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Research on the Impact Mechanism of Green Finance on Low-carbon Innovation of Real Economy

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Abstract

Driven by global climate change and sustainable development goals, green finance has attracted widespread attention as an important tool to promote the transformation of a low-carbon economy. Green finance provides financial support and policy incentives for low-carbon innovation projects through financial instruments such as green credit, green bonds, and green funds, reduces corporate financing costs, promotes corporate green transformation, and promotes market development. This paper aims to explore the impact mechanism of green finance on low-carbon innovation in the real economy. First, this paper systematically sorts out the definitions and evaluation indicators of green finance and low-carbon innovation, and analyzes relevant research results at home and abroad. Secondly, this paper discusses in detail the impact mechanism of green finance on low-carbon innovation in the real economy from four aspects: providing financial support, reducing financing costs, promoting corporate green transformation, and promoting market development. Through typical case analysis, this paper summarizes the successful experience and lessons of green finance in supporting low-carbon innovation projects. Finally, this paper puts forward relevant policy recommendations, including government support and guidance in the development of green finance, participation and innovation of financial institutions, and green development strategies of enterprises. Research shows that green finance plays a significant role in promoting low-carbon innovation in the real economy, which not only improves the innovation ability and market competitiveness of enterprises, but also promotes the sustainable development of the economy. Future research can further explore the application effects of green finance in different scales and industries, deepen the understanding of the relationship between green finance and low-carbon innovation, and provide a scientific basis for policy making and practice.

Keywords

Green finance, real economy, low-carbon innovation, impact mechanism.

1. Introduction

1.1. Research Background

Global climate change is one of the most serious environmental problems facing today's society. The acceleration of industrialization and economic development have led to a sharp increase in greenhouse gas emissions, triggering a series of environmental problems such as global warming, rising sea levels, and frequent extreme weather. In order to cope with climate change, governments, enterprises and all sectors of society have gradually realized the importance of low-carbon economic development. Low-carbon economy is an economic development model based on low energy consumption, low pollution and low emissions. Through technological innovation and structural adjustment, it achieves the coordination and unity of economic growth and environmental protection. Promoting the development of low-carbon economy will not only help alleviate climate change, but also promote the optimization of industrial structure

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and sustainable economic development. The report of the 20th National Congress of the Communist Party of China proposed that "promoting green and low-carbon economic and social development is a key link in achieving high-quality development", and especially pointed out that it is necessary to promote the high-end, intelligent and green development of manufacturing industry, and at the same time emphasize the green finance to promote the sustainable development of economy and society. The Central Financial Work Conference held in November 2023 clearly identified "green finance" as one of the five major articles in building a financial power, and hoped to optimize the capital supply structure and use more financial resources to promote scientific and technological innovation, advanced manufacturing, green development and small and medium-sized enterprises. It can be expected that for a long time in the future, vigorously developing green finance and promoting green innovation in the real economy will be the main theme of my country's economic development mode transformation. Therefore, it is of great significance to conduct a systematic study on the impact mechanism of green finance on low-carbon innovation in the real economy.

1.2. Significance

The relationship between green finance and low-carbon innovation is an important topic in current academic research. This study systematically combs through the relevant theories of green finance and low-carbon innovation, and deeply explores how green finance affects the low-carbon innovation of the real economy through mechanisms such as financial support, reducing financing costs, and promoting green transformation of enterprises. Through theoretical analysis, this study aims to reveal the role mechanism and transmission path of green finance in low-carbon innovation, and enrich and expand the theoretical system of green finance and low-carbon innovation. Deepening the research on this relationship will not only help fill the gaps in existing research, but also provide new ideas and directions for future academic research and promote academic progress in related fields.

The practical significance of this study is to provide practical reference opinions for policy makers and financial institutions. First, through the analysis of the mechanism of green finance affecting low-carbon innovation, the research results can provide theoretical basis and data support for the government to formulate and optimize green financial policies, help the government better guide funds to the field of low-carbon innovation, and promote the green transformation of the economy. Secondly, the green financial tools and successful cases summarized in the study can provide practical guidance for financial institutions to develop and promote green financial products, and enhance the innovation ability and market competitiveness of financial institutions in the field of green finance. In addition, this study can also help enterprises understand the advantages and functions of green finance, guide enterprises to actively use green financial tools, and enhance their own low-carbon technology research and development capabilities and green competitiveness. Through the provision of policy recommendations and development strategies, this study aims to promote the collaborative cooperation between the government, financial institutions and enterprises, jointly promote the development of a low-carbon economy, and achieve the coordination and unity of the economy, society and environment.

