

Research on the Mechanism, Effect and Evaluation System of Green Finance Promoting Industrial Upgrading Under the Background of the Transformation of Old and New Kinetic Energy

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Abstract

China's 14th Five-Year Plan addresses ecological degradation, resource depletion, and economic issues by proposing a "dual cycle" strategy. Green finance gains importance in this context. The plan focuses on upgrading the industrial structure, aligning with supply-side reform for higher-quality development. Research shows that green finance can guide funds towards eco-friendly sectors, aiding industrial optimization. Shandong Province, a pilot zone for energy conversion, plays a crucial role in achieving carbon neutrality. Studying how green finance drives industrial upgrading in Shandong holds practical and academic value. The paper outlines: explaining green finance and industrial structure theories, analyzing their interplay, assessing Shandong's green finance and structural progress, empirical analysis of 2010-2021 data, and offering development recommendations based on findings.

Key words: Green finance; Upgrading of industrial structure; Transition to new from old economic

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1. INTRODUCTION

1.1 Research background

In 2020, the 14th Five-Year Plan proposes a new development pattern of "dual cycle" and emphasizes accelerating the green transformation of the development mode and vigorously developing the green economy. In 2022, General Secretary Xi Jinping emphasized in the report of the 20th National Congress of the Communist Party of China that we should actively and steadily promote carbon peak carbon neutrality and accelerate the adjustment and optimization of industrial structure. The upgrading of industrial structure has become the only way to build a new development pattern and achieve sustainable development. Green finance plays a significant role in promoting high-quality economic development. As an important means to promote the upgrading of the national industrial structure, it plays an important and indispensable role.

1.2 Literature review

1.2.1 Overview of the conversion of old and new kinetic energy

The concept of "new and old kinetic energy" refers to the transformation and upgrading of economic activities from traditional modes to more innovative and efficient ones. It encompasses various aspects such as industrial structure, consumption patterns, and enterprise development.

According to Wang (2015), this transformation manifests in two primary aspects:

Industrial Structure: Traditional industries undergo updates and iterations, while new industries and businesses emerge rapidly. Additionally, the service industry plays a significant role in boosting the economy.

Demand Structure: There's an acceleration in the upgrading of consumption patterns, leading to an increased role of consumption in driving economic growth.

Zhang (2016) views the transformation of new and old kinetic energy through the lens of enterprise development. This perspective emphasizes competition as a mechanism for survival, where inefficient and outdated enterprises are phased out while more efficient and high-quality ones thrive. This process injects fresh vitality into economic growth.

Wang et al. (2019) describe the conversion of old and new kinetic energy as a continuous process of replacing outdated modes with innovative ones. This iterative replacement ensures that the economy keeps evolving towards more efficient and dynamic models.

Sheng (2020) delves into the essence of new kinetic energy, portraying it as an advanced productivity and a pivotal driving force behind economic growth. This perspective underscores the importance of innovation and technological advancement in propelling economic development forward.

1.2.2 Overview of Green Finance

Green finance, also known as environmental finance, sustainable finance or carbon finance. (Salazar, 1998) took the lead in proposing the concept of green finance. He believed that green finance is the product of the organic combination of the financial industry and the green industry, aiming to incorporate environmental benefits into the scope of financial innovation. (Cowan,1999) believed that green finance is an interdisciplinary subject of green economic development theory and financial theory, and financial integration can promote the development speed of green economy. (Labatt, et al.,2002) also put forward a similar point of view, green finance is an important field that combines financial innovation and environmental protection, and its purpose is to help companies and financial institutions better manage environmental-related risks. (Scholtens, et al.,2007) further explored the connotation of green finance from the perspective of sustainable development. He believes that all policies, products and measures aimed at protecting the environment, slowing down global warming and improving ecology through the use of various financial derivatives to achieve social, economic and environmental sustainable development are within the scope of green finance.

1.2.3 Overview of green finance promoting industrial upgrading

According to foreign experts and scholars' research on the relationship between green financial development and industrial structure upgrading, (Berens, et al., 2016) believed that green finance played a positive role in supporting environmental protection agencies and green enterprises, and promoted the green economy by providing them with financing support. development of. At the same time, (Volz, 2018) pointed out that green finance also plays a key and core role at the economic level, realizing green economic growth by transforming the economic model. In addition, (Vivek, et al.,2016)

based on the observation and data analysis of the Indian Green Bank, green finance is also of great significance to promote the upgrading of industrial structure.

According to the research of domestic experts and scholars, (Yan, et al.,2004) believed that in the adjustment of industrial structure, industries with different growth rates have different demands for funds, and the adjustment of the flow and direction of capital in the financial market can promote the optimization of industrial structure. (Xu,2011) pointed out that making full use of the funds in the financial market itself and building a green financial system by improving the efficiency of fund utilization is conducive to dealing with various pollution incidents and the blind expansion of high-pollution and high-energy-consuming enterprises, and is also conducive to promoting China's Optimization and upgrading of industrial structure. (Li, et al.,2015) believe that the government should play a leading role to guide green finance to support green industries, so as to promote the development of industrial structure in a more reasonable direction.

