Financing Constraints, Green Innovation and Corporate Green Transformation

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Abstract. Corporate green transformation has gradually started to drive the low-carbon upgrading of the real economy, as joined in with the all-round progress of the dual-carbon strategy and develop quality economy. It's a kind of "green finance" and will help the company better solve the problems that need to be solved during the transformation and use green to promote development. The financing constraints, green innovation and corporate green transformation are the main research content of this paper, which is used to explain the empowering mechanism of green finance on corporate green transformation. It will systematically study the transmission path and the heterogeneous characteristics of the impact of green finance on green transformation of companies based on the development situation of domestic green finance reform and innovation pilot projects and previous academic studies. In this paper, based on comprehensive research on relevant theories and empirical results in the literature, the differences between the development of green finance in different areas will be introduced, as well as the main reasons and ways of action. From the above research, it can be concluded that green finance can relieve the financial constraints of enterprises and hence drive the development of green technology innovation. But there are significant disparities between the areas, ownership and sectors, and issues of fund inequity and poor quality of innovation remain. The goal of this paper is to enhance the theoretical system of green finance, further reform enterprises and assist enterprises in high-quality development.

Keywords: Financing constraints, green innovation, corporate green transformation, green finance.

1 Introduction

With the strengthening of global climate and the all-round promotion of China's "dual-carbon" goals, the green transformation of enterprises is now needed to promote high-quality economic development and achieve sustainable development. Green finance, as one of the key bridges between financial resources and low-carbon development, can direct social funds to low-carbon, environmentally friendly, energy-saving development sectors through issuing different types of green credit, bond and fund instruments. It can provide some organised financial assistance for the green transformation of enterprises and act as a policy tool to facilitate the green

© The Author(s) 2026
L. C. Yoong (ed.), *Proceedings of the 2026 2nd International Conference on Financial Innovation and Marketing Management (FIMM 2026)*, Advances in Economics, Business and Management Research 408,
https://doi.org/10.2991/978-94-6239-801-6_87

transformation of enterprises' industrial structure and low-carbon development of the real economy. Over the last few years, China has been continuously extending the pilot projects for reform and innovation of green finance, and continuously improving the support policy system, providing a large number of rich and typical practice cases for academic research on green finance and corporate green transformation.

Many scholars have already been studying the theoretical contents, policy effects and transmission paths of green finance in the past. Loiseau and his colleagues have systematically arranged the main contents of the green economy and related concepts at the theoretical level to lay the foundation for the theoretical definition and system construction of green finance [1]. In empirical research on the effectiveness of green finance policies, DID methods and fixed effects models are often used. Shi and others have found that the reform and innovation pilot projects can efficiency reduced the debt financing costs of heavy-polluting enterprises [2]. Lyu and others have found that the policy of green finance can help enterprises develop in a green manner and reduce financing difficulties caused by the process of green transition [3]. According to the production data of Wang, green finance can increase the green innovation efficiency of manufacturing to a certain extent [4]. Du and others have also found that policy has promoted the motivation for technology innovation and improved the financial health of enterprises [5]. Green finance will also help to change the mode of investment and financing for enterprises and promote the green transformation of industries to drive green development in the real economy. Research has shown that the effects of policies vary in different areas, are spread out unevenly across many industries, and change according to the stage of their own economic development and the extent of environmental protection.

Although many good achievements have been made in the field of research on green finance, there are still some deficiencies; first of all, most of the studies have not considered the entire process of corporate green transformation and have only focused on some specific parts, such as innovation and financing. Second, there are no studies on the long-term dynamic effects and synergistic effects of various policies; thus, the long-term impact of green finance on corporate green transformation is not well known. Finally, the differentiation mechanisms and transmission paths of green finance have not yet been studied and determined. Based on the above analysis, this paper will be organised to present the research path of green finance for promoting corporate green transformation in an organised way, comprehensively examine the current achievements and deficiencies in research, and, in light of actual circumstances in China, put forward some future research directions that can provide solid theoretical support and empirical basis for strengthening the green finance policy system and promoting high-quality green transformation of enterprises.