2. Literature Review

2.1. Research on green finance

Regarding the conceptual connotation of green finance, from a credit perspective, it is believed that green finance is a credit policy in which banking financial institutions provide key financing support to clean and environmentally friendly industries by lowering loan thresholds and loan interest rates (Campiglio, 2016). There is also a view that green finance is a financial means or

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measure in environmental regulatory policies, which aims to play a capital allocation function through financial instruments such as green credit, green bonds, green insurance and environmental rights trading, thereby playing a role in suppressing the development of high-pollution and high-energy consumption industries and supporting the development of clean and environmentally friendly industries (He Dexu and Cheng Gui, 2022); Regarding the scientific measurement of green finance, Lin Muxi and Xiao Yubo (2023) constructed a comprehensive evaluation system to measure the level of China's green finance development from five dimensions: green credit, green investment, green securities, green insurance and environmental rights trading; Regarding the impact effect of green finance substitution, Li Yan and Zhou Hanmei (2023) used the spatial Durbin econometric model to empirically examine the spatial spillover effect and regional heterogeneity effect of green finance development on the transformation and upgrading of industrial structure. The results show that green finance has significantly improved the level of industrial structure rationalization and industrial structure transformation in general, but this positive impact is significantly stronger in the central and eastern regions than in the western regions. Zhang Hui (2024) found that the inhibitory effect of green finance development on carbon emission intensity will decrease with the increase of trade openness.

2.2. Research on low-carbon innovation in the real economy

Regarding the conceptual connotation of low-carbon innovation, Li Xin'an (2021) interpreted green innovation from the perspective of maximizing input-output efficiency as the technological progress behavior of regional economy to meet the requirements of minimizing resource use and environmental damage under the constraints of green growth goals; Regarding the evaluation and measurement of low-carbon innovation, scholars prefer to quantitatively characterize the low-carbon innovation capabilities of enterprises from the perspective of patent output (Lerer and Seru, 2022). Peng Dinghong et al. (2023) first selected 22 indicators from four dimensions: low-carbon innovation input capacity, implementation capacity, development capacity and adaptability, and then established an enterprise green innovation capacity evaluation model using the membership method, and conducted an actual evaluation of the low-carbon innovation capabilities of four enterprises in Yunnan Province; Regarding the driving factors of low-carbon innovation, in terms of internal factors, Kerr (2018) pointed out that small and medium-sized enterprises have simple management structures, flexible organizations, convenient communication, timely decision-making, and are easy to respond quickly and effectively to market demand, and often show stronger innovation capabilities than large enterprises. In terms of external factors, Wang et al. (2023) used Chinese listed companies as a research sample and found that companies with higher environmental responsibility rating scores tend to achieve more low-carbon innovation outputs. In order to establish a good green image in front of the public, companies often respond to external environmental evaluations such as news media in terms of low-carbon innovation. Xu Yan (2024) believes that easing corporate financing constraints and promoting corporate green technology innovation through green financial support is an important mechanism for low-carbon transformation policies to improve corporate ESG quality.

3. The Impact Mechanism of Green Finance on Low-carbon Innovation in The Real Economy

3.1. Providing financial support

Green finance has significantly promoted the development of low-carbon innovation projects by providing sufficient financial support. Low-carbon innovation projects often require a large amount of capital investment, but due to their high risks and long cycles, traditional financial

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institutions are less willing to finance them. The emergence of green finance has provided these projects with special financing channels and tools, such as green credit and green bonds. Green credit refers to financial institutions providing loan support for projects that meet green standards, while green bonds are special bonds issued by enterprises or governments for green projects. These financial instruments not only ease the financial pressure of low-carbon innovation projects, but also increase the success rate of project financing. For example, Industrial and Commercial Bank of China has supported a number of new energy and environmental protection projects through green credit, achieving significant environmental benefits and economic returns.

3.2. Reducing Financing Costs

Preferential policies and interest rates for green financial products have played an important role in reducing corporate financing costs. In order to encourage companies to make green investments, many countries and regions have implemented preferential policies for green financial products, such as tax exemptions and government interest subsidies. In addition, green financial products usually enjoy lower interest rates, which also greatly reduces the financing costs of companies. For example, the issuance rate of some green bonds is lower than the market average, allowing companies to obtain funds at a lower cost and then invest in low-carbon technology research and development and green project construction. By reducing financing costs, green finance not only improves the economic benefits of companies, but also enhances their motivation to invest in green projects, thereby promoting the widespread development of low-carbon innovation.

3.3. Promoting green transformation of enterprises

Green finance has played a key role in promoting the green transformation of enterprises. By providing financial support and policy incentives, green finance encourages enterprises to increase their investment in low-carbon technology research and development, promote technological innovation and industrial upgrading. Green finance not only provides the necessary financial support, but also guides enterprises to pay more attention to environmental protection and resource conservation in the production and operation process by setting green standards and requirements. For example, when providing green credit, many financial institutions will require enterprises to meet certain environmental protection standards and regularly evaluate their environmental performance. This mechanism encourages enterprises to continuously improve their production processes and adopt more environmentally friendly technologies and equipment, thereby achieving green transformation and sustainable development.