1.2.4 Literature review

A study of domestic and foreign literature found that the research on green finance in foreign academic circles was carried out earlier, the development of green finance was relatively mature, and the definition, connotation, importance and necessity of green finance were made clear. explanation of.

At present, scholars at home and abroad have achieved fruitful results in the research on green finance and industrial structure upgrading, but there are still some shortcomings:

(1) Regarding the research on green finance promoting industrial upgrading, due to its short development time and large degree of subdivision of research fields, the research methods, research objects, and research angles of each literature are also different. The research on green finance and industrial structure.

(2) In the context of the transformation of old and new kinetic energy in my country, the academic community has not yet included it in the consideration of green finance to promote the upgrading of industrial structure, and there is a lack of corresponding research results and literature.

1.3 Innovations in this paper

Most domestic and foreign scholars' research on green finance's impact on industrial structure upgrading is mainly qualitative research, and rarely studies the impact of green finance on industrial structure upgrading with a regional background. This paper makes innovations based on the above two points:

(1) Research perspective: From the perspective of Shandong Province, this paper analyzes the impact of green finance on the upgrading of industrial structure, which is innovative.

(2) Research methods: Most of the existing literature is mainly qualitative research. These methods have problems of high subjectivity and relatively simple analysis when studying the impact of green finance on industrial structure upgrading. This paper collects relevant data, establishes an econometric model, and conducts an empirical analysis of green finance's promotion of industrial structure upgrading, which is more accurate.

2. THEORETICAL BASIS

2.1 Theoretical basis for green finance to promote industrial structure upgrading

2.1.1 Theories related to green finance

Externality Theory

Externality theory is an important concept in economics, which refers to the non-market impact of the behavior of an economic entity on other economic entities. Ma Jun (2015) believes that the positive externalities of green finance are very significant, and the government can adjust product pricing, subsidies, taxes and costs to achieve the purpose of reducing the output of polluting products and increasing the output of clean products, thereby internally Biochemical externalities, which make firm behavior more consistent with social welfare maximization.

The mechanism of action of green financial products and services mainly works by inhibiting negative externalities and promoting positive externalities. For example, green credit can reduce the financing cost of green projects, increase green investment, and increase the cost of polluting investment, thereby reducing the scale of polluting investment.

Environmental Kuznets Curve (EKC)

The Environmental Kuznets Curve is an inverted U-shaped curve describing the relationship between economic development and environmental pollution. Specifically, a country's environmental pollution is relatively light in the early stage of economic development, but with economic growth, environmental pollution gradually intensifies, and then begins to decline after reaching an inflection point. This curve shape indicates that there is a certain correlation between economic development and environmental quality.

Another important finding of the Environmental Kuznets Curve is that as the economy develops to a certain stage, environmental pollution begins to decrease, which means that while the economy grows, the environmental quality may also be improved. Green finance plays a key role in this process. By guiding funds to invest in sustainable development fields and environment-friendly projects, it promotes the development of green industries, reduces resource consumption and environmental pollution, and achieves coordinated development of the economy and the environment.

2.1.2 Theories related to industrial structure

Petty-Clark theorem

The Petty-Clark theorem describes the changing relationship between income and labor mobility. In the early stage of economic development, when the per capita national income level increases, the labor force will first transfer from the primary industry to the secondary industry. The secondary industry is usually a high value-added industry such as manufacturing, and its relative income is higher, which attracts more labor to enter this field. With the further development of the economy and the further increase of per capita national income, the labor force will continue to move to the tertiary industry.

From a geographical perspective, the process of labor mobility in Shandong Province is completely consistent with the Petty-Clark theorem. Before the reform and opening up, the labor force factors in Shandong Province were mainly concentrated in the primary industry. After the reform and opening up, along with the prosperity of many manufacturing industries, the labor factor has shifted from the primary industry to the secondary industry, the output value of the secondary industry has increased, and the proportion of labor force has increased. With the development of the economy, the traditional manufacturing industry has encountered bottlenecks, and the labor force has shifted to the more efficient tertiary industry.

2.2 The mechanism of green finance to promote the optimization and upgrading of industrial structure

2.2.1 Capital formation mechanism

Capital is crucial to an enterprise. The formation of capital is mainly divided into two stages. In the first stage, financial institutions such as banks, securities companies, and insurance companies collect idle funds and absorb the disposable income of various micro entities to form savings. In the second stage, after withdrawing the statutory reserve, financial institutions invest part of their savings in enterprises and capitalize currency into physical capital. The speed of capital accumulation and capital transfer directly affects the size of capital. Therefore, the key point of the capital formation mechanism is the efficiency of converting savings into capital. The higher the efficiency, the more obvious the impact on industrial structure upgrading.

2.2.2 Capital-oriented mechanism

The flow of capital will affect the optimization efficiency of industrial structure. The capital-oriented mechanism refers to guiding capital to flow among various industries, departments and regions with the greatest efficiency through policies and mechanisms, and reducing the ineffective use of capital. By rationally allocating and optimizing resources and giving full play to the guiding role of the government, funds that originally flowed to

high energy-consuming and high-pollution industries will continue to flow into green industries, thereby affecting the upgrading of the industrial structure.

