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Research on the Development of Fintech and Green Economy Efficiency

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Abstract: Financial technology is profoundly changing China's financial ecology and financial landscape. With the deepening and promotion of mobile Internet technology, as well as the integration of new generation information technologies such as big data with traditional finance, major innovations in the financial system and infrastructure are affecting the efficiency of green economic development. In this economic context, this article explains the impact of the development of financial technology on the efficiency of green economic development based on existing research on economic growth models and green economic development theories. In order to further promote the comprehensive empowerment of financial technology for green economy and improve the efficiency of China's green economy, some rational suggestions are proposed for beneficial exploration.

1. Introduction

General Secretary emphasized that green waters and green mountains are as valuable as mountains of gold and silver. Green development is an inevitable requirement for ecological civilization construction. Promoting green economic development is an important embodiment of implementing ecological civilization ideology. At the same time, green development has gradually become an important social consensus. Under the current economic situation, China has achieved remarkable results and the economy continues to grow at a high speed. Meanwhile, financial technology has flourished globally and has attracted attention from various industries, profoundly impacting the financial system. Financial technology is technology-driven financial innovation, using technology as a means, but its goals and sources of profit still lie in finance. In recent years, under the wave of "finance + technology", China's financial technology has entered a stage of rapid development, adding new vitality to the service model of the financial industry through innovation during this stage. On the one hand, the development of financial technology will effectively support the R&D activities of real industries by alleviating financing constraints, making real industries more efficient, faster, and more stable in low-carbon transformation.

On the other hand, green finance has a natural dependence on financial technology. The development of financial technology reduces transaction costs between green enterprises and the financial industry, weakens the degree of information asymmetry between enterprises and financial institutions, expands the scope of participants in green economic development, which is conducive to the development of green economy, strengthens the supervision in the process of green economic

development, prevents systemic financial risks, and promotes supply-side reform. Based on the current economic background, this article analyzes the current situation and unresolved issues of existing research, enriches the research on the impact of financial technology on the development of green economy, and provides new perspectives and ideas for the further development and application of financial technology.

2. Development of the economic benefits of financial technology

Financial technology is a technology-driven financial model with light assets, low profits, high scalability, and innovative characteristics. Its development and evolution have always been an important research topic in academia. Puschmann comprehensively summarized the definition and evolution of financial technology worldwide, pointing out that financial technology is already changing the traditional financial industry [1]. Li Guangzi defined the connotation of financial technology from the perspectives of finance, technology, and their combination, and proposed that financial technology is actually the result of the matching of information technology and the financial industry [2]. Haddad and Hornuf analyzed the influence of a country's financial technology development on its technological progress, human capital, security of venture capital, and economic development level from the perspective of the market environment, and found that financial technology has a positive effect [3]. In addition, the economic benefits brought about by the development of financial technology have also received widespread attention, and a large number of domestic literature has explored the economic impact of the development of financial technology. In theory, the financial system can play its functions of aggregating information, analyzing information, diversifying risks, and allocating resources, thereby promoting economic and social development. The development of financial technology will bring about significant changes in traditional financial systems, financial transaction models, and the depth of financial development, and will thereby enhance the quality and efficiency of development in other industries. In recent years, more and more research has focused on the impact of the development of financial technology on the existing financial model, as well as the support and guarantee of financial technology for technological innovation. Arner, Barberis, and Buckley's research indicates that the development of financial technology has a positive driving effect on issues such as improving the financial system, optimizing financial markets, and allocating social resources [4].

Many scholars have pointed out the strong complementarity between the development of financial technology and the financial industry, which can help financial institutions more accurately target the market, thereby enhancing the flexibility and convenience of the financial industry, and also expanding the long-tail service population. The development of financial technology has disrupted the traditional service models in the financial industry and has caused a series of socioeconomic chain reactions. For example, Xie Xuanli and other scholars have analyzed the inclusive role of financial technology in financial services and pointed out that financial technology can promote the emergence of online transaction models for financial services, thereby generating new business models and enhancing the inclusiveness of financial services [5]. Li Tao, Xu Xiang, and Sun Shuo have conducted in-depth analysis of the inclusive characteristics of financial technology and pointed out that the improvement of financial inclusiveness helps alleviate the financing constraints of residents or enterprises, promotes the popularization and diversification of financial services, promotes regional consumption upgrades, and accelerates economic transformation and upgrading [6]. It can be seen that the development of financial technology is a technological revolution that promotes supply-side structural reform in the financial industry and provides new driving force for China's economic transformation and high-quality development.