3.4. Promoting market development

The development of the green finance market has played a positive role in promoting low-carbon innovation. With the continuous growth of the green finance market, the types and scale of various green financial products have continued to increase, the market mechanism has gradually improved, and the promotion and application of low-carbon technologies by green finance have become increasingly significant. The development of the green finance market not only provides more sources of funds for low-carbon innovation, but also promotes the standardization and scale of green technologies and projects. For example, the rapid growth of the green bond market has provided stable financial support for various low-carbon projects, and through market-oriented operating mechanisms, it has attracted more social capital to invest in the green field. In addition, the development of the green finance market has also promoted the establishment and improvement of the green information disclosure system, improved market transparency and investor confidence, and further promoted the popularization and promotion of low-carbon innovation.

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4. Typical Case Analysis

4.1. Case selection and introduction

In this study, we selected the green credit project of BYD Company supported by ICBC as a typical case. BYD is a world-leading new energy vehicle manufacturer committed to promoting the development of a low-carbon economy through technological innovation. In recent years, BYD has obtained large-scale green credit support through cooperation with ICBC for the research and development and production of new energy electric vehicles and related technologies.

The basic situation of the case is as follows: BYD Company applied for green credit support from the Industrial and Commercial Bank of China in order to accelerate the research and development and market promotion of new energy electric vehicles. According to the standards and requirements of green finance, the Industrial and Commercial Bank of China conducted a comprehensive assessment of BYD's project and believed that it met the conditions of green credit, so it approved a green loan of RMB 5 billion. This loan is mainly used for the research and development of BYD's new generation of electric vehicles, the purchase of production equipment and the construction of related supporting infrastructure. In terms of implementation status, BYD Company has successfully launched a number of internationally competitive electric vehicle models with this green loan, and has achieved remarkable sales performance in the market. At the same time, through financial support, BYD has accelerated the pace of technological innovation, developed a number of core technologies, and improved the overall competitiveness and market position of the enterprise. At present, BYD's new energy electric vehicles have become important products in the domestic and foreign markets, demonstrating the great potential and effectiveness of green finance in supporting low-carbon innovation and corporate green transformation.

4.2. Specific impact of green finance on low-carbon innovation

In the case of BYD, green finance's support for low-carbon innovation is mainly reflected in the following aspects. First, green credit provides sufficient financial guarantee, enabling BYD to increase its investment in the research and development of new energy vehicles and develop a series of low-carbon products with market competitiveness. Secondly, the preferential interest rates and policy exemptions of green credit significantly reduce BYD's financing costs, improve the economic benefits of the project, and enhance the company's investment willingness and ability. Ultimately, this green loan not only helped BYD achieve technological breakthroughs and product innovation, but also promoted the rapid development of the new energy vehicle market, making an important contribution to the low-carbon economy.

Summarizing the successful experience and lessons of this case, we can find that in promoting low-carbon innovation, green finance, in addition to providing financial support, also needs clear green standards and strict evaluation mechanisms to ensure that funds are used for real green projects. At the same time, policy support and market response are also crucial. BYD's successful experience shows that when companies use green financial tools, they should focus on the coordinated promotion of technology research and development and market promotion to achieve a win-win situation for economic and environmental benefits. In this way, green finance can better promote the green transformation of enterprises and promote the sustainable development of a low-carbon economy.

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5. Countermeasures and Suggestions

5.1. Support and guidance from the government

The government plays an important role in supporting and guiding the development of green finance. First, the government should formulate and improve policies and regulations related to green finance to provide legal guarantees and institutional support for the development of green finance. This includes formulating standards and guidelines for green finance to ensure the standardization and transparency of green financial products. Second, the government should encourage and guide the flow of funds to green projects through fiscal policies and tax incentives. For example, tax exemptions can be provided for the issuance of green bonds, and financial subsidies and interest-free loans can be provided to enterprises and projects that meet green standards. In addition, the government should increase investment in green financial infrastructure, establish and improve the green financial information disclosure system and environmental performance evaluation system, improve market transparency, and enhance investor confidence.

5.2. Participation of financial institutions

Financial institutions play a key role in green finance, and their participation and support are important forces in promoting the development of green finance. Financial institutions should actively participate in the innovation and promotion of green financial products, and develop diversified green financial instruments, such as green credit, green bonds, green funds, etc., to meet the financing needs of different types of enterprises and projects. At the same time, financial institutions should strengthen the risk management of green finance, and ensure the sustainability and environmental benefits of green financial projects by introducing environmental risk assessment and environmental performance indicators. In addition, financial institutions should strengthen cooperation with the government, enterprises and other stakeholders, build a coordinated development mechanism for green finance, and jointly promote the development of a low-carbon economy.