2.2.3 Information transmission mechanism

The information transmission mechanism refers to the financial system's use of financial market tools and financial policies to alleviate the information asymmetry problem among enterprises. The information transmission mechanism has an effective inhibitory effect on the adverse selection and moral hazard problems caused by the influence of private information on the financial system.

3. DEVELOPMENT STATUS OF GREEN FINANCE AND INDUSTRIAL STRUCTURE UPGRADING

3.1 Current status of green finance development

In 2016, the People's Bank of China and other seven ministries and commissions jointly issued the "Guiding Opinions on Building a Green Financial System", which established the top-level design of China's green financial construction and gave the official definition of green finance. After years of practical exploration and policy promotion, the five pillars of green financial development have gradually formed, including green financial standard

system, environmental information disclosure, incentive and restraint mechanism, product and market system, and international cooperation. In February 2021, the State Council issued the "Opinions on Accelerating the Establishment and Improvement of the Guidance System for the Development of a Green and Low-Carbon Circular Economy", which clarified the task arrangement for vigorously developing green finance, that is, developing green credit and green direct financing, and increasing support for green financing for financial institutions. The intensity of financial performance evaluation and assessment.

3.1.1 Current status of China's green finance development

Green credit

As shown in Figure 1, China's green credit has shown a significant growth trend in the past. In 2010, China's green credit balance was 1.24 trillion yuan, and then increased year by year. By 2012, the balance of green credit increased to 3.6 trillion yuan, 5.2 trillion yuan in 2013, 6.01 trillion yuan in 2014, and 7.01 trillion yuan in 2015. In the past three years, the growth rate of China's green credit balance has increased significantly. By the end of 2022, the national green credit balance will reach 22.03 trillion yuan. Green credit provides more financial support for green industries, which also reflects the positive progress my country has made in promoting the development of green finance.

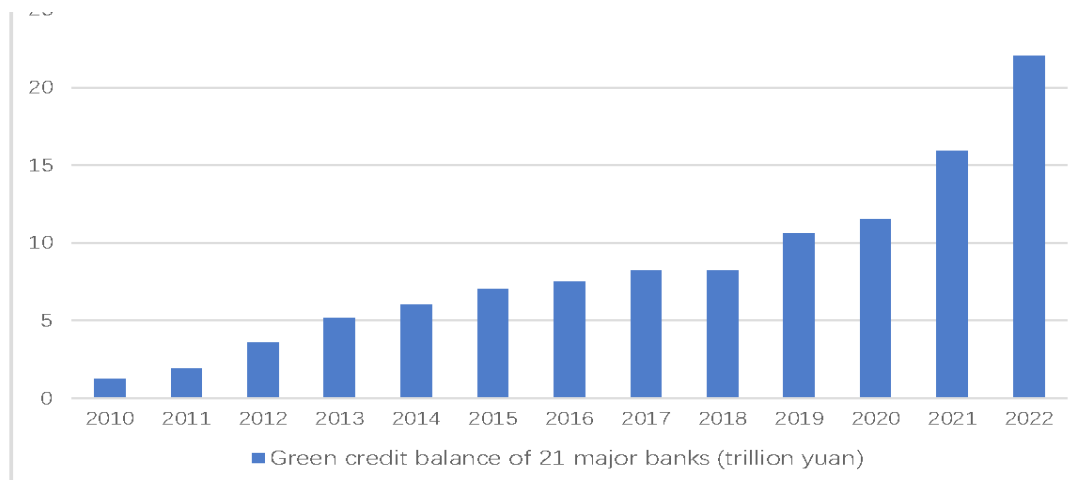


Figure 1
Green credit balance of 21 major banks from 2010 to 2022
 Data Sources: China Banking Industry Social Responsibility Report

Green investment

Green investment refers to the investment that can improve the global environment and promote the sustainable development of resources while obtaining wealth. The amount of investment in environmental pollution control is an important indicator for evaluating the level of green investment, and the increase in green investment will have a positive effect on the upgrading of the industrial structure. Figure 2 shows the changes in the

amount of investment in environmental pollution across the country. As shown in the figure, the investment in environmental pollution control over the years has shown an overall upward trend, increasing from 626.79 billion yuan in 2010 to 900.36 billion yuan in 2017, reaching the highest value in history. However, from 2018 to 2020, the amount of investment in environmental pollution control has dropped significantly.

