

Empirical Analysis on the Relationship between Green Finance and Industrial Structure Optimization in Yangtze River Economic Belt

Fei Chen¹, Chen Dong^{1*}

¹ Institute of Finance, Anhui University of Finance and Economics, Bengbu, Anhui, China

Email Address

2060794818@qq.com (Fei Chen), 2259083108@qq.com (Chen Dong)

*Correspondence: 2259083108@qq.com

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Abstract:

The green and low-carbon transformation has become the global trend at present. Although many countries in the world are striving to realize the green transformation of energy, the speed of transformation has a tendency to slow down. Around the green industry, China regards high-quality development as the core of its economic development, and green development is put in the first place of high-quality development, because the key step of high-quality development is to promote the green and low-carbon development of economy and society. But to meet the requirements of green development, priority needs to be given to the development of resources and environmental information markets and the improvement of the distribution system. Under the situation that the world is deeply affected by the COVID-19 epidemic and the economy is in the doldrums, although the development of green finance in our country presents an upward trend, there are still some problems in the upgrading of green finance and industrial structure in various provinces. Based on the data from 2011 to 2020 in 11 provinces along the Yangtze River Economic Belt, this paper establishes an index system to measure the development of green finance and the optimization of industrial structure, and makes an empirical study on the coupling synergistic effect of green finance and industrial structure in the provinces along the Yangtze River Economic Belt. The research results are as follows: (1) The overall coupling degree of green finance and industrial structure in the Yangtze River Economic Belt from 2011 to 2020 is at a primary level, indicating that the coordinated development level of the two economic belts needs to be improved urgently. (2) Overall, the overall coupling degree between green finance and industrial structure in the Yangtze River Economic Belt is slowly and steadily increasing, indicating that the coordinated development level of the two economic belts is increasing, but the speed still needs to be improved. (3) The coupling coordination degree of the upper reaches of the Yangtze River economic belt is generally higher than that of the middle and lower reaches, indicating that there are regional differences in the coordinated development level of green finance and industrial structure. According to the research conclusions, the following policy recommendations are put forward: to speed up the improvement of laws and regulations on green finance development, to break down administrative barriers.

Keywords:

Green Finance, Industrial Structure, Coupling Analysis

1. Introduction

In order to promote the development of the Yangtze River Economic Belt and formulate a policy suitable for its economic development, General Secretary Xi Jinping inspected the upper, middle and lower reaches of the Yangtze River and held four seminars on promoting the development of the Yangtze River Economic Belt. He conducted in-depth research on the development of the Yangtze River Economic Belt and proposed new development ideas. The development of the Yangtze River Economic Belt is an important link in China's economic development and an important step in promoting China's modernization. Therefore, it can be seen that the state attaches great importance to the economic development of the Yangtze River Economic Belt. The Yangtze River Economic Belt includes 11 provinces and cities, including Jiangsu and Anhui. It not only includes the most developed industrial and commercial regions in China, but also connects with the poorest regions in China. Therefore, the development of the Yangtze River Economic Belt is very important. Green finance is an important aspect of China's economic development. China has always been firmly committed to the development purpose of "harmonious coexistence of man and nature". Therefore, to promote the development of green finance and realize the goal of "peak carbon dioxide emissions, carbon neutrality" requires all provinces and cities in China to make a reasonable development strategy and make a contribution. The Yangtze River Economic Belt is an obvious representative of financial development. Therefore, through the study of green finance in the Yangtze River Economic Belt, taking developed areas and poor areas as examples, the coordination of coupling degree between green finance and industrial structure is calculated, which is more helpful to better discover the problems of green finance policy and promote the upgrading of industrial structure.

