



Analysing the Effects of Green Finance on China's Low-Carbon Transition

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Abstract. This essay explores the impact of green finance on China's low-carbon economic transition. Green finance, defined as financial activities aimed at achieving better environmental outcomes, has become a crucial tool in promoting sustainable development. The paper highlights the positive role of green finance in supporting green technology innovation, providing financial resources, and encouraging enterprises to adopt environmentally friendly practices. It also discusses the challenges, such as spatial spillover effects, threshold effects, and information asymmetry, which can limit the effectiveness of green finance. The essay concludes that while green finance significantly contributes to China's low-carbon transition, its positive impact diminishes beyond a certain threshold. The findings suggest that clear definitions, standards, and risk management are essential for the sustainable development of green finance, both in China and globally.

Keywords: Green Finance, Low-Carbon Transition, Green Technology Innovation, Environmental Sustainability.

1 Introduction to Green Finance and Low-Carbon Transition

Since the second Industrial Revolution, technological change has promoted the development of human society. People have begun to widely use fossil energy in production and life. However, with the use of fossil energy, a large amount of greenhouse gases have been released into the environment, resulting in global warming [5]. At present, global warming has become a major challenge facing mankind, and low-carbon transformation is an important way to deal with this challenge. In this context, green finance came into being and has become an important financial tool to promote low-carbon transformation. Green finance can be defined as any structured financial activity, product, or service that is created to ensure better environmental outcomes [2].

In 2021, China's total economy has become the world's second largest economy, and with its rapid development, carbon emissions continue to grow, which has a significant impact on the global climate [3]. However, the pace of the low-carbon transition is accelerating. Green finance policies have been vigorously promoted and implemented in China. Therefore, studying the impact of green finance on China's low-carbon

transformation can not only see the role of green finance on the low-carbon transformation of the economy, but also provide relevant solutions for other countries [6]. Hence this topic needs to be discussed.

This essay aims to show that green finance will play a positive role in the low-carbon transformation of China's economy to a large extent. It will first introduce the basic concept and development process of green finance. Subsequently, the paper will focus on analyzing the positive impact of green finance on China's low-carbon transformation, as well as the challenges and problems faced in this process, and explain why the positive impact of green finance on the economy will decrease when it exceeds a certain threshold. Finally, the paper will focus on how China's approach to green finance can be adopted by other countries, and summarize the whole essay, give suggestions to promote green finance to play a better role in low-carbon transition.

2 Positive Impacts of Green Finance on China's Low-Carbon Transition

Green finance has a positive impact on the low-carbon transformation of China's economy [5], which can provide financial resources and financial services by encouraging and supporting the research and development and application of green technologies, therefore encouraging enterprises to carry out technological innovation and develop more environmentally friendly and efficient production methods and products [6]. This process aligns with the "directionality" hypothesis in innovation economics, where targeted financial incentives redirect corporate R&D priorities toward sustainability-oriented technological trajectories. This includes policy support, financial resource support, and financial service innovation, such as promoting green credit and green bonds. Policy instruments like preferential interest rates for green loans and tax exemptions for green bond issuances create a self-reinforcing cycle: lower financing costs attract more enterprises to adopt clean technologies, which in turn expands the market scale and further reduces technology costs through learning-by-doing effects.

By providing green credit, financial institutions support the research, development and application of green technologies in the fields of clean energy, energy conservation and environmental protection [4]. The screening criteria for green credit inherently prioritize projects with long-term environmental externalities, thereby internalizing ecological costs that traditional financing models often neglect. For instance, renewable energy projects requiring high upfront capital but offering stable lifecycle returns become more viable through tailored repayment schedules linked to energy output. Green bonds can also be issued to raise funds for green technology research and development and application projects. By issuing green bonds, enterprises or institutions promise to use the funds raised exclusively for environmental protection projects, and undergo strict audit and certification by professional institutions, which can provide more financing channels for enterprises and provide investors with sustainable investment opportunities [3]. The certification process itself acts as a signaling mechanism, distinguishing truly sustainable enterprises from those engaged in superficial

compliance, thereby reducing market noise and enhancing allocative efficiency in capital markets.

This innovation incentive not only helps to enhance the competitiveness of enterprises, but also drives the low-carbon transition of society as a whole ^[1]. Enterprises can independently develop and use financial technology means such as big data, artificial intelligence and blockchain, so that financial institutions can more efficiently identify, assess and manage green project risks, and improve the efficiency of green financial services. Blockchain's immutable ledger technology, for example, enables end-to-end traceability of green fund flows, mitigating risks of misallocation while building stakeholder trust. Similarly, machine learning algorithms trained on historical project data can predict technology commercialization risks more accurately than conventional credit scoring models. These technological enablers collectively address the "temporal mismatch" challenge in green finance—where long-term environmental benefits conflict with short-term financial return expectations—by improving risk-adjusted return profiles through data-driven decision-making.

3 Regional Effectiveness of Green Finance in China

Green finance can also support green technology innovation through ongoing economic assistance, and provides continuous financial support and risk protection for economic construction and carbon emission reduction targets ^[6]. In the specific implementation process, green finance is more effective in promoting the development of low-carbon economy in the central and western regions of China than in the eastern regions, and more effective in the economically underdeveloped regions than in the economically developed regions ^[4]. This may be because the central and western regions are the transfer areas of labor-intensive and highly polluting industries in China.

Green finance can promote the green transformation of these industries by meeting the main preconditions of green finance supply and realize regional low-carbon economic development. In addition, the financial base, human resources and digital infrastructure in the central and western regions are relatively weak, so the impact of green finance in these regions is more significant. Such economic assistance is often accompanied by policy support.

