Research on Green Finance in the Context of Dual-Carbon Strategy

Mohan Wu[a]
School of Applied Mathematics, Shanxi University of Finance and Economics, Taiyuan City, Shanxi Province 030000 China

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Abstract: As the global climate change problem gets more serious, carbon neutrality has become an important issue. And green finance is a bridge between economy and environment. Green finance to support carbon neutrality is the focus of current research. Therefore, this study summarizes the present application of green financial tools from domestic research on green finance. This article shows that green financial tools primarily involve green credit, bonds as well as taxes, which can help the dual-carbon strategy. In addition, different tools and their combinations can help the dual-carbon strategy to a different extent and to various regions. At the regional level, Green finance helps to reduce carbon emissions by updating and streamlining the industrial structure., promoting energy transformation and enhancing resource utilization. At the same time, at the enterprise level, it helps the dual-carbon strategy by raising enterprises' awareness of environmental protection, easing financing constraints and improving productivity. However, Research on green financing to achieve carbon neutrality and reduce emissions lags behind leading countries, unevenly distributed, and thin in connotation, which will help future scholars' research.

1 INTRODUCTION

With the increase in carbon dioxide emissions in recent years, extreme weather events such as extreme heat and extreme precipitation are occurring more frequently, which greatly impacts people's daily lives. China has proposed a dual-carbon strategy to mitigate extreme weather problems. It is estimated that more than 10 billion dollars are needed to realize this policy, 90% of which needs to be provided by the capital market centered on commercial banks (Qiao, 2024). However, the traditional financial model, based on the business law of unlimited environmental capacity, is not able to sustain the supply of appropriate capital. Traditional financial industry enterprises pollute the environment, waste of resources, sloppy business model, cannot achieve sustainable development, and in the allocation of funds are often oriented to economic efficiency. Green finance is becoming a financial innovation in the financial sector. Traditional financing's shortcomings can be overcome and the capital needs of the environmental protection industry can be met.

Green finance and dual-carbon strategies research has been highly regarded by many scholars in recent years. And a series of excellent research results in various aspects have emerged, covering the realization path of green finance to help carbon emission reduction in the context of dual-carbon. The concept of green finance has been reviewed by some scholars due to the high attention given to it, its comparison with traditional finance and its constraints, etc., and summarized the relevant results regarding the connotation, role, policy and development status of green finance, etc. In this thesis, the author will summarize the appropriate results from the perspective of green finance.

Based on this, this paper will focus on summarizing the influence of financial instruments related to green finance on the dual-carbon strategy and the ways of green finance to help carbon emission reduction from the relevant domestic research on green finance and systematically sorting out the relevant research results of green finance to help carbon emission reduction. However, Green finance research to support carbon neutrality and carbon emission still has some shortcomings reduction, and

[a] https://orcid.org/0009-0006-8592-4457

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further deepening research, perfecting research and innovative research are needed.

2 THE RESEARCH LINEAGE OF GREEN FINANCE

Green finance is crucial in promoting economic transformation to green and low-carbon development and realizing sustainable development by directing the flow of funds towards protecting the environment and sustainable development. During the period between the end of the 20th century and the start of the 21st century, China has not yet started the research and practice of green finance. Relevant research is only in the embryonic stage; some scholars have put forward the operation mechanism and implementation program of green management in China's financial industry, and some have introduced foreign research results in order to carry out academic research and industry practice. Financial institutions have not yet practiced green management, and there is a lack of mechanisms for identifying, preventing and managing environmental risks in their operations.

As illustrated in Figure 1, research on the topic of green finance has gradually increased since 2013, with scholars analyzing data and reviewing investigation into the progress of green finance development at that time (Qiao, 2024). Moreover, other research fields have emphasized the importance of green finance as a measure to govern the environmental economy, which shows that the importance attached to green finance in various research fields has been further strengthened.