Under the background that the international community is paying more and more attention to environmental protection and sustainable development, the interactive effect of green finance and industrial structure upgrading has attracted extensive attention from many scholars. Feng Yun [1] believes that there is a positive relationship between industrial development and green finance, and there is a high degree of coupling and coordination between them. Green finance and industrial structure upgrading complement each other. Liu Qijun and others [2] found that the degree of coupling and coordination between regional green finance and industrial structure has been increasing year by year, continuously promoting the development of green finance and actively guiding green finance and industrial upgrading to form a good interactive relationship, which can promote the upgrading of industrial structure and promote high-quality economic development. According to the research by Li Xiaolin [3] et al. and Chen Yu [4], the development of green finance has promoted the upgrading and transformation of Jiangsu's industrial structure to a certain extent. The former also thinks that this promotion effect will reach a stable state, while the latter thinks that scientific and technological progress can also promote the optimization and upgrading of the industrial structure. However, Well Lee [5] studies the data of green finance and industrial structure in Hebei Province and finds that there is a certain interaction between the two and the degree of coupling and coordination is improving

year by year, showing an overall upward trend year by year. Wang Yingnan [6] and Du Jiayan [7] have all studied that green finance can promote the optimal development of China's industrial structure and show obvious regional differences. Guo Yuchen et al [8] found that green finance uses capital and takes relevant measures to transfer capital to green industry to transform and upgrade the industrial structure. Cai Caipei [9] found through research that green credit and green investment combined with technological progress have a pull-up effect on the upgrading of industrial structure, while green credit has a slow-down trend to promote the upgrading of industrial structure but can still promoting the upgrading of industrial structure, that is, green finance can promote the optimization of industrial structure. Similarly, Ding Pan and others [10] have concluded that green financial policies can exert a positive impact on sustainable economic growth by improving corporate technology and promoting industrial structure optimization.

To sum up, most of the researches are at the macro level, or in a specific region or a province. Based on the above research, this paper establishes a coupling degree analysis model through the comprehensive analysis of the relevant panel data of green finance and industrial structure in the Yangtze River Economic Belt from 2011 to 2020, and makes a quantitative analysis of the coordination between green finance and industrial structure. On this basis, this paper puts forward some policy suggestions on how to promote the optimization and upgrading of green finance and industrial structure in the Yangtze River Economic Belt in China.

2. The Background of Financial and Industrial Structure Development

2.1. Status of Green Finance Development in Yangtze River Economic Belt

The financial industry can provide strong support for the green development of the Yangtze River Economic Belt. From the perspective of national development, the economic development of the Yangtze River Economic Belt urgently needs green transformation. Green and high-quality development includes the coordinated development of 11 provinces and cities in the Yangtze River Economic Belt and the transformation and development of the primary, secondary and tertiary industrial structures. Specifically, the problems in industry, agriculture and urbanization in the economic development of the Yangtze River Economic Belt should be taken as the starting point to deeply understand and analyze the outstanding resource and environment problems in the development of the Yangtze River Economic Belt. Through the application of green finance related knowledge, the combination of theory and practice can be achieved to promote the green transformation of the Yangtze River Economic Belt exhibition. The Agricultural Bank of China has provided professional financial services for the construction of the "Yangtze River Ecological Environment Industry Consortium". It has linked up with the "Yangtze River Protection" project and established the "Industry Fund" to promote the construction of the project through various means. In terms of concrete operation, the Agricultural Bank has set up a special service team to speed up the examination and approval, and has conducted in-depth docking with Jiangxi, Anhui, Yunnan, Guizhou, Chongqing and other places, providing enterprises with more comprehensive financial services represented by "financing" and "intelligence". The Agricultural Bank of China will be the first batch of pilot cities for the Yangtze River protection in Jiujiang, Jiangxi Province, and has established the first regional legal entity in the Agricultural

Bank of China. Agricultural Bank and related enterprises have made new breakthroughs in project financing, fund settlement and public-private cooperation.

At the national level, the system of “Green Financial Reform and Innovation Pilot Zone” has been gradually formed, guided by the policy guidance at the national level. From June 2017 to September 2022, the the State Council executive meeting decided to set up green financial reform and innovation pilot zones in some regions of the Yangtze River Economic Belt, namely, Zhejiang Huzhou Quzhou, Guizhou Guiyang, Jiangxi Ganzhou and Chongqing. Among them, many changes have taken place in various provinces and autonomous regions during the establishment of the pilot zone. For example, the initial attempt of the pilot zones in Huzhou and Quzhou has explored one for the green transformation of urban industry. The first green government special bond that passed the examination was successfully issued in Ganzhou New District of Jiangxi Province. According to statistics, up to 2022, the green bond issuance scale in Jiangxi Ganjiang region was 43% and that in Guizhou Guiyang region was 41%. These two regions played an important role in the green bond issuance in this region. However, the total size of green bonds in Zhejiang and Zhejiang cities accounts for 22% of the total size of the whole province, and more exploration on green bond products and services in the pilot areas is yet to be made. Among them, the issuance of green bonds in Guiyang and Chongqing of Guizhou was 19.7% and 15.2% respectively, which shows in a sense that the issuance of green bonds is more affected by the demand of the issuer than the perfection of financial markets.