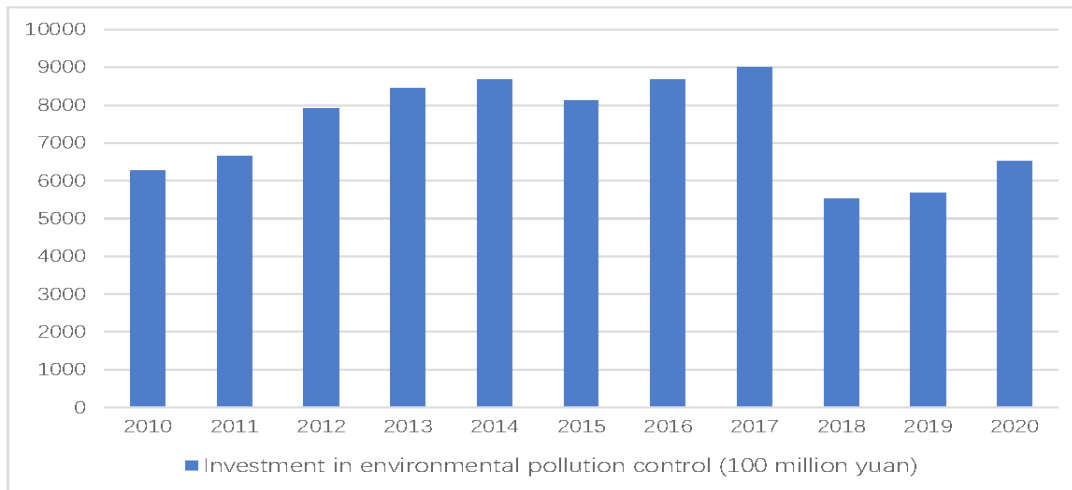


Figure 2
2010-2020 National Environmental Pollution Investment Amount
 Data Sources: China Statistical Yearbook

3.1.2 Status quo of green finance development in Shandong Province

Figure 3 reflects the level of green credit in Shandong Province from 2005 to 2020, and the specific data is the proportion of interest expenses of the six major energy-intensive industries in Shandong Province. It can be seen that its proportion has steadily decreased since 2006, indicating that more green credit funds in my country flow to non-high energy-consuming and non-high-pollution industries. The flow of funds shows that the

green credit policy of Shandong Province has played an effective role. More funds flowed to green industries. However, since 2016, the proportion of interest expenses of the six major energy-intensive industries in Shandong Province has increased rapidly, indicating that the effect of the previous green credit policy is not stable, reflecting that the development of green finance in Shandong Province still has weak green credit issuance, “Two high and one surplus” problems such as slow industrial transformation.

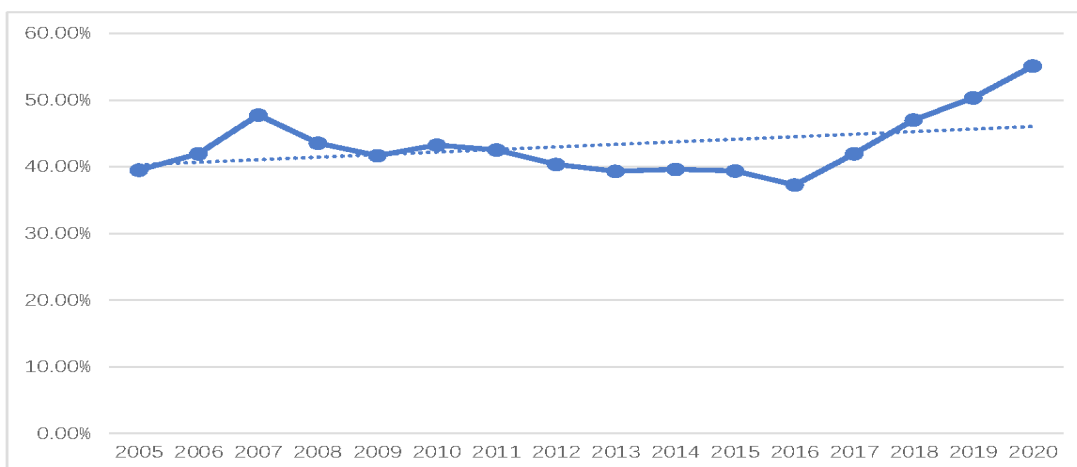


Figure 3
Proportion of Interest Expenses of the Six High Energy Consumption Industries in Shandong Province from 2005 to 2020
 Data Sources: China Statistical Yearbook, China Industrial Statistical Yearbook.

3.2 Status quo of industrial structure development

3.2.1 Status Quo of Industrial Structure

Figure 4 shows the change trend of the three industries in Shandong Province from 2010 to 2022. It can be seen from the figure that the output value of the secondary and tertiary industries in Shandong Province has increased year by

year and the growth rate of the added value of the tertiary industry has accelerated, while the output value of the primary industry has grown steadily. Generally speaking, the output value structure of Shandong Province has undergone tremendous changes, which shows that Shandong Province is gradually transitioning to an advanced stage of industrialization centered on the tertiary industry.