2 Current Situation of Industrial Green Transformation and Development of Green Finance

In line with the dual-carbon strategy and the goal of high-quality development, enterprises across the country have been making all-weather improvements to the green

transformation and development of green finance. At the top level, the policy system is being continually strengthened; at the same time, market forms are gradually expanding, the speed of industrial structural reform is increasing steadily, and therefore the general development pattern of finance supporting the green transformation of the real economy is taking shape. At the level of policy, China has built an all-round institutional system for green credit, green bonds, carbon finance and transition finance, and green finance has been officially listed as one of the main directions of financial services for the real economy. Support has been provided for the regulation of assessments, standards and norms, as well as incentive measures, and these have gradually moved from the top-down planning stage to regular operation, laying the foundation for the enterprises' green transformation in all sectors. At the market level, the Chinese green finance market has been world-leading, and the amount of core green credit and green bond products is growing steadily; at the same time, all kinds of carbon finance instruments, green funds and ESG investment products are being constantly innovated and expanded. Over time, the proportion of funds in the financial market for green industry, low-carbon transformation and ecological governance projects has gradually increased; thus, enterprises are now more easily able to obtain financing to move towards green development. At the level of the industry and enterprises, a general trend of green transformation in the macroeconomy is also being shown. The old industries use a large amount of energy and produce many pollutants; thus, energy-saving and pollution-control efforts are being strengthened in China's manufacturing sector. The agglomeration effect of green industries, such as new energy, energy saving and conservation, environmental protection and the circular economy, is still relatively strong. With the development of awareness and motivation in all sectors of society for green development and low-carbon innovation, passive compliance is gradually being replaced by active improvement of green quality and energy efficiency. At the level of macroeconomics, however, the development of green transformation and green finance in China has not been well-balanced or comprehensive. The Speed of green transformation in the industries differs from one another at various times and places. The efficiency of green finance resource allocation and the effect of policy transmission are not the same. Cooperation between financial services and the green development of the real economy has not yet been realised to the full extent.

Green finance has been developed to different extents in each province since the pilot zones were set up for the reform and innovation of green finance in 2017. The two pilot areas in Zhejiang and Guangdong have been included in the first round and expanded, and there are different levels in the scale of green credit, green bond issuance and innovation of carbon finance instruments. Eastern coastal provinces have been better developed with their financial markets, and have received better policy support, thus leading the way in deepening green finance. Pilot areas in the central and western parts of China have been equipped with all kinds of resources, and more focus is placed on supplying adequate financial resources to new-energy industries and ecological restoration projects. Wang and others' data from 2023 show that green finance can boost the efficiency of green innovation in the manufacturing industry; however, due to different financial infrastructures, the spread of policy among provinces is not uniform.

The three reasons for the development of green finance are as follows: First, the scope of financial marketisation. To a certain extent, there will be a reduced corporate financing constraint for the company under the green finance policy, but it will not be substantial. Second, the Strength of Local Government Environmental Regulations. Du and others have shown in their study that green finance policies can promote the development of green technology and improve the financial health of enterprises through incentives, and it has been found that an integrated approach of environmental regulations and green finance can help high-polluting industries transform [5]. Third, the characteristics of the regional industrial structure. Provinces with a large number of new-energy industries will be more likely to form a virtuous cycle of green finance and industrial upgrading. Green Finance and Industrial Reorganisation are also linked in an all-weather way with environmental policy. The combination of the aforementioned parties will be in line with the government and public environmental demands.

3 The Impact of Financing Constraints and Green Innovation on Corporate Green Development.

Enterprises' Green transformation is not only about technological innovation but also an all-round, low-carbon upgrading plan for the entire industrial chain that requires the joint efforts and strong capital support of all parties to the process. It should be supported by strong funding and the foundational green-technology enterprises at this time. Without either of them, people would not be able to carry out and improve quality. Based on the current cutting-edge research in academia and the actual situations of enterprise reform, capital barriers and the power of innovation are the two main factors that directly affect the progress and results of enterprises' green development. At the same time, the two are not independent but are connected in a closed-loop manner of linkage and transmission, carrying empowering policies of green finance to be received by the green production and operation layout of enterprises at all stages of the enterprise [3]. Based on the above, to be in line with the logic of empirical research and the underlying practical logic of enterprise transformation, it is necessary to accurately determine what kind of core impact mechanism and clarify the whole transmission path in this section by employing a progressive research method and conducting layered analysis in sequence: First, focus on the main obstacles in advance and investigate in depth how rigid barriers to financing constraints directly restrict enterprises' green transformation and what relieving-and-regulating roles green finance can play. Secondly, will study the main endogenous driving forces and investigate how the value of green innovation's core empowerment path can enhance the quality of green transformation and point out current deficiencies in innovation. Finally, link the two main variables, analyse the intermediary transmission logic between them, clarify the entire chain of "financing relief - improvement in innovation quality - empowerment transformation", and strengthen the foundation for theoretical mechanism analysis of this study.