At the same time, many studies have discussed the issue of technology-driven industrial

development in the context of the rapid development of financial technology. Tang Song, Lai Xiaobing, and Huang Rui's research shows that the diversification of investment and financing services and channels in the financial industry has a positive impact on technological innovation [7]. In addition, with the good application of technological development, financial technology and technological innovation promote each other and further enhance the level of technology and innovation. Some scholars have also explored the relationship between financial technology and technological innovation from the perspective of invention patents. Chen, Wu, Yang, and others use event study methods to analyze how financial technology affects the stock prices of listed companies, and the research shows that the long-term value of the development of financial technology is greater, and the long-term value of financial technology development in the blockchain-related aspects is the highest [8]. Xu Lu, Lu Xiaobin, and Yang Guancan construct an automatic retrieval and classification process for financial technology patents, and classify these patents into six categories: password security, mobile payment, and smart transactions, based on the definition of financial technology. They analyze the development status of financial technology from the perspective of different types of patents [9].

3. Related research on green economy efficiency

In 1989, the concept of "green economy" was first proposed by British economist Pearce, who believed that "green economy" is an economic development model based on ecology and human carrying capacity. He also pointed out that blindly pursuing maximum economic growth will deplete natural resources and ultimately cause serious environmental hazards. The Green Economy Association (IGEA) defines green economy as a low-carbon, green, and circular industrial economy, with the goal of ultimately achieving ecological protection, social progress, and economic development. Wang Jinnan, Li Xiaoliang, and Ge Chazhong found that in order to achieve "maximized social welfare", it is necessary to realize a green economic model that is environmentally friendly and does not conflict with nature [10]. Peng and Sun found that China's green industry is currently in the middle stage of industrialization, and the transformation of traditional industry technology is insufficient. The market share of new green industries is small [11]. Therefore, relying on the economic development evaluation system of total factor productivity, it is necessary to accelerate the upgrading and transformation of traditional industries, supervise and optimize the reform of green industries, and stimulate the rapid development of new industries in China, and ultimately successfully achieve the transformation to a green economic model.

Economic efficiency refers to the ability of society to achieve maximum output under the conditions of using existing resources (such as labor, capital, and other production factors). In the early stage of economic development, in order to achieve the goal of minimizing costs and maximizing profits, producers continuously optimize economic efficiency. However, at that time, the impact on the environment was not taken into account when considering economic efficiency. Due to the continuous improvement of the degree of economic industrialization and the acceleration of urbanization, the large-scale use of natural resources has caused more attention to the ecological environment crisis, which poses a huge challenge to the sustainable development of the economy. Many scholars have pointed out that the improvement of economic efficiency not only refers to the growth of the economy (GDP), but also needs to include the consumption of resources and environmental costs in the process of economic development. Otherwise, the high or low economic efficiency will be evaluated incorrectly, and the economic benefits and social welfare will generally be overestimated, which hinders the implementation of optimal economic policies and is not conducive to the sustainable development of the economy and ecology. Based on this, many scholars have further defined economic efficiency and put forward the concept of "green economic

efficiency". Green economic efficiency is a measure of the economic efficiency of a country or region that takes into account energy consumption and environmental costs. In recent years, more and more scholars have made almost similar definitions of green economic efficiency, mainly taking into account issues such as economic growth, resource consumption, and environmental pollution in their specific meanings. Ren Yangjun and Wang Chuanxu found that in the existing production function, green economic efficiency also needs to consider factors such as resource utilization and ecological costs to improve and revise the original production function [12]. Juanjun et al.'s research shows that "green economic efficiency" is actually an evaluation of the unit output capability of social production factors, which comprehensively considers resource utilization and environmental pollution on the basis of existing economic efficiency [13]. Xu Ning, Shi Benzhi, and Liu Ming believe that when measuring social production and evaluating the comprehensive input-output capability of unit production factors, green economic efficiency relies on traditional economy and an economic model that progresses in harmony with ecology [14]. In summary, the connotation of "green economic efficiency" refers to the true economic efficiency under the inclusion of factors such as resource consumption and environmental pollution, which includes not only inputs such as labor and capital, but also energy and environmental pollution factors. Therefore, "green economic efficiency" can more comprehensively and accurately evaluate the true level of socio-economic efficiency.