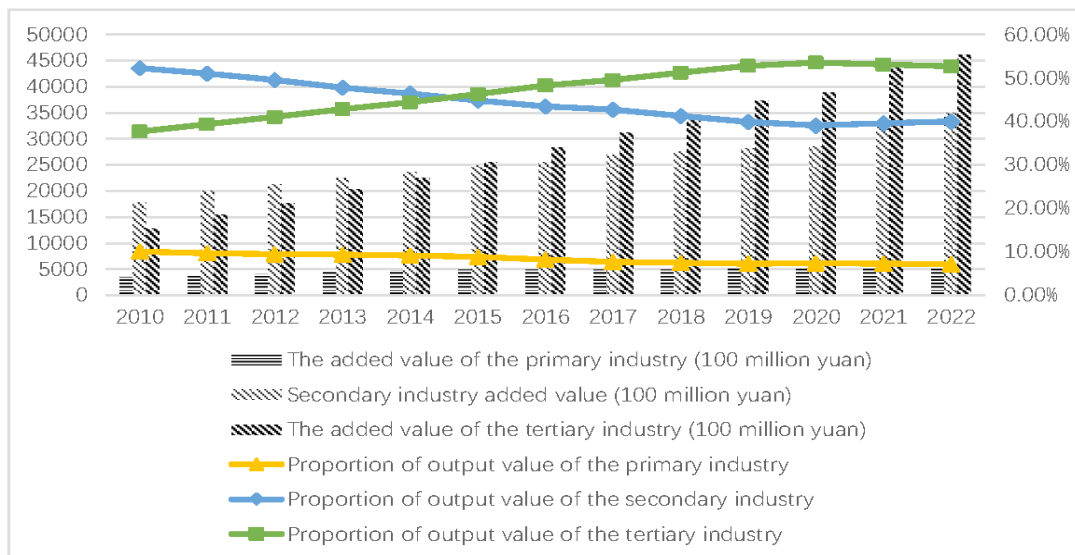


Figure 4
2010-2022 three industry trends in Shandong Province
Data Sources: Office for National Statistics

3.2.2 Current Employment Structure

With the increase in output value and internal adjustment of the three major industries in Shandong Province, it has also had a significant impact on the employment structure of Shandong Province. Figure 5 shows the change trend of employment in the three industries in Shandong Province from 2010 to 2021. The proportion of employment in the

secondary industry began to decline in 2016, and then stabilized at around 33%. With the development of the economy, the number of jobs provided by the service industry and other industries has risen sharply, and the proportion of the number of employed people in the tertiary industry in the total number of employed people has accelerated in 2016.

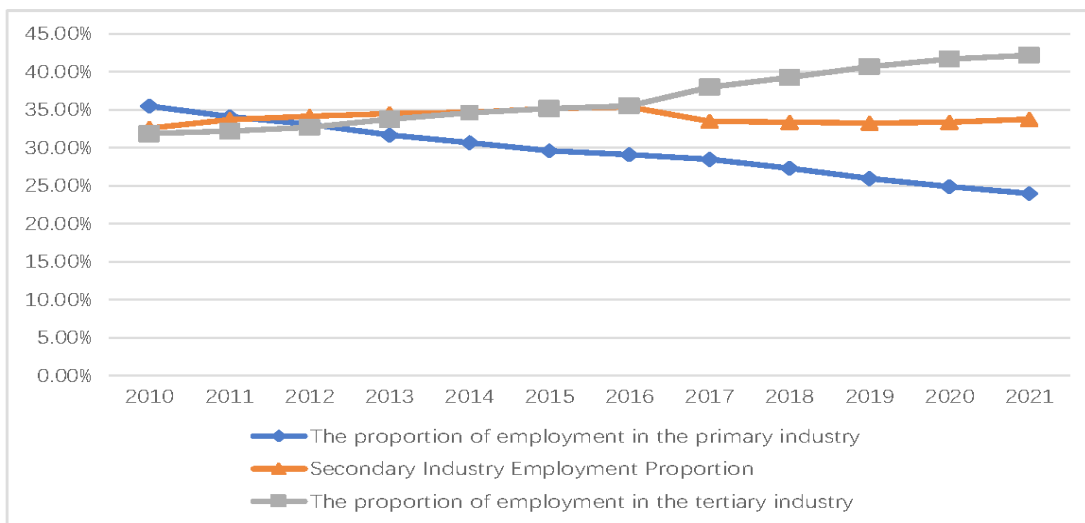


Figure 5
2010-2021 Three Industry Employment Change Trends in Shandong Province
Data Sources: Shandong Province Yearbook

3.2.3 Status Quo of Industrial Structure Upgrading Advanced industrial structure

Figure 6 shows the changing trend of the industrial structure advanced index in Shandong Province from 2000 to 2021. It can be seen from the figure that as time goes by, the industrial structure advanced index continues

to grow, which shows that the gap between the output value of the tertiary industry and the output value of the secondary industry is widening, and the industrial structure of Shandong Province is constantly moving to a higher level. The development shows that the industrial structure of Shandong Province continues to improve and optimize.