5.3. Green development strategy of enterprises

With the support of green finance, enterprises should formulate and implement effective low-carbon innovation strategies to promote their own green transformation and sustainable development. First, enterprises should actively use green financial tools to obtain low-cost financial support and invest in low-carbon technology research and development and green project construction. Secondly, enterprises should establish and improve green management systems, incorporate environmental protection and resource conservation into corporate strategy and operational management, and enhance overall green competitiveness. In addition, enterprises should actively carry out green cooperation, cooperate with upstream and downstream enterprises, scientific research institutions and financial institutions, and form a green industrial chain and innovation ecosystem. Through these strategies, enterprises can not only achieve their own green development goals, but also contribute to the sustainable development of society.

6. Conclusion and Outlook

6.1. Research conclusions

This study systematically analyzes the comprehensive impact of green finance on low-carbon innovation in the real economy. The study shows that green finance has significantly promoted the process of low-carbon innovation through various mechanisms such as providing financial support, reducing financing costs, promoting green transformation of enterprises, and promoting market development. Specifically, green finance provides sufficient financial

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guarantees and preferential policies for low-carbon innovation projects, reduces the financing costs of enterprises, and encourages enterprises to increase investment in low-carbon technology research and development. In addition, the development of the green financial market has not only promoted the promotion and application of low-carbon technologies, but also increased the public's attention and recognition of green investment. In general, green finance has played an important role in promoting the development of a low-carbon economy, promoting environmental protection, and achieving sustainable development.

6.2. Future research directions

Future research can further explore the following potential areas. First, we can conduct in-depth research on the specific impacts and differences of different types of green financial instruments on low-carbon innovation, revealing their applicability and effects in different industries and projects. Second, we can study the development models and experiences of green finance in different countries and regions, compare and analyze the differences in their policies and market mechanisms, and find best practices. In addition, future research can also focus on the synergy between green finance and other sustainable development financial instruments, and explore the comprehensive role of diversified financial means in promoting low-carbon innovation. In terms of research methods, we can adopt a combination of big data analysis, case studies and empirical research to improve the scientificity and reliability of the research and further reveal the impact mechanism and effect of green finance on low-carbon innovation.

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References

[1] Zeng Peng, Shang Lingjie. Analysis of the integration level of scientific and technological innovation and real economy in China's cities and its spatiotemporal characteristics[J]. Economic Geography, 2024, 44(04): 110-120.

[2] Pu Mo, Li Yan, Meng Qingbin, Gao Yingfan. Analysis on the innovation capability of technology-intensive enterprises and its impact on the real economy[J]. Science and Technology Management Research, 2024, 44(07): 27-34.

[3] Zhou Bing, Li Yi. The impact of coupling coordination between green finance and technological innovation on the development of low-carbon economy[J]. Economic and Management Research, 2024, 45(03): 3-22.

[4] Zhu Zhujun, Yuan Yiming, Xu Ming, Chai Binfeng. Digital finance, path breakthrough and high-quality innovation in manufacturing industry - On the innovation-driven path of financial services for the real economy[J]. Journal of Quantitative and Technical Economics, 2024, 41(04): 68-88.

[5] Chen Qian, Zhang Shuo, Xu Ke. Research on fiscal and financial support for green and low-carbon technology innovation: Based on the perspective of technology maturity[J]. Southwest Finance, 2024, (01): 29-42.

[6] Zhou Lei, Zhang Xin, Dong Ke. Does digital financial innovation help promote the high-quality development of the real economy? - Mechanism analysis and spatial measurement based on financial service efficiency [J]. Journal of Xi'an University of Finance and Economics, 2024, 37(01): 60-72.

[7] Lv Yue, Chen Yongchang, Zhang Haotian, Zhu Zhujun. E-commerce platforms and innovation of manufacturing enterprises: On the innovation-driven path of deep integration of digital economy and real economy[J]. Economic Research, 2023, 58(08): 174-190.

ISSN: 2710-0588

[8] Zhang Hongrui, Wu Ping. Spatial spillover effect of green credit on carbon emissions: an analysis based on the regulatory effect of environmental supervision[J]. Southwest Finance, 2023, (08): 18-31.

[9] Liu Hui, Wang Yueying. "Digital-real integration" drives the innovative development of the real economy: analytical framework and promotion strategy[J]. Economic Perspectives, 2023, (05): 59-67.

[10] Shi Dan, Sun Guanglin. The impact of the integration of digital economy and real economy on green innovation[J]. Reform, 2023, (02): 1-13.