

The Promotion of Green Technology Innovation by the Growth of Digital Finance in China: An Analysis from the Viewpoint of Investment and Financing

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Abstract: The Chinese economy is at a crucial turning point of high-quality development and transformation. The advancement of the economic structure and the promotion of green economic development will be accelerated with the establishment of a new development model with green technological innovation at its core. Innovation in green technology has always been strongly influenced by financial development. There are now several advantages that digital financial services offers over traditional finance, opening up new avenues for the advancement of green technology. As a critical factor affecting the technological development in green innovation, investment and funding status of businesses is essential, directly affecting the operation of the financial system in the whole area of green innovation and determining the speed and quality of the advancement of China's green technology. In order to discuss digital finance's specific role in alleviating financial constraints and promoting green investment, this article principally examines, from the viewpoints of investment and financing, the impacts of China's digital finance growth on green technologies.

Keywords: green technology innovation, financing constraints, green investment, digital finance

1. Introduction

The double carbon target" has taken center stage in the latest round of international competition, and green, innovative technology is a major enabler for attaining the target of carbon neutrality. At present, China's industrialization and urbanization process has not yet been completed, and promoting green transformation of economic growth is the secret to achieving high-quality development. However, the pace of innovation in green technology tends to be generally constrained by various problems, including internal and external funding restrictions, and information asymmetry in traditional financial models, resulting in insufficient innovation momentum. The emergence of digital finance has to some extent eased the financing constraints in traditional financial markets, and the feasibility of enterprises utilizing digital finance to develop green technology innovation has significantly in-

creased. Digital finance not only drives green consumption demand and increases knowledge spillovers in the field of green technology, but also offers quick and consistent financial assistance for the whole lifecycle innovation in green technology from project inception to product marketization [1]. Therefore, innovation in green technology will be long-term driven by digital financing. Integrating digital financing and innovation in green technology is conducive to giving play to their respective advantages, reducing the investment and financing threshold, promoting the upgrading of green innovation industries, accelerating the expansion of low-carbon finances, and attaining carbon neutrality.

The study of digital financial mechanisms in the context of cutting-edge green technology is receiving more attention from academics, who are also encouraging the development of mechanisms. The elimination of corporate financial constraints, the development of the industrial structure, and the expansion of the manufacturing sector are primarily responsible for this stimulative effect. From an overall viewpoint, digital financing has the potential to improve the supply chain, reduce financial constraints on businesses engaged in green innovation and manufacturing, and grow the manufacturing industry. Digital financing can also be used to screen efficient industries, direct high-quality factors like social capital to flow towards efficient industries, encourage the modernization of industrial structures, and boost local green innovation capacities. Green technology activities require capital inflows, but the resulting financing constraints can hinder the advancement of green innovative technologies. The adoption of green technology by Chinese listed companies is positively impacted by green investment funds [2].

On the one hand, using digital financing can aid businesses with their funding needs by increasing the efficiency of fund distribution, thereby facilitating enterprise innovation. On the other hand, to create a comprehensive investment platform, digital finance in the information age depends on cutting-edge information technologies. Expanding the scale of social financing or reducing financing costs plays a role in improving the technological innovation environment. Therefore, investigating the effects of green innovative technology from the viewpoints of investment and financing is crucial.

Based on existing research, digital financing can have a favorable impact on businesses' green investments and alleviate financing constraints for enterprises [3]. Digital finance greatly affects enterprises' green innovation activities. Therefore, from the viewpoints of financing limitations and green investment, we aim to explore whether digital finance will positively influence innovation in green technology, along with the specific mechanisms of action, by summarizing existing literature. Through the research in this article, the present research regarding how future digital financing will influence innovation in green technology in terms of investment and financing is anticipated to be able to be summarized, providing direction for future research and promoting green technology innovation.

This essay is structured as follows: firstly, analyze the current state of innovation in green technologies, then, analyze the current state of digital financing and the promotion of innovation in green technologies that arises from it. Finally, summarize the analysis content and provide suggestions for future research directions.