From existing research, production factors, economic factors, and government regulation are the main factors affecting green economic efficiency. Industrial development is the carrier of economic development, and the development model of green economy means that the industrial system should shift to resource-saving, environmentally friendly, and factor-intensive types. At the research level of the impact of industrial agglomeration on green economic efficiency, Liu Yaobin, Yuan Huaxi, and Wang Zhe pointed out that the impact of industrial agglomeration on green economic efficiency is nonlinear [15]. Chen Yang and Tang Xiaohua's research shows that service industry agglomeration promotes the improvement of green production efficiency for a certain period of time, but then inhibits green economic efficiency after a certain level is reached [16]. Zhang Zhidong and Qin Shuyue's research shows that upgrading the industrial structure has a significant positive effect on local green economic efficiency, but has a reverse inhibitory effect on surrounding cities [17]. Based on existing research, many scholars have found that the impact of foreign direct investment (FDI) on green economic efficiency can be broadly divided into two different views: positive and negative. Guo Bingnan and Tang Li's research found that FDI helps to promote the improvement of the level of green economic efficiency in the Yangtze River Economic Belt [18]. Zeng and Zhao's research found that FDI will make environmental pollution more serious and have an adverse effect on China's efforts to improve green economic efficiency [19]. Regarding the impact of urbanization level on green economic efficiency, the views of domestic and foreign scholars are not consistent. Wang Yaping, Cheng Yu, and Ren Jianlan's research found that there is a nonlinear relationship between the level of urbanization and green economic efficiency, showing a "U" shaped characteristic, and the impact of urbanization on green economic efficiency varies significantly among different provinces [20].

4. Impact of fintech on the efficiency of green economy

Due to the "green" attributes of financial technology itself, financial technology can effectively solve the cumbersome problems in the financing process, directly improving the efficiency of the green economy. Feng Honglin and Yang Siying believe that the development of financial technology has played a certain role in reducing urban pollution [21]. Buera, Kaboski, and Shin's research shows that financial technology can optimize resource allocation, making it easier for low-energy-consuming enterprises to obtain capital support, ultimately achieving the goal of green

development [22]. Liu Jing and Zhang Yao believe that financial technology has a positive driving effect on improving the development of green industries [23]. Under the current environmental regulations, the higher the city's fintech development, the more complete the development of green industries. Mitigating the information asymmetry between financial institutions and enterprises in the financial market, improving the efficiency of fund matching, is the most direct effect of the development of financial technology, which has promoted the development of China's green economy. This is mainly due to the development of financial technology, which makes the financial industry more informatized, and at the same time, the information in the financial market is more conducive to the timely and effective capture of information by the supply and demand sides of financial resources, thereby promoting the rational allocation of financial resources. In order to effectively solve the problems caused by high-polluting industries, it is necessary to set thresholds for credit support to high-energy-consuming enterprises to require financial institutions to accurately analyze the various environmental indicators of enterprises in operation. Research shows that financial technology can improve the development efficiency of the green economy by reducing credit support to high-energy-consuming enterprises. The development of financial technology effectively solves the information asymmetry between the supply and demand sides of financial resources in the process of green finance development, and promotes the effective allocation of green resources. Schumpeter's innovation theory believes that financial development can effectively support the development of innovation. Both the neoclassical economic growth model and the endogenous growth theory indicate that the state of financial development also affects endogenous technological progress. At the same time, Ge Pengfei, Huang Xiulu, and Han Xianfeng propose a new economic growth model, that is, the continuously improving level of applied innovation in a country can effectively enhance its green total factor productivity [24]. Therefore, the development of financial technology can promote the efficiency of the green economy by improving the level of technological innovation.

