



The Path of Green Finance Promoting Industrial Upgrading: A Study Based on Regional Heterogeneity

Anfei Liu

School of Finance, Jilin University of Finance and Economics, Changchun, China
0302042315114@s.jlufe.edu.cn

Abstract. This paper explores how green finance promotes industrial upgrading and analyzes its heterogeneity across different regions. The study in this paper shows that green finance drives industrial upgrading through mechanisms such as capital guidance, technological innovation incentives, and risk prevention and control, but its effectiveness is affected by factors like regional economic foundations, industrial structures, and policy implementation capabilities. Among them, the eastern region has achieved remarkable results in green finance due to its sound financial system and optimized industrial structure; while the central and western regions have relatively limited effectiveness because of weak infrastructure and insufficient policy implementation. The research reveals the key role of green finance in promoting the development of high-value-added industries and emphasizes the need to formulate differentiated policies based on regional characteristics. Finally, the core conclusion drawn in this paper is that green finance drives industrial upgrading through both technological and structural pathways, but there is significant regional heterogeneity.

Keywords: Green Finance, Industrial Upgrading, Regional Heterogeneity, Policy Effects, Industrial Upgrading.

1 Introduction

Global climate change is profoundly reshaping the paradigm of economic development, and the international consensus on carbon neutrality goals has spurred systematic policy changes. Green finance has emerged as a key policy tool. Its core function is to reconstruct the logic of capital factor allocation and guide the transfer of funds from high-carbon fields to clean technology fields through environmental risk pricing mechanisms. According to data from the Bank for International Settlements, the global issuance of green bonds will exceed \$600 billion in 2023, with China becoming the largest issuer with a 35% share, demonstrating policy-driven market response. This capital reallocation not only alleviates the climate financing gap but also drives industrial transformation by changing the factor cost structure, forming a synergistic effect of environmental regulation and market incentives. It is worth noting that the uneven regional development in China has led to the differentiation of industrial upgrading paths. The proportion of high-tech industries in the Yangtze River Delta region reaches 42%,

while the northwest region is still dominated by energy and raw materials. This structural difference determines that green finance policies must implement precise regional adaptation.

The essence of industrial upgrading is the process of improving factor productivity and transitioning the value chain position, and green finance drives this process through a triple transmission mechanism. In terms of capital guidance, the central bank's targeted reserve requirement ratio reduction tool and green credit MPA assessment form a policy combination punch, which reduces the financing cost of clean technology enterprises by 1.5-2.8 percentage points compared to traditional industries, effectively solving the "valley of death" dilemma of technology transformation. At the level of technological innovation, green patent pledge financing and carbon forward trading markets significantly improve the return on investment in research and development. Empirical research shows that for every 1% increase in green finance coverage, the number of green patent authorizations by enterprises increases by 0.7%. Regional heterogeneity is manifested as a significant gradient difference in policy effectiveness. In the eastern region, due to the improvement of financial infrastructure and mature industrial supporting facilities, the interest rate spread of green bond issuance is 63 basis points lower than that of the central and western regions, while underdeveloped regions are hindered by insufficient environmental information disclosure and a lack of collateral, resulting in policy transmission barriers. This difference requires the establishment of a dynamic policy toolbox, strengthening the construction of market mechanisms in developed regions, and focusing on the construction of fiscal subsidies and guarantee systems in underdeveloped regions, ultimately achieving inclusive promotion of industrial upgrading [1].

2 Concept Overview

Green finance, as an important practice of supporting environmentally sustainable development in the financial system, focuses on integrating environmental factors into financial decision-making and guiding capital towards environmentally friendly industries through market-oriented means. According to the guidelines jointly issued by seven ministries and commissions, including the People's Bank of China, green finance is defined as financial services provided by economic activities that support environmental improvement, climate change, and efficient use of resources [2]. This concept goes beyond the single economic goal of traditional finance and emphasizes the dual functions of internalizing environmental risks and transforming ecological values [3]. In practice, green financial instruments are diversified, including targeted support for clean energy projects through green credit, long-term financing for ecological infrastructure through green bonds, carbon pricing mechanisms formed by environmental equity trading markets, and capital market reallocation driven by ESG investment standards. These tools reduce the financing costs and risk premiums of green projects, promote the transfer of production factors to the clean technology field, and form a capital-guided "green premium".

The upgrading of industries is manifested as the transition of industrial structure from resource-dependent to knowledge-intensive, and from low-end to high-end in the value chain. Its connotation covers three dimensions: increasing technology intensity, increasing value-added rate, and reducing environmental load. Specifically, it is manifested as an increase in R&D investment intensity, an increase in the proportion of high-tech industries, and a decrease in carbon emission intensity per unit of GDP. The academic community usually uses a composite system of industrial structure elevation index, total factor productivity contribution rate, and ecological efficiency index to measure. This structural transformation not only relies on spontaneous market adjustments but also requires the financial system to correct environmental externalities through differentiated pricing mechanisms, providing capital support for green technology innovation and industrial ecological transformation. It is worth noting that the process of industrial upgrading has spatial differentiation characteristics, and different regions present unique transformation paths due to differences in factor endowments and development stages [4].