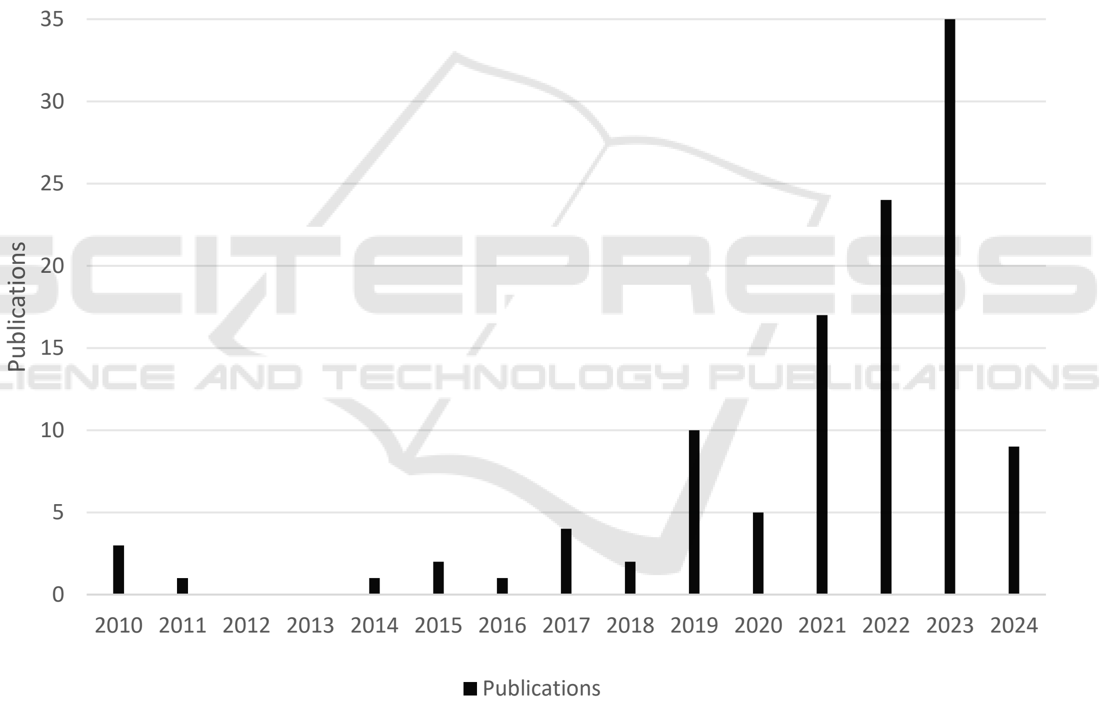

Figure 1: Histogram of 114 publications in Web of Science database under the topic of green finance, sorted by the number of publication years (Qiao, 2024).

Green finance research has become more comprehensive in recent years and is mainly divided into studies that examine how green finance and its related products affect regions and companies. These studies are summarized in the following section.

3 COMPARATIVE ANALYSIS OF THE EMISSION REDUCTION EFFECT OF GREEN FINANCIAL INSTRUMENTS

Green financial tools primarily include green credit, bonds, taxes, etc. These tools can provide the necessary financial support for green projects, accelerate renewable energy development, promote ecological protection, and other fields, promote enterprises to strengthen environmental risk management, and guide the optimal allocation of social resources.

3.1 Green credit

Green credit refers to the government's environmental economic policy to realize the goal of environmental protection through financial regulation (Zeng, 2024). This policy provides preferential credit support for technological innovation, industrial structure optimization, new energy development and other related industries or projects based on national policies (Wang, 2008). The following section will organize and summarize the research results from the perspective of fitting the above definition.

On the impact of green innovation, green credit restricts the green innovation performance of the industry to be more active, but the green innovation's quality is not obvious, and the intensity of its role has regional differences, with the strengthening of the enforcement of regional environmental laws and the protection of intellectual property rights. In terms of technological innovation, green credit mainly through R & D investment to promote the regional green technological innovation's level. Besides, green utility model patents are promoted significantly by green invention patents, but the role of green utility model patents to promote the existence of not significant.

At the corporate level, the green credit policy is reflected in the impact of heavy pollution enterprises. The implementation of this policy results in a significant financial penalty and an inhibition of investment, through optimizing energy structure, promoting technological transformation, and increasing the intensity of innovation investment to inhibit the carbon emissions' volume of the “two high” enterprises. Green credit policies hinder the green innovation of heavily polluting enterprises compared to non-heavily polluting enterprises, and to a certain extent promotes the transformation of enterprises that are heavily polluting, and performs the function of 'elimination of the fittest', which is mainly reflected in the state-owned enterprises, highly socially responsible enterprises and enterprises with high transparency of information, and in the non-state enterprises, low social responsibility enterprises and enterprises with low information transparency. It is mainly found in state-owned enterprises, high social responsibility enterprises and high information transparency enterprises, but not in enterprises not owned by the state, low social responsibility firms and low information transparency firms.

3.2 Green Bonds

Green bond is the government, financial institutions, industrial and commercial enterprises and other issuers to investors issued by the creditor's debt certificates, with legal effect, and the ultimate investment of the funds raised for the green project in line with the specified conditions, which is also different from the ordinary bonds of its nature (Chai, 2023).

Compared with ordinary bonds, green attributes can significantly reduce the credit spreads of bonds, lower the financing costs of bond issuers, and thus increase the level of environmental protection investment. This effect varies significantly among different types of green bonds, different issuers and different regulatory authorities. Green bonds also have higher capital gains, better liquidity and a “reputational spillover” effect. By increasing profitability and risk tolerance, stock liquidity is also improved.. Its issuance can also significantly increase enterprise value and have dynamic continuity. The impact of an increase in enterprise value varies depending on the geography and nature of enterprises.