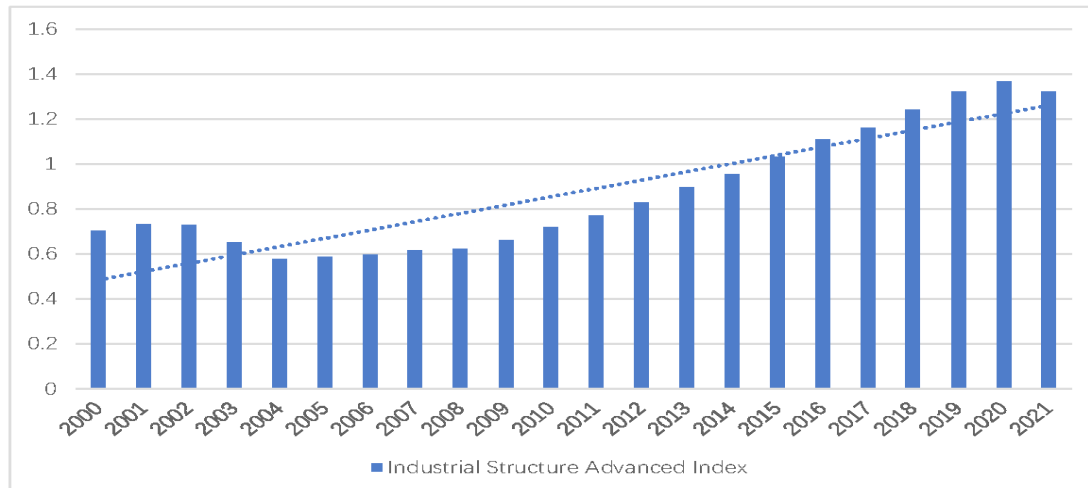


Figure 6
Industrial Structure Advanced Index of Shandong Province from 2000 to 2021

Data Sources: Office for National Statistics

Rationalization of industrial structure

Rationalization of industrial structure refers to adjusting the industrial structure that is incompatible with the existing level of economic development under the constraints of existing resource conditions and technological levels, and scientifically allocating production factors according to the existing demand structure and technological levels, so that the industries and A dynamic adjustment process in which the layout of factors within an industry tends to be rationalized. This paper adopts the calculation method of Chinese scholar Gan Chunhui (2015) and uses Theil index to measure. The calculation process of Theil index is as follows:

Among them, TI is Theil index, which represents the degree of rationalization of China’s industrial structure, G is the GDP of Shandong Province in that year, L is the number of employees in my country, and i=1, 2, 3 are the primary, secondary, and tertiary industries respectively; G_i represents the gross product value of the i-th industry, and L_i represents the employed population of the i-th industry. It can be seen from Figure 7 that the Theil index of Shandong Province has been showing a downward trend. From 2000 to 2021, the Theil index dropped from 0.32 to 0.09, indicating that the industrial structure of Shandong Province tends to be rationalized.

$$TI = \sum_{i=1}^n \frac{G_i}{G} \ln \left(\frac{G_i / L_i}{G / L} \right)$$

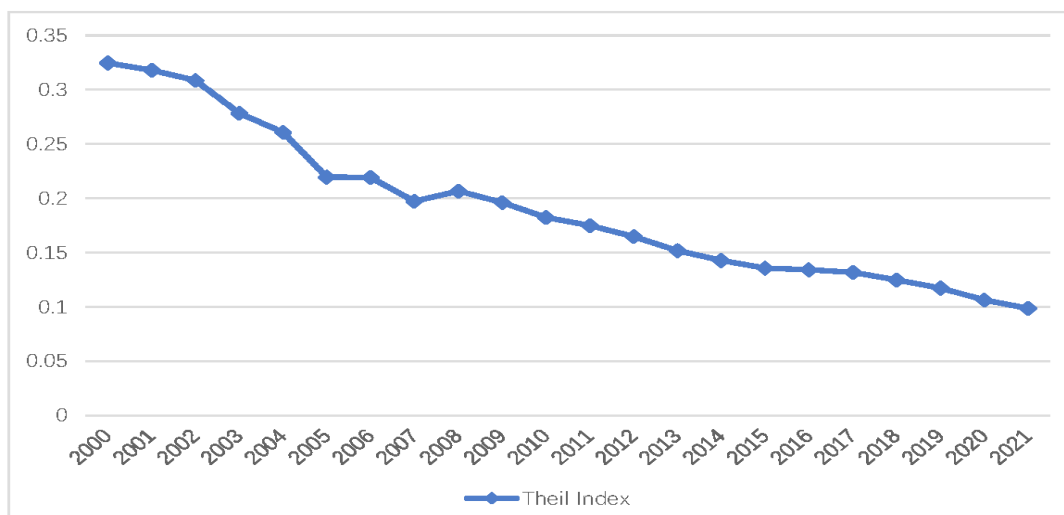


Figure 7
Theil Index of Shandong Province from 2000 to 2021

Data Sources: China Statistical Yearbook, Office for National Statistics

4. EMPIRICAL ANALYSIS OF GREEN FINANCE DEVELOPMENT PROMOTING THE UPGRADING OF SHANDONG PROVINCE'S INDUSTRIAL STRUCTURE

4.1 Model setting and data processing

4.1.1 Model settings

The focus of this study is to explore the impact of green credit as an input on industrial structure, and how green credit will change when industrial structure is used as an input. There is a process of mutual influence and mutual adjustment between the two. However, when studying the impact of green finance on industrial structure, it is not enough to only consider green credit indicators. We should also integrate factors such as capital accumulation, technological progress, green investment, and green insurance. Therefore, starting from the perspective of input industries, this study takes the industrial structure as the explained variable and the above five factors as the explanatory variables to analyze the impact of the industrial structure on green finance, and establishes the following econometric model:

$$Y_i = C + \alpha X + \beta_i Z_i + \mu$$

Among them, represents the number of influencing factors, Y represents the explained variable, that is, the industrial structure, X represents the explanatory variable, that is, the proportion of green credit, and Z represents other factors that affect the industrial structure.