Regional heterogeneity is a key factor affecting the differences in the effectiveness of green finance policies, stemming from the uneven distribution of economic foundations, institutional environments, and resource endowments within geographic space. This heterogeneity affects the industrial upgrading efficiency of green finance through the demand side, supply side, and policy transmission levels. On the demand side, the characteristics of regional industrial structure determine the ability to undertake green financing; on the supply side, the completeness of financial infrastructure constrains the efficiency of capital allocation; at the level of policy transmission, the differences in the intensity of local government environmental regulations and financial regulatory capabilities lead to the differentiation of policy implementation effects. For example, developed eastern regions can more efficiently connect green capital with technological innovation through mature capital markets and digital financial tools; however, the central and western regions are limited by traditional industrial path dependence and insufficient financial intermediary services, and need to break through the bottleneck of transformation through policy compensation mechanisms. Therefore, green finance policies must be dynamically adapted to regional comparative advantages to fully leverage their role in industrial upgrading [5].

3 Theoretical Analysis

From the perspective of the intersection of economics and environmental science, the theoretical framework for promoting industrial upgrading through green finance needs to integrate externalities theory, resource constraint theory, and industrial structure evolution theory. Environmental economics emphasizes the negative externalities of the environment caused by market failures, while green finance internalizes environmental costs through pricing mechanisms such as differentiated interest rates for green loans and carbon emissions trading, correcting the high pollution production models of traditional industries. The theory of financial development reveals the core function of green financial instruments (green bonds, ESG investments) in optimizing capital allocation,

guiding scarce financial resources to flow from high energy-consuming and low value-added industries to clean technology and knowledge-intensive industries, and driving the reset of production factors. From the perspective of industrial ecology, this resource reallocation triggers collaborative evolution within the industrial system - traditional industries upgrade their processes through green technology transformation, while emerging green industries rely on financial support to form economies of scale, jointly promoting the upgrading of the value chain position.

Regional heterogeneity constitutes a key moderating variable in the theoretical framework, and its mechanism of action exhibits three-dimensional characteristics [6]. The difference in economic development level directly affects the penetration depth of green finance: mature capital markets in high-income areas can efficiently transform green finance policies into industrial investments, while underdeveloped areas weaken the policy transmission effect due to financial repression. The industrial structure determines the transformation path, and the eastern region is mainly focused on the service industry and high-tech, which is more conducive to meeting the digital and low-carbon needs of green finance. The proportion of heavy industry in the central and western regions is high, facing difficulties in capacity substitution and technology lock-in. The differences in policy implementation exacerbate regional differentiation. Empirical evidence shows that the eastern region can better implement green credit standards due to improved regulation, while the central and western regions have weakened policy effectiveness due to insufficient evaluation and information disclosure capabilities. This also explains why the promotion of green finance for industrial structure upgrading is more evident in the western region - areas with low levels of financial development mainly show growth in "quantity", while high-level areas achieve a dual improvement in "quality" and "quantity".

4 The Mechanism of Green Finance in Industrial Upgrading

Green finance effectively promotes industrial upgrading through capital guidance mechanisms, which involve policy tools, market operations, and financial innovation. At the policy level, the government uses incentive measures such as tax incentives, fiscal subsidies, and loan interest subsidies to guide capital towards green technology and high-value-added industries, such as technological innovation and advanced manufacturing [7]. In terms of market mechanisms, it will improve the capital market system, increase the proportion of direct financing, provide diversified financing channels for different enterprises, strengthen information disclosure and investor protection, and enhance market transparency [8]. Financial innovation, such as equity crowdfunding and intellectual property pledge financing, has expanded the funding sources for technology-based enterprises, optimized capital allocation efficiency through financial technology, and promoted the tilt of resources towards green industries. This mechanism has achieved significant results in the eastern region, but the central and western regions are constrained by insufficient infrastructure and require differentiated policy support.

The risk prevention and control mechanism ensures the stable operation of green finance in the process of industrial upgrading, covering regulatory policies, internal controls, and market constraints. At the regulatory level, the government strictly implements policies to prevent emerging financial risks, such as shadow banking and Internet financial supervision, to prevent systemic risks. There are regional differences in the development of green finance in China, with the eastern region driving the central and western regions through spatial spillover effects, forming a coordinated risk prevention and control. Internal control of financial institutions is crucial. Establishing sound risk management systems and processes, strengthening employee training to enhance risk awareness, and ensuring financial stability. Market constraints emphasize improving transparency and fairness, cracking down on market manipulation, and enhancing self-protection capabilities through investor education. Empirical evidence shows that the risk prevention and control system in the eastern region is sound, supporting the effectiveness of green finance, while the central and western regions need to strengthen policy implementation to address heterogeneity challenges [9].