In 2020, the National Development Bank gave full play to the function of development finance and provided 488.8 billion yuan of credit for the great protection of the Yangtze River and green development, up 27% from the corresponding period of last year. The “Yangtze River Economic Belt” theme “Bonds Link” successfully issued 10 billion yuan of green financial bonds to investors around the world in 2021. The funds raised will be used to support the green transformation of energy-saving and environmental protection industries and infrastructure in the Yangtze River Economic Belt. The term of this bond issue is three years, 2.28% in coupon rate. The loan based on the raised fund can save 11, 400 metric tons of standard coal, 23200 metric tons of carbon dioxide per year, 30.73 tonnes of nitrogen oxides and 0.58 tonnes of inhalable particulates. The National Development Bank said it would further strengthen the cooperation between the bank and the government, make full use of the advantages of medium and long-term investment and financing, continue to support key areas and major projects in the Yangtze River Economic Belt, and strive to provide new development assistance to promote the high-quality development of the Yangtze River Economic Belt.

In recent years, in order to promote the development of the Yangtze River Economic Belt, the state has successively supported some regions to carry out green development demonstration, in-depth research on the realization of the value of ecological products, and to convert ecological natural resources into green financial assets. It has also carried out in-depth exploration in the “green development pilot” of the Yangtze River Economic Belt, so as to form a list of experiences that can be copied and popularized, so that the 11 provinces along the Yangtze River can communicate with each other, and has formulated corresponding supporting policies in various aspects such as workers’ and peasants’ businesses to support the green” development. At the same time, the new way of “two mountains” transformation is discussed, which can also promote the reasonable exploration of the value of natural factors.

2.2. The development status of industrial structure in the Yangtze River Economic Belt

In view of the industrial structure of the provinces and cities in the Yangtze River Economic Belt during the decade from 2011 to 2020, this paper mainly conducts research and analysis from the perspective of the composition of output value proportion of primary, secondary and tertiary industries in each province and city. According to the statistical yearbook of each province and city for this decade, the proportion of the output value of primary, secondary and tertiary industries in the GDP output value of each province and city can show the current composition of the industrial structure of the Yangtze River Economic Belt in a more comprehensive way. The average output value growth of the Yangtze River Economic Belt is mainly concentrated in the secondary and tertiary industries, with the weight of the primary industry remaining below 15% for the most part. The decrease in the weight of the secondary industry and the increase in the proportion of the tertiary industry indicate that the overall industrial structure of the Yangtze River Economic Belt has gradually changed from traditional industrial production to high value-added industries characterized by high value-added and high-technology concentration, and has shown a continuous upgrading trend. The ups and downs of the three industrial added values in the Yangtze River Economic Belt are basically in line with the growth and decrease of their respective industrial added values.

At present, the whole country is under the new normal of economy. Adjusting the industrial structure is a key step to promote economic development. Except for a few provinces and cities that suddenly changed the proportion of industrial structure, the proportion of primary and secondary industrial structures has basically been too large. In recent years, the proportion of tertiary industry has increased accordingly. Instead of primary and secondary industries, the industrial structure development model of the Yangtze River Economic Belt has developed from “231” to “321”. In the 11 provinces and cities studied, Jiangsu Province, Shanghai and other cities in the middle and lower reaches of the Yangtze River basically rely on industrial commerce for rapid economic development. At the same time, this will inevitably lead to environmental pollution and waste of resources, which will cause damage to the ecological environment. However, the economic development in the middle and lower reaches of the Yangtze River has reached a certain scale, and the “conversion of farmland to forests” will inevitably cause financial market disorder. Therefore, promoting a better combination of finance and the environment will be the key to economic development. For cities in the middle and upper reaches of the Yangtze River, their economic development mainly depends on industry and agriculture. Due to differences in geographical locations, the economic development of these provinces and cities is slow. At the same time, if they want to develop their economy, they can only rely on the development means of “relying on the mountain and water. They are also plagued by environmental problems. Therefore, the promotion of economic development of these provinces and cities is even more inseparable from the development of green finance and the upgrading of industrial structure.