The government provides strong support and guarantee for the development of green finance by formulating and improving green finance policies ^[6]. These policies include financial instruments such as green credit, green bonds and green funds, as well as related tax incentives and fiscal subsidies ^[3]. These policies can reduce the costs and risks of green finance and attract more capital into the green sector, thus promoting the low-carbon transformation of the economy ^[3]. The research results show that among the above mechanisms, the impact of green finance on low-carbon economy is mainly realized through technical effects ^[4].

China has made a series of efforts to realize green finance, including the introduction of a range of green finance policies by the Chinese government to encourage financial

institutions to provide green financial services ^[1]. The government has motivated financial institutions to increase financing support for environmental protection projects through tax incentives and preferential loan interest rates. China has also established a set of green finance indicator systems to assess the performance of financial institutions in green finance. These indicators include the proportion of green loans and the scale of green bond issuance. By evaluating the green finance performance of financial institutions, they are encouraged to better develop green finance business. It can be seen that the effective implementation of green finance in China can promote the low-carbon transformation of China's economy.

In addition to the two approaches highlighted above, green finance can also guide funds from high-pollution and energy-consuming industries to more environmentally friendly and energy-saving fields through its unique resource allocation function ^[4]. Or by providing risk management and insurance services, reduce the risks and uncertainties of green projects, enhance the confidence of investors, promote the smooth implementation of green projects, and further promote the low-carbon transformation of the economy ^[2].

4 Challenges and Limitations of Green Finance

However, green finance also faces some limitations and challenges in promoting the low-carbon transition of the economy. For example, the impact of green finance on environmental pollution has spatial spillover effect and threshold effect ^[1]. This may be because the excessive development of green finance may lead to lower efficiency of resource allocation and lower return on investment. When the level of green finance exceeds a certain threshold, there may be excessive investment and waste of resources, which may reduce the willingness of enterprises to invest in low-carbon economic projects, thus reducing the contribution of green finance to the development of low-carbon economy ^[1].

However, this can be achieved through the formulation of scientific green finance policies and management measures. For example setting reasonable development goals and thresholds, strengthening supervision and monitoring, to promote the synergistic development of green finance and environmental protection ^[2]. The EU's "Do No Significant Harm" principle in its taxonomy regulation offers a reference for defining such thresholds through dynamic sectoral assessments.

In addition, green finance needs a lot of technology and information support, but in China, the problem of technology and information asymmetry still exists ^[1]. On the one hand, financial institutions and investors have limited understanding and cognition of green technologies and projects.

Green projects often involve new technologies, new industries and new models, and the environmental benefits and risks of these projects are difficult for ordinary investors to understand and evaluate. The project side may exaggerate the environmental benefits of the project or conceal the environmental risks, which makes it difficult for investors to obtain the true situation of the project ^[4]. The lack of uniform green finance stand-

ards and certification mechanisms makes it difficult for investors to identify genuine green finance products, potentially leading to misleading or fraudulent practices. On the other hand, the information asymmetry of green technologies and projects also limits the development of green finance ^[4]. Because green finance involves a wide range of fields and green projects, products and subjects, it is very difficult to identify these subjects, projects and products. This requires big data, the Internet of Things, blockchain and other financial technology means to enable green finance, but the application of these technologies is still in the initial stage. Pilot projects such as the Guangdong-Hong Kong-Macao Green Fintech Platform have demonstrated a 40% reduction in due diligence costs through blockchain-based carbon data tracing, yet nationwide adoption faces interoperability challenges across provincial regulatory systems. Fortunately, the Chinese government is actively discussing how to address such problems ^[1].

5 Conclusion and Global Implications

While the current study provides valuable insights into the role of green finance in China's low-carbon transition, several areas remain underexplored and warrant further investigation.

First, future research should delve deeper into the long-term impact of green finance on regional economic disparities. The differential effectiveness of green finance across China's regions suggests that tailored policies may be needed to ensure equitable low-carbon development. For instance, more research is needed to understand how green finance can better support the transition in less developed regions without exacerbating existing inequalities.

Second, the role of private sector involvement in green finance deserves greater attention. While government policies and public institutions have been instrumental in driving green finance, the potential of private capital to accelerate the low-carbon transition remains largely untapped. Future studies should explore innovative financial instruments and regulatory frameworks that can incentivize private investors to participate more actively in green projects.

Third, the environmental and social co-benefits of green finance should be more comprehensively assessed. Beyond carbon emissions reduction, green finance may also contribute to biodiversity conservation, pollution control, and social equity. A holistic evaluation framework that integrates these co-benefits could provide a more complete picture of the value of green finance.

Finally, international cooperation in green finance is essential for addressing global climate challenges. China's experience offers valuable lessons, but more comparative studies are needed to understand how different countries can adapt and implement green finance strategies based on their unique economic, social, and environmental contexts. Future research should focus on fostering international collaboration and knowledge-sharing to enhance the global effectiveness of green finance.

In conclusion, green finance has played a crucial role in driving the low-carbon transition of the Chinese economy ^[2], although this contribution diminishes beyond a

certain threshold^[1]. From China to the world, in order to effectively use green finance to promote low-carbon economic transformation, it is necessary to clarify the definition, standards and evaluation methods of green finance, which will help ensure the authenticity and effectiveness of green finance. Meanwhile, it is necessary to pay attention to risk management and prevention to ensure the robustness and sustainability of green finance activities^[6]. Always pay attention to the contribution of green finance to the economy should not exceed a certain threshold, so as to ensure the stability of the green financial system.

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