The issuance of green bonds not only enables enterprises to obtain more benefits, but also substantially lowers the intensity of urban carbon emissions, and the role of emission reduction is more prominent in areas that have a higher level of financial marketization and weaker environmental regulations, and also improves urban green total factor productivity.

3.3 Green taxation

Environmental taxation, or green taxation, aims to raise funds for environmental protection through tax policy, and strengthen the environmental protection behavior of enterprises and individuals (Jia, 2002).

At the macro level, the increase in green tax revenue is conducive to the growth of gross domestic product and fixed asset investment, and can effectively reduce the urban unemployment rate and generate employment dividends, as well as a short-lived role in suppressing the rise of CPI. Some scholars divide green tax policy into “narrow” and “broad” green tax policy. Narrow green tax policy concerns those taxes levied for the intention of protecting the environment and have the strongest environmental protection function. In contrast, broad green tax policy refers to those taxes that have environmental protection function but are not levied to protect the environment. It is also pointed out that in the context of China's slowly rising carbon emissions, both narrow and broad eco-friendly tax policies have significantly suppressed China's carbon emissions, and there is an obvious path-dependent influence on carbon emissions. When the energy conservation and emission reduction policy is incorporated into the evaluation system for local governments, the inhibitory effect of the narrow-minded green tax scheme on carbon emissions is further strengthened, and the inhibitory effect of the broad-minded green tax scheme on carbon emissions begins to appear (Fu, 2008).

At the micro level, green tax policy is mainly manifested as green tax incentives. Although the benefits of green transformation of enterprises are much higher than the costs, due to the long cycle, enterprises face higher transformation costs, including the purchase of new environmental protection equipment, the creation of green processes, as well as adjusting the production structure, staff training and other aspects of the necessary expenditures. At the same time, the return brought by the transformation to enterprises is uncertain within a short period of time, and the full benefits of green transformation activities cannot be obtained, thus hindering the normal development of enterprises. As a result, China has introduced a variety of green tax incentives to promote environmental protection in recent years, giving green tax incentives to environmentally friendly industries and green behaviors of enterprises investing in environmental protection projects, and the intensity of the incentives has been increasing. And some scholars pointed out that green tax incentives by reducing the adjustment costs faced in the transition of the sustainable changes in companies to play an incentive role, and the incentive effect with The essence of ownership rights and the regional marketization process of different differences (Bi, 2019).

3.4 Comparative analysis of emission reduction effect

Some scholars combine and compare different kinds of green financial products.
For example, Jiang Hongli et al (Jiang, 2020) pointed out that green credit and green venture capital alone can inhibit emissions of carbon When both are included in the same model, Green credit and green venture capital have the same effect on carbon emission reduction in both high and low carbon emission groups, but there is a significant difference in the carbon emission reduction effect of green credit and green venture capital in the high and low green credit group.

In the empirical investigation of You Zhiting et al (You, 2022), overall each green financial business has a significant impact on reducing emissions, but the combination of green credit and green bonds shows a negative moderating effect, and the rest of the combination is a complementary effect. In the regional analysis, green industrial investment in the western region has a stronger impact on reducing emissions, but green credit is less effective. In the central region, green bonds do not significantly affect regional carbon emissions, and the complementary effect exists only between green credit and green industrial investment. In the eastern region, the single or interactive terms are significantly negatively correlated with regional emissions of carbon, and the impact of reducing emissions is optimal.

Wang et al (Leiling, 2024) analyzed different combinations of green financial instruments and concluded that The emission reduction effects of green credit and green investment were significantly higher than those of green securities and green insurance, and the main ways of emission reduction differed in various regions. Among them, emission reduction in the eastern region is significantly aided by green credit and investment, and green credit and green insurance are the main ways of the decrease in emissions in the central and western regions.

Li Boyang et al (Li, 2024) showed that renewable energy development can be significantly influenced by green credit and venture capital. Although the upgrading of the industrial structure can be aided by green credit and venture capital and incentivize green technological innovation through two channels in the development of renewable energy, but green credit on industrial structure upgrading to promote the stronger effect, while green venture capital has the ability to effectively motivate green technological innovation to improve both quality and quantity.And the development of renewable energy can be aided by the role of developed financial regions in the development of green credit and green venture capital, which are geographically different, and a high degree of marketization in the region more significant.

4 PATHWAYS AND IMPACTS OF GREEN FINANCE FOR DUAL CARBON STRATEGY

4.1 Region and industry

At the regional level, Wang Jie and Wang Jun (Wang, 2024) highlighted that the development of green finance enhances the efficiency of local energy use, but at the same time, it will result in a decrease in the efficiency of energy utilization in neighboring regions, which is not in accordance with the concept of sustainable development. Thus, some scholars conducted further research and found that a 46.72% reduction in carbon emission intensity was achieved through the establishment of pilot zones for green financial reform and innovation at the municipal and prefectural levels. The policy can successfully achieve carbon emission reduction effect through the promotion of green technological innovation and industrial structure optimization, and green financial reform and innovation pilot zone policy has a positive impact on reducing carbon emissions, which is still significantly positive under the moderating effect of environmental regulation.