3. Empirical Research

3.1. Indicators and data

3.1.1. Indicator design and properties

Indicators refer to the general concept that describes a certain part of social development. Indicator design is a concrete generalization of various social phenomena, so design indicators should adhere to the principles of guidance and scientificity. Generally, there are two types of operation indicators: positive indicators and negative indicators. Different indicators have different impact effects: positive indicators refer to the things that are evaluated correctly. The higher the indicators in this category, the better. For negative indicators, the lower the indicators in this category, the better. In the research on green finance and industrial structure of the provinces and cities in the Yangtze River Economic Belt from 2011 to 2020, the differences in regional economic scale, industrial distribution, development speed, etc. are fully considered, and on the basis of domestic and foreign research on relevant theories, the financial products currently existing in the market are incorporated into the reference. Build a measurement index system for green financial development and industrial structure as shown in Table 1 and Table 2.

Green finance takes into account the environmental changes in economic development, the sustainability of social and economic activities and the possibility of sustainable development, and is generally divided into five first-level indicators, among which the carbon emission loan intensity is the second-level indicator of carbon finance. The loan amount of environmental protection enterprises and the proportion of interest expenses of energy-intensive industries, the proportion of investment in environmental pollution control and the proportion of energy conservation and environmental protection expenses, the proportion of market value of environmental protection enterprises and the proportion of market value of energy-intensive industries, the proportion of agricultural insurance scale and the proportion of agricultural insurance payout ratio are the secondary indicators of green credit, investment, securities and insurance respectively. Among these indicators, the indicators related to energy-intensive industries are negative in nature because they are inconsistent with the sustainability development of green finance, so the higher their values are. The development level of green credit may decrease accordingly, and the change in the development level of green securities can also be obtained. The selection of these indicators is to help enterprises in provinces and cities quickly screen out development projects that are easy to be affected by the environment or that will have a certain impact on the environment in the development process, so as to assist the government and enterprises in selecting the most appropriate and sustainable economic projects.

Table 1. Green Financial Indicator System.

Level 1 indicators	Level 2 indicators	Computing formula	Indicator attribute
Carbon finance	Carbon loan intensity	Loan balance/carbon emissions	forward direction
Green credit	Loans from environmental protection enterprises		forward direction
	High energy consuming industry interest expense accounts for compare	Interest expense/labor of six high energy consuming industries Industry interest expense	negative direction
Green investment	Proportion of investment in environmental	Investment in environmental pollution /GDP	forward direction

	pollution control		
	Proportion of energy conservation and environmental protection expenditures	Financial Expenditure/Finance of Energy Saving and Environmental Protection Industry gross expenditure	forward direction
Green securities	Percentage of market value of environmental protection enterprises	Gross output value of environmental protection enterprises/total market value of A shares	forward direction
	Percentage of market value of energy-intensive industries	Total market value of energy-intensive industries/Group A total market value	negative direction
Green insurance	Proportion of agricultural insurance scale	Agricultural insurance expenses/total insurance expenses	forward direction
	Agricultural insurance payout ratio	Agricultural insurance expenses/agricultural insurance income	forward direction

Table 2. Index System of Industrial Structure.

Level 1 indicators	Level 2 indicators	Calculation formula of secondary index	Indicator attribute
employment structure	Employment rate of primary industry	Primary industry employment rate Primary industry employment/total industry employment	forward direction
	Employment rate of secondary industry	Secondary industry employment rate Secondary industry employment/total industry employment	forward direction
	Employment rate of tertiary industry	Tertiary industry employment rate tertiary industry employment/total industry employment	forward direction
industrial structure	Proportion of output value of primary industry	Output value of primary industry/GDP	forward direction
	Proportion of output value of secondary industry	Output value of secondary industry/GDP	forward direction
	Proportion of output value of tertiary industry	Output value of tertiary industry/GDP	forward direction
Reasonable industrial structure	theil index	Theil entropy standard	negative direction
Advanced industrial structure	Output value of tertiary industry/Output value of secondary industry	Output value of tertiary industry/Output value of secondary industry	forward direction