4.1.2 Data processing

Zeng Xuewen (2014) measured the overall development level of green finance in my country by constructing a green financial index weight system. Expenditure green credit accounts for the largest weight in the overall development of green finance, which is more representative, so green credit is selected as an explanatory variable. Since the green credit policy adopts restrictive measures for the development of industries with high energy consumption, high pollution, backward production capacity, and overcapacity, the proportion of interest expenses of high energy-consuming industries is selected as a measurement indicator. This indicator calculates the ratio of interest expenditures covering chemicals, metal smelting, petroleum processing, electricity supply, and non-metallic mineral products to the interest expenditures of the entire industrial sector. The size of this ratio reflects the province's achievements in curbing the development of high energy-consuming industries.

4.2 Data source and variable description

4.2.1 Data sources

In addition to selecting green credit as an explanatory variable, this paper also selects four other variables, namely fixed capital stock (FCS), technological progress

(TIL), government support (GS), and green insurance (GA). The variable data involved come from China Statistical Yearbook, Shandong Province Statistical Yearbook, China Insurance Yearbook.

4.2.2 Variable description Table

Table 1
Main variables and description

Variable Name	Symbolic Representation	Variable Definitions
Industrial Structure	ISO1	The added value of the secondary industry accounted for the GDP of Shandong Province
	IOS2	The added value of the tertiary industry accounts for the GDP of Shandong Province
Green Credit Level	GC	Interest expenses of the six major energy-intensive industries in Shandong Province/Total interest expenses of industries in Shandong Province
Fixed Capital Stock	FCS	Fixed capital of Shandong Province/GDP of Shandong Province
Skill Improved	TIL	Number of patents approved in Shandong Province
Governmental Support	GS	Fiscal expenditure of energy conservation and environmental protection industry/total fiscal expenditure of Shandong Province
Green Insurance	GA	Agricultural insurance expenditure in Shandong Province/Total insurance expenditure in Shandong Province

4.3 Analysis of empirical results

First, descriptive statistical analysis is carried out, as shown in Table 2.

Table 2
Descriptive statistics

Variable	Mean	Std.Dev.	Min	Max
ISO1	0.522	0.0839	0.393	0.626
ISO2	0.509	0.0447	0.423	0.568
GC	0.440	0.0735	0.358	0.599
FCS	0.797	0.0743	0.685	0.907
GA	.0403	0.02127	0.0116	0.0758
TIL	123320	82401	51490	329838
GS	0.0264	0.00258	0.0228	0.318

4.3.1 Unit root test

If there is a unit root process in the time series data, it means that it is not stable, which will cause spurious regression in the regression analysis. For example, to prevent spurious regression, it is necessary to perform a unit root test on the data. This paper uses stata software to carry out unit root test, which is also ADF test. The results are shown in Table 3. After two differences, the data are all stable. At this time, the data are second-order integrated time series data.

Table 3
ADF test

Variable	ADF Statistics	Stationarity
ISO1	-0.287	Non-Stationary
D.ISO1	-3.014	Stationary
D2.ISO1	-3.578	Stationary
ISO2	-2.610	Non-Stationary
D.ISO2	-2.172	Non-Stationary
D2.ISO2	-5.527	Stationary
GC	1.154	Non-Stationary
D.GC	-1.753	Non-Stationary
D2.GC	-5.358	Stationary
FCS	-1.467	Non-Stationary
D.FCS	-0.813	Non-Stationary
D2.FCS	-3.202	Stationary
TIL	3.831	Non-Stationary
D.TIL	-0.760	Non-Stationary
D2.TIL	-4.204	Stationary
GS	-3.736	Stationary
D.GS	-4.602	Stationary
D2.GS	-4.925	Stationary
GA	-1.748	Non-Stationary
D.GA	-2.511	Non-Stationary
D2.GA	-3.696	Stationary

4.3.2 Cointegration test

The ADF test shows that the data is stationary after the second difference, so the data is a second-order integrated time series data. Then the data were tested for cointegration, using the Johansen cointegration test. The results are shown in 4.4 and Table 4.

Table 4
ISO1 cointegration relationship test

Hypothesis	Eigenvalue	Maximum Eigenvalue	Critical value 5%	Conclusion
0			42.48	
1	1.00000	293.1862	36.41	cointegration
2	1.00000	0	30.33	
3	0.00000	0	23.78	
4	0.00000	0	16.87	
5	0.00000	0	3.74	

Table 5
ISO2 cointegration relationship test

Hypothesis	Eigenvalue	Maximum Eigenvalue	Critical value 5%	Conclusion
0			42.48	
1	1.00000	341.7185	36.41	cointegration
2	1.00000	0	30.33	
3	0.00000	0	23.78	
4	0.00000	0	16.87	
5	0.00000	0	3.74	

The results show that both ISO1 and ISO2 come to the conclusion of co-integration at the critical value of 5%, indicating that there is a long-term stable equilibrium relationship between green credit, fixed capital stock, green investment, green insurance, technological progress and industrial structure.