3.1 Financing Constraints

Financing constraints are considered to be the primary reason that enterprises have been unable to carry out green change. Green Innovation activities are usually high-R&D enterprises that require a large amount of investment and have a long cycle. In addition, the positive externalities that will be produced are also relatively large. Therefore, the funding gap for enterprises is relatively larger than that in the general innovation [5]. Green finance policies have used all sorts of channels to ease the financing constraints; Shi and others in 2022 found that, through credit, the reform and innovation pilot projects for green finance can reduce the debt financing costs of high-polluting enterprises to some extent [2], and special green credit quotas will be released in the pilot areas to further expand enterprise financing channels; at the level of direct financing, green bonds and equity financing can bring different sources of funds to enterprises [6].

Lyu and others found in a 2024 paper that the green finance policies have a promoting impact on enterprises' green development and can also ease the financial constraints enterprises face in the process of going green to a certain extent [3]. Moreover, the extent of the reduction is different. In other words, non-state-owned enterprises with a management team that has a financial background and are located in an area that is relatively high in marketisation will be more affected by this policy.

3.2 Green Innovation

Green innovation is one of the major means to achieve the green development goals of enterprises. Based on previous research, the impact of green finance policies on innovation has been analysed from both quantity and quality. In addition, under the green credit policy, the number of green patent applications submitted by enterprises has significantly increased, and the policy of green finance reform and innovation pilot zones has also promoted green technology innovation of enterprises to a certain extent [4, 5, 7]. In 2023, Wang applied the DID method in his paper. From the above analysis and various tests, it can be concluded that the policies have improved the green innovation efficiency in the manufacturing industry [4]. However, it should also be noted that some enterprises still tend to focus on the quantity of innovation activities at the expense of quality, and their original innovation needs need to be further strengthened and optimised.

3.3 Relationship

Financing Constraints are related to green innovation in some way. The chain of green finance policies is to loosen financing restrictions, promote green innovation and green transformation. These policies will decrease the financing costs of enterprises, thereby freeing up more funds for investment in research and development; therefore, it will promote the output of innovation [2, 3, 5]. Lyu and others found in their 2023 study that the two primary core transmission paths of the policy on the development of enterprises are financing constraints and green innovation [3]. Green finance can also

support the construction and operation of green enterprises, promote the sustainable development of industries, increase investment and financing, etc. Research shows that there will be some differences in the effects of the policies, and primary transmission channels have begun to be explored, such as loosened financing restrictions and promotion of green innovation [6, 8, 9].

4 Trends and Challenges in the Green Development of Enterprises.

4.1 Trends

The three characteristics of the green transformation of Chinese enterprises are: The first characteristic is that passive compliance with the policy is no longer the motivation for change, and the enterprise's own strategy is the motivation. Furthermore, it has been demonstrated that the effect of the policies on technology innovation and corporate financial performance is positive as well [5]. Second, the path towards change is no longer only about one piece of green technology, but rather greening and digitalisation. Use green finance and digital technology to address problems of the old financial system. Third, the area of the transformed region is no longer a pilot area, but has started to expand nationwide. The rich experience that has been built up in the pilot areas of green finance reform and innovation is also gradually being spread. Hua et al. examined in 2023 whether green finance can drive changes in the real economy and this paper is now frequently cited for the evaluation of green finance policies [8].

4.2 Challenges

The greening companies have numerous issues. The impact of the policy will not be equal and will be different. In this situation, state-owned enterprises and eastern enterprises have benefited more from the policy, while non-state-owned enterprises and the central and western region enterprises have relatively less benefited from the policy. It will also increase the differences in development among the regions. As can be seen from the analysis by Lyu and others, the policy effects are more pronounced in the areas of Zhejiang and Guangdong. The reaction to this policy is rather limited as industries are dominated by monopolies. There are Structural Imbalances in Green Financial Products. Meeting all financing needs of the enterprise through the indirect financing model based on green credit is not convenient. Hence, the Channels of Equity Financing to be extended. There has been no research on the long-term dynamic effects and synergy of some policies. Most of the related research was limited to short-term effects and failed to fully and comprehensively outline the long-term impact of green finance. Fourthly, the scale of the green transformation the company is doing is also quite limited. They usually only pay attention to the innovation or financing aspects, and fail to conduct a comprehensive and detailed analysis of the entire process [10].

5 Conclusion

Green Finance policies will reduce the corporate financing constraints to some extent and promote the national green development of the country by means of new-generation green technologies. There are still problems with the heterogeneity of green finance in different areas and under different kinds of enterprises, as well as relatively short-term dynamic effects. In the future, people will need to carry out more in-depth micro-level identification of the transmission mechanism, explore policies that can promote the synergy of green finance and transition finance, strengthen the systematic assessment of the entire green transformation process for enterprises to help them realise high-quality development in this area, and so on.

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