Industrial structure refers to the proportion of each industry in economic development and their mutual relationship. Optimization of industrial structure refers to the coordination of the proportion and relationship of each industry in economic development in the process of economic development, so as to promote the high-quality development of enterprises. There are four first-level indicators in the industrial structure, among which the employment rate and output value proportion of

the first, second and third industries are the second-level indicators of employment structure and industrial structure respectively, and the output value proportion of their index and the third industry in the second industry are the second-level indicators of reasonable industrial structure and high industrial structure respectively.

In the above secondary indicators, the reason why the nature of their index is negative is that the greater the regional differences, the higher the their index, but the lower the level of rationalization of its industrial structure.

3.1.2. Data source

The data on the proportion of employed people and the proportion of each output value in the industrial structure are from 2011 to 2020 in 11 provinces annual statistical yearbook. Carbon financial data are derived from China Financial Yearbook and China Energy Statistics Yearbook, and green credit data are derived from China Banking Social Responsibility Report and China Industrial Statistics Yearbook; Green securities data from Wind database; Green insurance data: China Insurance Yearbook and China Agricultural Statistics Yearbook.

3.2. Model Building

Before obtaining the data for the next calculation, the data need to be standardized for the following reasons: First, the magnitude of the data is very different, that is, the dimensions of the data are different. Standardizing the original data, and finally becoming the dimensionless index evaluation value, unifying the indexes on an order of magnitude for calculation, and comparing with the original data, if the numerical value of the numbers is too high, the proportion of the numbers in the comprehensive analysis will be increased, and the function of the indexes with low data level will be weakened; Second, avoid numerical problems caused by the calculation of data due to excessive numerical values; The third balance is the contribution of each eigenvalue. If the range of the selected eigenvalues is too large, but the actual situation is the case of a small range of values, the calculation will be contrary to the results of the actual situation; Fourth, the need to use the model to solve the data. The speed of the gradient descent method for finding the best solution is improved.

In order to ensure the rationality of the data, the collected data should be standardized for the above situations:

$$X_{ij} = \frac{X_{ij} - \min X_{ij}}{\max X_{ij} - \min X_{ij}} \quad (1)$$

$$X_{ij} = \frac{\max X_{ij} - X_{ij}}{\max X_{ij} - \min X_{ij}} \quad (2)$$

Formula (1) is the standardization of positive indicators, and formula (2) is the standardization of negative indicators. At the same time, in order to eliminate the influence of values less than 0 (including 0 itself), in addition to the results of all the data after standardization, a minimum unit value is added to make it meet the needs of calculation, and 0.0001 is taken to obtain X'.

Secondly, the weight of each index is calculated by the following formula:

$$P_{ij} = \frac{X_{ij}}{\sum_{i=1}^n X_{ij}} \quad (3)$$

Calculating index entropy value:

$$D_j = -\frac{1}{\ln n} \sum_{i=1}^n P_{ij} \ln P_{ij} \quad (4)$$

Obtaining index entropy redundancy:

$$G_j = 1 - D_j \quad (5)$$

Calculation of weight results:

$$W_j = \frac{G_j}{\sum_{j=1}^m G_j} \quad (6)$$

Measurement of comprehensive development level index:

$$U_j = \sum_{j=1}^m w_j \times X_{ij} \quad (7)$$

Referring to the establishment of the coupling degree model in the paper of Liu Qijun et, this paper uses the coupling degree coordination model to judge the coordinated development of the two. The coupling coordination model is as follows:

$$C = \sqrt{\frac{U_1 U_2}{(U_1 + U_2)^2}} \quad (8)$$

$$T = \sqrt{\alpha U_1 + \beta U_2} \quad (9)$$

$$D = \sqrt{C \times T} \quad (10)$$

C is the level of coupling between green finance and industrial structure, U 1 is the comprehensive development evaluation index of green finance, U 2 represents the comprehensive development evaluation index of industrial structure, d is the degree of coupling and coordination among various parts, and the value of d is between 0 and 1; T Comprehensive coordination index on green finance and industrial structure; Alpha, beta According to the relevant research results, we can see that green finance can promote the optimization of industrial structure, while the industry

The structural optimization also provides a guarantee for the development of green finance, both of which are of equal importance to a certain extent. Therefore, α and β are taken as 1/2. The coupling coordination degree can be divided into five levels, and the classification is shown in Table 3.