2. Current Status of Green Technology Innovation

2.1. Analysis of the Current Situation of Green Technology Innovation

At present, the importance of green development is gradually emerging, and has become an important strategic goal and direction of my country's development, the main policies are shown in Table 1. "Made in China 2025" indicates that innovation-driven development and green development go hand in hand. "14th Five-Year Outline" clarifies the green technology innovation system, promotes the green transformation of the economy and society, and builds a blueprint for a beautiful China. Green

innovation will promote my country's economic construction and ecological civilization construction [4].

Table 1: Policies related to green technology innovation.

Year	Publisher	Policy documents	policy content
2015	State Council	"Made in China 2025"	China's first ten-year plan of action for implementing the strategy of manufacturing a powerful country has put forward the basic policy of "Innovation drives development, guarantees quality, adheres to green and sustainable development, optimizes structural upgrades, and cultivates new talents Innovation drives development, guarantees quality, adheres to green and sustainable development, optimizes structural upgrades, and cultivates new talents."
2020	State Council	"Guiding Opinions on Building a Modern Environmental Governance System"	In order to implement the deployment of the Communist Party of China, build a modern environmental system of governance led by the party committee, led by the government, and participated by the main body of enterprises, social organizations, and promote the greening of production and services.
2021	State Council	"14th Five-Year Outline"	Improvement in economic development, reform and opening up, ecological civilization and national governance. Make arrangements around "promoting development of green" and "promoting the harmonious coexistence between man and nature", and put forward requirements for "Accelerate Green Transformation".
2022	National Development and Reform Commission	"Implementation Plan for Further Improving the Market-Oriented Green Technology Innovation System (2023-2025)"	Further improve the market-oriented green system technology innovation , and accelerate the development, promotion and application of advanced energy-saving and carbon-reducing technologies.

2.2. The Development Mode of Green Technology Innovation

Under the recent development situation, this innovation which is an important strategic strategy for the government to practice development of innovation-driven, and it can promote development of high-quality economic. At present, compared with other technologies, corporate green innovation has a longer cycle, higher risk and irreversibility. When there is a gap in the lack of funds, some enterprises can gain support through financing. Therefore, digital finance is essential to the green growth business innovation [4]. The development of the global economy has effectively promoted the improvement of digital finance, and the overall scale, intensity and depth have all increased significantly in this field. Therefore, digital finance can ease financing constraints in green innovative technology, improve the resource allocation efficiency of the financial sector and upgrade the industrial structure,

and increase green investment, thereby promoting the progress of this innovation. Digital infrastructure and level continue to advance as a result of the continued digital financial development, which includes a variety of service systems and support functions. More companies will enjoy digital finance in multiple areas and in various fields. The empowerment dividend, especially under the effect of the Internet. Meanwhile, digital financial effect of incentive on corporate this innovation will be increasingly pronounced [5].

3. Digital Finance and its Impact on Green Technology Innovation from the Perspective of Investment and Financing

3.1. Current Situation of Digital Finance

Digital finance is a service mode that is integrated with digital technology and financial services, which can more conveniently fulfill customer needs through digital banking, mobile payment and other digital services. At present, digital finance has been used in many countries, and mobile payment has been very common in China, India and other countries [6]. In China, the hindering effect of traditional financial services on the upgrading has been perfected by digital finance, promoted the development of financial services by mitigating information asymmetry and other technical means, and effectively promoted the economic situation of medium and small businesses. It can also indirectly promote green innovation, and invest in some green technology innovation projects that traditional financial institutions will not agree to lend [7].

3.2. Digital Finance Encourages Green Technology Innovation by Eliminating Financial Barriers

Enterprises' financial limitations are eased, and debt financing costs are decreased, thanks to digital financial technology. According to the implementation of policies in financial pilot areas in China, increasing the financing scale to ease financial constraints will boost the quality and quantity of green creativity [8]. By lowering financial limitations and increasing research and development (R&D) spending, digital finance is able to foster innovative technology.

