

correlation analysis of the environmental pollution index and the quality of economic growth from 2011 to 2020, the global Moran I index is used to measure the global correlation between the comprehensive environmental pollution index and the quality of economic growth in the Yangtze River economic belt, which is depicted with the help of the scatter diagram of Moran index; The hot spot analysis method is used for local correlation test to measure the difference of economic growth quality and environmental pollution comprehensive index between cities in the Yangtze River economic belt. Thus, the temporal and spatial evolution characteristics of economic growth quality and environmental pollution in the Yangtze River economic belt are obtained.

2.3. Research on the Relationship between the Quality of Economic Growth and Environmental Pollution

With the deepening of the research on the relationship between economic growth and environmental pollution by scholars at home and abroad, more and more rich research results have been obtained. The empirical research is mainly based on the hypothesis of "Environmental Kuznets Curve" (EKC) proposed by Grossman and Kruger (1995), that is, the relationship between economic growth and environmental pollution is in an inverted "U" shape. Most domestic scholars agree with this, but some scholars put forward that the two are in an "n" shape. What is the relationship between the two? This part will take the panel data of the urban agglomeration of the Yangtze River economic belt as the sample to make an empirical analysis on the relationship between economic growth and environmental pollution, so as to provide preparation for further exploring the impact mechanism and coordinated development of the two.

2.4. Research on the Promotion Path of Coordinated Development of Economy and Environment

The interaction mechanism between economic growth and environmental pollution is the key part of this research. Different economic growth performance will become the driving factor of different environmental pollution conditions. First, economic growth is manifested in the expansion of output scale, which leads to the expansion of population scale, but these two kinds of expansion will lead to different effects: on the one hand, the expansion of two kinds of scale will lead to the growth of all kinds of resource consumption and aggravate environmental pollution; On the other hand, scale expansion may reduce resource consumption due to economies of scale, resulting in the optimization of resource allocation and the reduction of environmental pollution. Second, economic growth is manifested in the adjustment of industrial structure, which will also have different effects on the environment: on the one hand, with the development of economy, the highly polluting secondary industry will gradually transform to high-tech industry, accelerate the improvement of technological progress rate, and reduce pollution; On the other hand, the economy maintains an extensive growth form, and the continuous expansion of heavy industrial enterprises will seriously affect the local environmental form. Third, economic growth will increase government revenue, thus investing more money in environmental governance. Fourth, technological progress caused by economic growth will promote the development of clean energy and the application of energy-saving and emission reduction technologies, so as to reduce environmental pollution. Based on the above impact mechanism, combined with the data of environmental index and economic growth measurement results in the second part, this part will establish a spatial error and spatial lag model to explore the angle from which economic growth affects environmental pollution and the impact of its spatial spillover effect on environmental governance in surrounding areas, so as to verify the previous mechanism analysis, It also provides empirical support for the later paper to explore the policy suggestions for the coordinated development of the two.

2.5. Conclusions and Policy Recommendations

This part will summarize the research conclusions of the article, mainly including the system construction and evaluation of the quality of economic growth and environmental pollution, the analysis of the temporal and spatial evolution characteristics of the quality of economic growth and environmental pollution, and the empirical analysis of the relationship and impact mechanism between the quality of economic growth and environmental pollution. Based on the above research conclusions, this paper puts forward the optimization path of coordinated economic and environmental development in the Yangtze River economic belt, such as strengthening environmental governance investment and environmental regulation in some areas, formulating differentiated regional governance policies according to the characteristics of pollution agglomeration, encouraging "industry university research" collaborative innovation, improving relevant laws and regulations of environmental protection, and putting forward reasonable policy suggestions in combination with the actual situation of environmental governance and economic development in China.

3. Empirical Results

This paper constructs the index system of environmental pollution in the Yangtze River economic belt by selecting some index data of various regions of the Yangtze River economic belt from 2011 to 2017. The selected pollution source indicators come from three parts (industrial source, agricultural source and residents' living source). Based on this, the comprehensive index of environmental pollution in the Yangtze River economic belt is calculated by principal component analysis, Then use Moran's I index to calculate the spatial correlation and aggregation of environmental pollution in various regions of the Yangtze River economic belt, and determine the reliability of the results through significance test. Finally, according to the five development ideas put forward by the central government, we choose the high-quality economic development strategy.