Table 3. Division of Coupling Coordination Degree.

Coupling association dispatch	(0, 0.3)	(0.3, 0.4)	(0.4, 0.5)	(0.5, 0.7)	(0.7, 0.9)	(0.9, 1)
Coupling coordination stage	Coupling factor extremely low	Low coupling	Coupling degree primary	Intermediate degree of coupling	High coupling degree level	Coupling pole good

3.3. Empirical analysis

First, according to the above formula, the calculation results of the index weights are shown in Table 4.

Table 4. *Evaluation of Green Finance and Upgrading of Industrial Structure: Proportion.*

Level 1 indicators	Level 2 indicators	Indicator weight
Carbon finance	Carbon loan intensity	17.52
Green credit	Loans from environmental protection enterprises	30.63
	Percentage of interest expense for energy-intensive industries	3.63
Green investment	Proportion of investment in environmental pollution control	10.13
	Proportion of energy conservation and environmental protection expenditures	5.11
Green securities	Percentage of market value of environmental protection enterprises	10.63
	Percentage of market value of energy-intensive industries	1.31
Green insurance	Proportion of agricultural insurance scale	16.68
	Agricultural insurance payout ratio	4.35
Employment structure	Proportion of employment in primary industry	8.04
	Proportion of secondary industry employment	19.69
	Proportion of tertiary industry employment	11.63
Industrial structure	Proportion of output value of primary industry	4.83
	Proportion of output value of secondary industry	5.6
	Proportion of output value of tertiary industry	12.94
The industrial structure is reasonable	theil index	7.13
Advanced industrial structure	Proportion of output value of tertiary industry in output value of secondary industry	30.3

Secondly, the coupling coordination degree is calculated as shown in Table 5.

Table 5. *Coupling Coordination Degree.*

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Shanghai	0.48	0.50	0.49	0.50	0.50	0.50	0.51	0.53	0.55	0.57
Jiangsu	0.51	0.51	0.52	0.52	0.52	0.54	0.54	0.55	0.56	0.57
Zhejiang	0.49	0.49	0.50	0.50	0.51	0.52	0.52	0.52	0.54	0.54
Anhui	0.48	0.48	0.50	0.48	0.49	0.52	0.50	0.53	0.50	0.51
Jiangxi	0.46	0.48	0.47	0.47	0.47	0.49	0.49	0.49	0.49	0.51
Hubei	0.48	0.48	0.49	0.49	0.49	0.51	0.51	0.52	0.52	0.52
Hunan	0.53	0.54	0.54	0.53	0.54	0.53	0.53	0.53	0.54	0.54
Chongqing	0.52	0.51	0.51	0.50	0.50	0.50	0.50	0.50	0.52	0.52
Sichuan	0.45	0.45	0.47	0.47	0.48	0.48	0.50	0.50	0.50	0.51
Yunnan	0.47	0.48	0.49	0.49	0.48	0.49	0.49	0.49	0.49	0.50
Guizhou	0.44	0.43	0.44	0.46	0.46	0.46	0.47	0.46	0.47	0.47

From the above data, the Yangtze River Economic Belt is basically at the beginning of coupling degree from 2011 to 2020 level, the numerical value is approximately 0.5, and the coupling coordination degree of 11 provinces is approximately at the growth level with low growth rate, which to a certain extent indicates that with the passage of time, each province in the Yangtze River Economic Belt has gradually increased its attention to the coordinated development of green finance and industrial structure, and is also gradually coordinating the development between the two. Moreover, the coordination level of the coupling degree of the Yangtze River Economic Belt is large from 2012 to 2017. Most provinces and cities experienced a slight increase and an