Technological innovation incentives are the core path for green finance to drive industrial upgrading, stimulating enterprise innovation vitality through policy support, capital investment, and talent cultivation. In terms of policy, the additional deduction of research and development expenses and tax incentives for high-tech enterprises reduce innovation costs, and intellectual property protection creates a legal environment to ensure innovation benefits. Descriptive statistical analysis shows that there is a significant positive correlation between the level of green transformation of Chinese enterprises and the development of regional financial technology. Financial technology alleviates financing constraints and enhances innovation capabilities; For example, the construction of a full lifecycle service system for technology finance solutions in the banking and insurance industries promotes the transformation of technological achievements. In terms of capital investment, innovation funds and venture capital provide stable support, while social capital participates to accelerate technological iteration. In terms of technology, green financing encourages enterprises to adopt advanced environmental protection technologies, improve production efficiency and product added value [10]. Strengthening the cooperation between industry, academia and research in talent cultivation, introducing high-level talents to enhance innovation efficiency, empirical evidence shows that the synergy effect of financial technology in the eastern region is obvious, driving green upgrading of enterprises, while the central and western regions need to strengthen basic investment to narrow the gap.

5 Conclusion

Green finance plays a core role in promoting the process of industrial upgrading, guiding the flow of funds to high-value-added industries through optimizing resource allocation mechanisms, and significantly promoting the optimization and upgrading of the industrial structure. Green financial instruments such as green bonds and green loans provide financial support for low-carbon technology research and clean energy projects, driving traditional industries to transform towards green and intelligent directions.

This process is reflected in the dual path drive of technology and structure: green financing plays an incentive role at the technical level, prompting enterprises to adopt advanced environmental protection technologies, thereby improving production efficiency and product added value; At the structural level, risk prevention and control mechanisms are used to constrain the expansion of high polluting industries, while supporting strategic emerging industries such as new energy and high-end manufacturing, to achieve the upward movement of the industrial value chain towards the high-end. Empirical research has shown that green finance policies effectively reduce energy consumption and carbon emission intensity per unit of GDP, enhancing the resilience of sustainable economic development. The effectiveness of policies highly depends on the maturity of financial markets and industrial foundations, and uneven regional development leads to significant differences in implementation efficiency.

Regional heterogeneity plays a crucial regulatory role in the effectiveness of green finance policies. In the eastern region, with a sound financial infrastructure and high degree of digital synergy, green finance has formed economies of scale and promoted rapid industrial upgrading. On the contrary, the central and western regions are limited by a weak financial system and a single industrial structure, and policy implementation faces challenges such as narrow financing channels and a shortage of technical talents, which weakens the guiding role of green finance. Future policy formulation needs to strengthen differentiation strategies: for the eastern region, deepen the integration of digitalization and green finance, optimize incentive mechanisms to consolidate innovation advantages; for the central and western regions, increase infrastructure investment and policy support, and promote cross-regional flow of funds and technology through regional coordination and cooperation. Improve the regulatory framework for green finance, including environmental risk assessment and carbon trading mechanisms, to ensure policy sustainability and promote the balanced achievement of national industrial upgrading goals.

References

1. Zhang, G.: The heterogeneous role of green finance on industrial structure upgrading - based on spatial spillover perspective. *Finance Research Letters* **5**(8), 104596 (2023)
2. Wang, X., Wang, Q.: Research on the impact of green finance on the upgrading of China's regional industrial structure from the perspective of sustainable development. *Resources Policy* **7**(4), 102436 (2021)
3. Kong, H., Xu, Y., Zhang, R., et al.: Research on the upgrading of China's regional industrial structure based on the perspective of green finance. *Frontiers in Environmental Science* **11** (4), 10-12 (2023)
4. Zhao, K., Wu, C., Liu, J., Liu, Y.: Green finance, green technology innovation and the upgrading of China's industrial structure: a study from the perspective of heterogeneous environmental regulation. *Sustainability* **16**(8), 3-10 (2024)
5. Zhu, M., Sun, M., Elahi, E., et al.: Analyzing the relationship between green finance and agricultural industrial upgrading: a panel data study of 31 provinces in China. *Sustainability* **1**(5), 8-13 (2023)

6. Sun, W., Li, Q.: Analysis of the practical path of digital economy promoting green and high-quality development. *Journal of Yancheng Normal University (Humanities and Social Sciences)* **43**(6), 48-56 (2023)
7. Hu, H.: Green financial impact on the area of green technology innovation research. *Changchun University of Science and Technology* **4**(6), 4-6 (2022)
8. He, Q.: Research on the impact of regional financial structure optimization on industrial structure upgrading. *Henan University of Technology* **6**(15), 122-124 (2018)
9. Xie, X., Yan, S.: Research on the spatial spillover effects and path mechanisms of green finance driving high-quality economic development. *Wuhan Finance* **8**(10), 22-34 (2021).
10. Liu, X.: The industrial structure upgrading effect and heterogeneity of county-level fiscal and financial services: an empirical study based on dynamic panel quantile regression model. *Chongqing Social Science* **6**(10), 79-89 (2020)

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