Five indicators of volume growth: innovation input-output level (number of patents authorized / full-time equivalent of R & D personnel), urbanization rate (urban population / total population), urban greening level (urban green space area / built-up area), foreign investment level (total foreign direct investment / GDP) and medical and health input level (medical and health expenditure / total population). The final result is obtained by constructing spatial lag model (SLM). The results show that in the Yangtze River economic belt, environmental pollution not only presents spatial spillover effect in the overall scope, but also has obvious agglomeration characteristics in some areas.

4. Conclusions and Recommendations

The development of the Yangtze River economic belt has always been an important part of China's economic development. At the same time, it plays an important role in the development strategy of the East, central and western regions. It is particularly important to coordinate the quality of economic growth and ecological and environmental problems while developing the economy, and find a path of common progress of economy and environment. Based on the relationship between the quality of economic growth and environmental pollution in the Yangtze River economic belt and the possible collaborative optimization path, this paper puts forward the following relevant suggestions:

(1) Encourage innovation and strengthen regional cooperation. The organic coordination of economy and environment is an important basis for promoting their common progress. The uncoordinated development of various regions is also an important factor leading to environmental and economic conflicts. Therefore, when dealing with such problems, we should

adjust measures to local conditions and adhere to the zoning policy. In areas with high economic growth, encourage enterprises to carry out technological innovation to deal with industrial sewage, improve resource utilization, promote the development of low-carbon circular economy, and vigorously promote the use of clean energy; In areas with low economic growth, the government should optimize the allocation of resources, and the financial department should increase funding and introduce advanced technology to effectively alleviate the shortage. Improve the linkage mechanism, coordinate the coordinated development among regions, and strengthen the protection of water and forest resources.

(2) Increase investment in regional environmental protection. The current environmental protection investment in the Yangtze River economic belt has no obvious effect on the management of environmental pollution, which shows that the local governments have limited efforts to control the current environmental pollution. They should appropriately increase the investment in pollution control, strengthen the level of government environmental regulation, and strengthen the efforts of environmental governance through policy environmental investment.

(3) Improve the level of regional ecological performance. At present, the performance level of ecological welfare is also an important indicator to measure the urban development between regions, which is generally reflected by the level of education, medical treatment, greening and other indicators. Improving the level of regional medical conditions and increasing the investment in basic education facilities will alleviate the contradiction between economic development and environmental pollution to a certain extent. At the same time, it is conducive to the high-quality development of economy and has a positive impact on the improvement of the overall welfare level of society.

(4) Promote the transformation of enterprise industrial structure. The Yangtze River economic belt is mainly dominated by the secondary industry. In the process of economic development, the excessive proportion of the secondary industry is bound to aggravate the problem of environmental pollution, which also leads to the difficulty of economic transformation to a certain extent. Therefore, the regional governments of the Yangtze River Economic Belt should accelerate the transformation of industrial structure, vigorously promote the development of new environmental protection enterprises, encourage the large-scale promotion of clean technology, promote the development of high value-added industries, reduce unit energy consumption and improve energy efficiency.

(5) Improve relevant regional laws and regulations. Local governments should, according to their own conditions, improve relevant environmental legislation, establish and improve rules and regulations on sewage and waste discharge, determine relevant standards for sewage and waste discharge, establish a benign reward and punishment system, encourage enterprises' environmental protection behavior and severely punish enterprises that exceed the standard. At the same time, actively publicize environmental protection knowledge, vigorously promote environmental protection behavior, and cultivate people's and enterprises' awareness of environmental protection.

Acknowledgments

Anhui University of Finance and Economics, 2021 National Innovation Training Program: Research on the relationship between economic growth quality and environmental pollution in the Yangtze River economic belt and its collaborative optimization path (Project Number: 202110378122).

References

- [1] Bai Ling, Jiang Lei, Zhou Haifeng, Chen Zhongsheng. Analysis on temporal and spatial characteristics and driving factors of air quality index in the Yangtze River Economic Belt -- An Empirical Study Based on Bayesian spatial econometric model[J]. *Geographical Science*,2018,38(12):2100-2108.
- [2] Ping Zhiyi, Wu Xuebing, Wu Xuelian Analysis on the impact of economic growth on industrial pollution in the Yangtze River Economic Belt -- spatial Dobbin model based on geographical distance matrix [J] *Ecological economy*, 2019,35 (07): 161-167.
- [3] Ding Huangyan Spatial characteristics of infrastructure development and economic growth in the Yangtze River Economic Belt -- An Empirical Study Based on spatial measurement and panel threshold model [J] *Statistics and information forum*, 2016,31 (01): 24-32.
- [4] Ren Xue Analysis on the threshold effect of economic growth on haze pollution in the Yangtze River economic belt [J] *Statistics and decision making*, 2018,34 (20): 138-141.