unstable decline, which started from 2017 to 2020. It rose by a small margin of 0.1-0.2 or remained stable. This is because in 2012, the Yangtze River economic belt developed. The exhibition has once again risen to the country's important development strategy, involving as many as 11 provinces and cities. All kinds of policy systems are continuously sound, and a number of development policies have been promulgated and implemented at the national level. Until now, the country still attaches great importance to the development of the Yangtze River Economic Belt and has launched various documents concerning the development of the primary, secondary and tertiary industries to promote the high-quality development of the industrial structure of the Yangtze River Economic Belt. However, between 2012 and 2017, China has just started and completed the exploration and construction of green finance. Although the Yangtze River Economic Belt has continuously issued a series of policy documents to promote "green development" of the industry, the combination of theory and practice during this period is still in the exploratory stage. Therefore, the level of coupling between green finance and the development of industrial structure in various provinces and cities in the Yangtze River Economic Belt is unstable. From 2017 to 2020, the development of green finance in China began to grow and expand. Several regional green finance pilot zones also provided China with a development model that combines green finance with industrial structure. The Yangtze River Economic Belt has launched policies related to economic development, such as digital and green transformation of traditional industries, construction of emerging green industries, etc. Therefore, the level of coupling in the Yangtze River Economic Belt began to show a steady or upward trend.

Judging from the coupling coordination degree of each region, from 2011 to 2020, the coupling coordination degree of Jiangsu, Zhejiang and Shanghai provinces in the lower reaches of the Yangtze River Economic Belt is in the top three of 11 provinces and cities, and their economic development also shows a high level, while the coupling degree of Yunnan, Guizhou and Jiangxi provinces in the upper and middle reaches is slightly lower, and most of them are below 0.5, while the other provinces basically show stable fluctuations. The above results may be caused by the following reasons: First, the difference in geographical location results in a great difference in the development level of green financial resources and industrial structure. According to 2011-2020, the proportion of the total green financial resources in each region of the Yangtze River Economic Belt to the total green financial resources in the Yangtze River Economic Belt can be known, among which, the total green financial resources in Jiangsu, Zhejiang and Shanghai in the lower reaches of the Yangtze River Economic Belt. Accounting for more than half of the green financial resources in the Yangtze River Economic Belt, Yunnan and Guizhou provinces account for less than one-tenth of the total, ranking last among the green resources. It can be seen from the above that the distribution of green financial resources among the regions in the Yangtze River Economic Belt is unbalanced. However, from the reasonable degree of the industrial structure of the Yangtze River Economic Belt, we can see that the reasonable degree of the industrial structure is the highest in the following tours, followed by the middle reaches, and then the lower upstream areas. The reasonable adjustment degree of the industrial structure of the upper and lower reaches is quite different. Second, regional coordination needs to be strengthened. At present, the industrial planning, spatial distribution and development objectives of the Yangtze River Economic Belt are mostly concentrated in administrative divisions, and administrative barriers exist between administrative divisions, which has become the bottleneck of coordinated development of the industrial structure and green finance of

the Yangtze River Economic Belt. The third is to strengthen policy support. At present, the support policies related to the development of green finance focus on the emerging green industries related to resource conservation and environment-friendly industries, while the support for the digitalization and green transformation of traditional industries is relatively small. Some traditional industries in “main producing areas” should be given sufficient attention.

4. Conclusions

4.1. Research Conclusions

Based on the panel data of green finance and industrial structure of 11 provinces in the Yangtze River Economic Belt from 2011 to 2020, this paper uses the coupling degree analysis method. It can be concluded that: (1) the overall coupling degree of green finance and industrial structure in the Yangtze River Economic Belt from 2011 to 2020 presents a primary level, with a value of approximately 0.5, indicating that the coordinated development level of green finance and industrial structure in the Yangtze River Economic Belt needs to be improved urgently. (2) Overall, the overall coupling degree between green finance and industrial structure in the Yangtze River Economic Belt showed a slow and steady increase from 2011 to 2020, indicating that the coordinated development level of green finance and industrial structure in the Yangtze River Economic Belt is on the rise, but the speed still needs to be improved. (3) The coupling coordination degree of the upper reaches of the Yangtze River economic belt is generally higher than that of the middle and lower reaches, indicating that there are regional differences in the coordinated development level of green finance and industrial structure.