Chen Yan and Li Hao (Chen, 2024) based on empirical analysis, concluded that green finance can help reduce carbon emissions by utilizing advanced industrial structures and rationalizing industrial structures, in which the indirect carbon reduction effect produced by green finance through the advanced industrial structure is comparable to the direct effect, but the indirect carbon reduction effect produced by green finance through the rationalization of industrial structure is comparable to the direct effect.Green finance's indirect carbon reduction effect can be compared to the direct effect of industrial structure rationalization, but the indirect carbon reduction effect of green finance through industrial structure rationalization is much weaker than the direct effect.

Su Xiaorong and Liu Yan (Su, 2024) discovered that the dual-carbon strategy can be aided by the use of green finance to reduce carbon emissions, promoting energy transformation and enhancing resource utilization. In terms of reducing carbon emissions, The flow of funds can be directed towards low-carbon industries and clean energy industries can be promoted through green finance. Secondly, green finance can promote the transformation and modernizing traditional industries that produce a lot of carbon dioxide, give financial assistance to the application of low-carbon technologies and energy-saving equipment, and encourage enterprises to change their production methods, reduce the use of resources and the emission of pollutants. In promoting energy transformation, the rational use of green finance can promote progress in clean energy technology and industrial development, as well as China's energy transformation. When it comes to improving the utilization rate of resources, the traditional financial system has problems such as imprecise flow of funds and unclear investment direction, while green finance establishes special green funds, green credit and other mechanisms, which makes the allocation of funds more reasonable and focuses on resources to promote ecological protection work.

4.2 Enterprises

The reduction of corporate carbon emissions can be achieved through green finance by enhancing corporate environmental awareness, as found by Xu Yan (Xu, 2024) and others, easing financing constraints to increase green investment and other channels to accomplish a decrease in carbon emissions. Meanwhile, green finance development improves enterprises' ESG performance and economic performance, realizing the 'win-win' between economic growth and protecting the environment. At the same time, the ESG scoring system has different degrees of positive impacts on listed companies in different industries, and the carbon emission intensity of various types of enterprises is affected differently by green finance. Non-state-owned enterprises have an effect on carbon emission intensity that is inhibited, non-heavily polluted enterprises and high-tech enterprises is more significant, and enterprises in first-tier cities, non-resource cities and regions with stronger basic system regulations can reduce carbon emission intensity more effectively.

Wang Yulin and Zhou Yahong (Wang, 2023) found that green financial development also has a significant role in promoting enterprise innovation, green financial development of state-owned enterprises, enterprises that are in areas with better intellectual property protection and less heavy pollution are more significant in promoting innovation, and green invention patent innovation can significantly improve the financial performance and environmental performance of enterprises.

5 CONCLUSIONS

This paper reviews the domestic research on green finance, specifically on the effect that green financial instruments have on the dual-carbon strategy and green finance to help the dual-carbon strategy in two ways to summarize.

This paper finds that carbon emissions can be effectively reduced through the use of green financial tools. The integration of various tools has different effects on carbon emission reduction, and the effects of emission reduction vary depending on the regions and enterprises involved. At the same time, it is found that the main way to reduce carbon emissions is by promoting the structural upgrading of high-carbon industries and directing capital towards industries that reduce carbon emissions. at the regional level. At the enterprise level, the dual-carbon strategy is practiced mainly through promoting enterprise innovation and alleviating financing constraints.

The future financial development will be led by green finance, a major innovation and change in the financial field. At present,the field of green finance research is still in its infancy and exploration stages, and there are still some issues that need to be resolved. First of all, in terms of research on green financial products, the gap between China and foreign leaders is still obvious. Relevant research is unevenly distributed, mostly focusing on green bonds and green credit, with lacking knowledge about other green finance products, such as green securities and green insurance. Connotation of green finance Secondly, more research needs to be conducted on the concept of green finance.The proposal of carbon neutral targets and the end of domestic environmental pollution control have made carbon finance the core of green finance. Therefore, the center of gravity of the connotation of green finance in the future needs to shift to carbon finance. Finally, green finance's realization path and product research to support carbon neutrality need to be further innovated. In regards to the implementation of green finance to achieve carbon neutrality, new innovative paths can be explored based on China's national conditions. For example, it is necessary to explore the innovation of financial products that are focused on reducing carbon emissions (including carbon credit, carbon bonds, carbon equity and carbon funds, etc.) and how green finance can be combined with financial technology and digital finance.

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