4.3.3 Granger causality test

In order to further analyze the causal relationship between the secondary industry and the tertiary industry and green credit, a Granger causality test is required, and the results are shown in Table 6 and Table 7.

Table 6
Granger causality test between the secondary industry and its influencing factors

Null hypothesis	F value	P value
GC is not a Granger reason for ISO1	5.009	0.025
ISO1 is not a Granger reason for GC	5.9791	0.014
FCS is not a Granger reason for ISO1	7.8525	0.005
ISO1 is not a Granger reason for FCS	1.7294	0.188
TIL is not a Granger reason for ISO1	14.867	0
ISO1 is not a Granger reason for TIL	13.298	0
GS is not a Granger reason for ISO1	0.03524	0.851
ISO1 is not a Granger reason for GS	1.7808	0.182
GA is not the Granger reason for ISO1	0.2366	0.627
ISO1 is not a Granger reason for GA	20.003	0

Table 7
Granger causality test between the tertiary industry and its influencing factors

Null hypothesis	F value	P value
GC is not a Granger reason for ISO2	0.87665	0.349
ISO2 is not a Granger reason for GC	11.368	0.001
FCS is not a Granger reason for ISO2	87.818	0
ISO2 is not a Granger reason for FCS	2.1694	0.141
TIL is not a Granger reason for ISO2	3.0331	0.082
ISO2 is not a Granger reason for TIL	2.5075	0.113
GS is not a Granger reason for ISO2	456.9	0
ISO2 is not a Granger reason for GS	0.01556	0.901
GA is not the Granger reason for ISO2	17.683	0
ISO2 is not a Granger reason for GA	0.38065	0.537

At the 5% significance level, the null hypothesis “green credit is not the Granger reason for the optimization of the secondary industry structure” is rejected, because P is 0.025, which is less than 0.05. At the same time, we must accept the original hypothesis “Government support is not the Granger reason for the optimization of the secondary industry structure” and “Green insurance is not the Granger reason for the optimization of the secondary industry structure”, so it can be concluded that green credit is the secondary industry in Shandong Province

Structural upgrading Granger reasons, government support and green insurance are not the reasons for the structural upgrading of the secondary industry in Shandong Province. For the Granger causality test between the tertiary industry and its influencing factors, it is necessary to reject the null hypothesis “government support is not the Granger cause of the tertiary industry structure optimization” and “green insurance is not the Granger cause of the tertiary industry structure optimization”, accept the null hypothesis “green credit is not the Granger reason for the optimization of the tertiary industry structure”. This shows that green credit is not the Granger reason for the upgrading of the tertiary industry in Shandong Province, but government support and green insurance are the reasons for the upgrading of the tertiary industry in Shandong Province.

5. POLICY SUGGESTIONS FOR THE DEVELOPMENT OF GREEN FINANCE TO PROMOTE THE UPGRADING OF SHANDONG PROVINCE’S INDUSTRIAL STRUCTURE

5.1 Establish a comprehensive green credit reference system

In order to better support the transformation of old and new kinetic energy in Shandong Province and accelerate the development of green finance in Shandong Province, it is crucial to establish a sound and comprehensive green credit reference system. The Shandong provincial government should strengthen cooperation with financial institutions, environmental departments, and scientific research institutions, strengthen information communication among various departments, and establish a public environmental data platform and a green rating system. Through information sharing and improvement of data accuracy, improve the green credit system, provide financial institutions with more comprehensive and accurate corporate environmental information, reduce financing costs for environmental protection enterprises, and promote the rapid expansion of green credit scale.

5.2 Innovative green financial products and services

The carbon market construction in Shandong Province is still in its infancy. It should actively respond to the “Opinions of the State Council on Supporting Shandong to Deepen the Conversion of Old and New Growth Drivers to Promote Green, Low-Carbon and High-quality Development”, promote the development of carbon financial business, formulate financial standards for transformation, and build industrial carbon accounts, expand the multi-scenario application of carbon accounts,

and promote the construction of a carbon inclusive system, etc., to provide basic support for the development of carbon finance and help Shandong Province achieve its carbon emission reduction goals.

5.3 Improve laws and regulations related to green finance

First, in terms of environmental information disclosure and evaluation system, establish a sound environmental information disclosure and evaluation system, require green financial institutions to disclose data and information related to the environment, improve transparency and credibility, and help investors and borrowers Make informed decisions. However, a sound environmental information disclosure and assessment system needs to rely on the green credit reference system. Shandong Province is still in the exploratory stage in this regard, and the green environment information is relatively closed, and it still takes time to establish an information disclosure mechanism. Second, for the establishment of regulatory laws and regulations for green finance, separate supervision can be carried out for China’s banking, securities, insurance and other separate business models. For green credit, green bonds and green insurance, separate supervision can be adopted for supervision.

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