First, big data along with other digital financing technologies can lessen the information asymmetry between banks and businesses, easing financial limitations and encouraging the development of green technologies [9]. With more credit information about lenders available thanks to digital finance, financial institutions are better positioned to eliminate information asymmetry and fund more business innovation initiatives [10].

Second, the financing magnitude also reflects how digital finance is encouraging funding. Digital finance has expanded financing options, satiated the varied financing requirements of businesses, and let businesses carry out green technology and scientific innovation at the same time [10].

Third, some studies contend that by lowering financing costs, digital financing is able to encourage the development of innovative green technology. The growth of digital financing may foster green technology innovation in internal enterprise financing by lowering financing expenses and enhancing financing flexibility, significantly enhancing the technological environment of businesses [2]. According to the results of the endogeneity test, digital finance can also help businesses with their funding needs by increasing capital allocation efficiency and lowering financing costs [7].

However, at present, most studies focus on the consideration that digital finance can ease funding restrictions and encourage the development of green technologies, while few papers quantify the easing situation of financing constraints, so that comparing the promoting result of financing on innovation in green technology with other categories is impossible. Additionally, there are relatively few studies from the perspective of specific applications, and there is a lack of specific practical research and exploration of solutions.

3.3. Digital Finance Encourages Green Technology Innovation by Boosting Green Investment

Digital finance not only encourages the development of green technologies by removing financial barriers, but it also directly influences green investment, which has a favorable effect on enterprise technology innovation. Digital finance can increase green investment for enterprises. The long-term and short-term studies have shown that green investment has a promoting effect on the development of green technology, with the long-term effects being more pronounced [11].

The intermediary function currently plays a major part in the positive impact and absorptive ability of enterprise digitalization on green technology innovation, and green credit can increase this absorption, thereby promoting green technology innovation [12]. According to data on China's A-share listed manufacturing companies from 2007 to 2020, digital transformation within enterprises can foster green innovation by increasing investment in innovative resources and reducing the cost of debt, it can play a positive role in green investment [13]. At the same time, from a new perspective, digital financing may also increase the company's financial investment, thereby squeezing out green investment and negatively impacting enterprises' green investment [14].

For green innovation enterprises, green investment is essential. However, studies on the stimulating impact of green investment in digital finance on green technology innovation currently focus more on the respective effects of green technology investment, and there is currently not much direct discussion on the impact of green investment on it.

4. Conclusion

This study analyzes the development status of green technological innovation and digital finance, and it addresses the beneficial effects of digital finance on green innovation, from the perspective of investment and financing based on several papers. It mainly draws the following conclusions: First, by alleviating financial constraints Digital finance can ease financial limitations and encourage the development of green technologies by alleviating information asymmetry, expanding financing scale, and reducing financing costs. Second, the green investment of enterprises has a positive regulating and promoting effect on technological innovation. In order to advance the innovation of green technology in China, digital finance can enhance the intermediary and crowd out green investment of businesses. Long-term impacts are even clear.

There are the following problems in this research field: there is a lack of quantitative data support for research on financing, and there are few practical results; there are few direct research on investment research. These problems lead to insufficient research and unclear conclusions. The promotion of green technology innovation in investment and financing should receive greater attention in the future, and the practice should be strengthened, so as to make data more accurate and research clearer.

We shall offer the following policy recommendations in light of the aforementioned findings: First, steadily improve and promote the digital financial system, optimize the industrial structure and service system, and at the same time further develop high-end technology industries, such as cloud computing services, big data, new energy, etc., in order to better Good to provide technical support to promote green innovation efficiency. Second, strengthen the financial regulatory system, especially for areas with low financial regulatory levels, so as to reduce various financial risks, credit risks, investment risks, data risks, etc. Finally, the government should give green innovative products more attention, and increase the enthusiasm and motivation of enterprises to research and develop green creative products; at the same time, formulate protection policies for the achievements in this field, and establish and improve a series of environmental improvement measures.

Authors Contribution

All the authors contributed equally and their names were listed in alphabetical order.

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