4.2. Policy Advice

4.2.1. To speed up the development of green finance laws and regulations

The development of green finance and the upgrading of industrial structure need to be based on perfect laws and regulations. Perfect laws and regulations need to have specific pertinence first, to adjust measures to local conditions, to achieve reasonable planning of green financial related resources, to make rational use of green financial resources, and to promote the balanced development of various provinces and cities. If we want to effectively protect the ecological functions of the upper and middle reaches, we will fully develop the characteristic green industry. In areas with backward economic development, it is necessary to focus on investment in green financial resources, promote the development of green finance and help change the way of economic development. Secondly, a sound disciplinary system is also an important factor in promoting the improvement of laws and regulations. The development needs very strong binding force. For example, in terms of energy consumption and environmental pollution, the unsound system will cause enterprises to drill loopholes in laws, hinder the development of green finance and delay the upgrading of industrial structure; Finally, the supervision and supervision of the relevant national departments are equally important. The improvement of laws should be reflected in the improvement in writing and implementation in action. Therefore, the relevant departments supervise the banking, insurance and other industries in various provinces and cities, so that the perfect laws and regulations can be implemented at all levels.

4.2.2. To break down administrative barriers and reduce government interference

In order to improve the allocation efficiency of green financial resources, government intervention must be reduced. First of all, when allocating regional green financial resources, government intervention should be minimized and market forces should be relied on to determine the allocation direction and development direction. In the composition of China's green financial resources, large state-owned commercial banks, which occupy a large proportion in the banking industry and have a strong monopoly in the financial industry, are more vulnerable to government intervention in their lending behavior, while the government is more likely to have an impact on local financial resources. At the end of the day, we will break down the barriers in administrative divisions and promote the development of green financial cooperation in the Yangtze River Economic Belt. Administrative and institutional barriers are important factors that restrict the establishment of a unified market in various regions within the Yangtze River Economic Belt, and also important factors that restrict and optimize the inter-provincial flow of green financial resources. Therefore, the governments of the provinces and cities in the Yangtze River Economic Belt should continuously deepen the "streamline administration, delegate power, strengthen regulation and improve services" reform, speed up the establishment of a unified market system, speed up the circulation of essential factors, and abolish the administration and trade barriers to trade and cooperation.

4.2.3. Increase financial investment and optimize capital allocation

We will direct financial resources to less developed areas. At present, under the dual pressure of the epidemic and the international situation, China's economic development has begun to slow down, focusing on the huge domestic market. China is actively exploring the road of economic development and transformation. The upper, middle and lower regions of the Yangtze River economic belt have different requirements for green financial resources due to their respective advantages. Now, although these four regions have a large proportion of green financial resources, their development potential has been stimulated. In the short term, it is difficult for them to find a new foothold for economic development. However, financial resources are indispensable to the development of high-tech enterprises and the construction of infrastructure in the upper and middle regions. Therefore, in terms of policy, the green financial resources will be inclined to the relatively backward regions, which will help to explore a new way for green financial resources to support characteristic industries, which plays a very important role in improving the efficiency of regional allocation of green financial resources.

4.2.4. Exerting comparative advantages to narrow regional differences

Although the industrial structure and advantages of different regions in the Yangtze River Economic Belt are different, the allocation efficiency of green financial resources in the region can be significantly improved by upgrading the industrial structure. Therefore, the allocation efficiency of green financial resources in the region can be effectively improved by promoting the upgrading of the industrial structure. The upgrading of industrial structure should be based on local advantageous industries. First of all, the industrial development of each region in the Yangtze River Economic Belt should be balanced, and the major industries in each region should drive the adjustment and optimization of the industrial structure in the whole basin. For example, the downstream provinces are rich in financial resources, the financial

service industry is developed, and there are many high-tech enterprises and large enterprises. Secondly, it is necessary to actively guide the flow of financial resources between high-tech industries, key areas of green industries and areas with weak industries, and speed up the flow of capital between regions, so as to promote the economic development of weak regions. A mechanism for the flow of financial resources between industries can be established, for example, in the upstream regions where the total financial resources are backward, large financial institutions can be established to connect the middle and lower reaches, and a financial resource bank can be established to support weak industries.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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