Many scholars have found that financial technology can promote the level of technological innovation. It can be broadly classified into four categories. The first category is that the development of financial technology has slowed down the problem of information asymmetry between financial institutions and enterprises, accelerated loan approval, promoted inclusive access to resources, thereby reducing financing thresholds, saving financing costs for enterprises, and enabling enterprises to have more abundant funds to promote innovative development. The second category is that financial technology can effectively promote the expansion of the financial market and improve the efficiency of financial market services. The support for innovation and research and development in the financial market has gradually increased as the scale of the financial market expands. The improvement of the efficiency of financial market services enables enterprises to fully obtain external information, grasp the direction of financial resource support, and provide convenience for research and development and innovation, ultimately enhancing the efficiency of regional innovation and research and development. The third category is that the development of financial technology can promote regional investment openness and transform the traditional product-oriented service model in the financial market into a customer-oriented service model. By expanding regional investment openness, idle funds can be effectively concentrated, and the cycle of transforming savings into investment is significantly shortened, which is conducive to the concentration of innovative capital in the region, thereby increasing the output of regional technological innovation. The fourth category is that the development of financial technology can effectively promote regional trade openness and improve the efficiency of regional resource integration. By improving the efficiency of regional resource integration, it is possible to strengthen the construction of regional information networks, thereby reducing the information search and transaction costs required for regional innovation. At the same time, the strengthening of regional information networks is conducive to the improvement of information transmission, which can better carry out scientific research cooperation between regions, thereby promoting the optimal allocation of regional resources and the flow of factors, and promoting the development of regional

innovation activities and the level of innovation development.

5. Policy suggestions for improving the efficiency of green economy

To further promote the empowerment of financial technology in the green economy and improve the efficiency of China's green economy, beneficial explorations can be made in the following aspects in the future:

(1) Strengthening the top-level design of financial technology to support the development of the green economy and better serve its growth from a macro perspective. China has already formulated the "Development Plan for Financial Technology (2019-2021)" and the "Guidance on Building a Green Financial System," which have laid a solid foundation for financial technology to promote the development of the green economy. However, specific policy guidelines for the development of green financial technology have not yet been established. China needs to strengthen the role of financial technology, such as AI, big data, blockchain, and the Internet of Things, in the fields of green economy, ESG, and carbon management. Through innovative financial technology, it can enhance the standardization of green finance and promote the better service of green finance to the development of the green economy.

(2) We should improve the information infrastructure of financial technology. Firstly, establishing an information platform to provide a solid foundation for the development of the green economy. To facilitate the collection and statistical analysis of information related to green projects and financial business, it is necessary to establish a platform for green information and financial information statistics. This can provide important support for the identification of green projects and the regulation of the financial industry.

(3) We should strengthen innovation management and risk prevention by introducing a "sandbox supervision" mechanism. Enterprises and financial institutions can use this mechanism to test their innovative products or technologies within a certain range, and the regulatory department supervises and evaluates them during the testing period. The "sandbox supervision" mechanism protects consumer rights and prevents financial risks, encourages technological innovation, and improves the efficiency of innovative product use under the premise of controllable risks. Currently, China has launched pilot projects for "sandbox supervision" in nine regions, and other regions should actively introduce "sandbox supervision" to effectively promote the development of financial technology for green economy.

(4) In addition, it is necessary to strengthen the training of financial technology talents related to the development of green economy. From the perspective of the country, we need to establish a multidisciplinary and cross-disciplinary model to guide the education system to focus on the cultivation of green technology compound talents. We should also standardize the training and certification of financial technology personnel in the field of green economy, promote the integration of industry, academia, and research in talent cultivation, and create an environment or platform for international communication and cooperation for green finance and technology talents. Financial institutions should continue to improve the professional quality of their employees, optimize policies for introducing financial technology compound talents related to green economy, design incentive-based salary systems to attract and retain outstanding talents, and plan for talent reserves to better serve the green economy with financial technology in the future.

6. Conclusion

The development of financial technology significantly promotes the improvement of green economic efficiency and has become a "booster" for promoting green development and harmonious coexistence between humans and nature in the new era background of our country. Promoting the level of regional technological innovation is an important mechanism for the development of financial technology to improve green economic efficiency, that is, the development of financial

technology promotes the level of regional technological innovation, thereby improving green economic efficiency. The role played by breakthrough innovation in this process is greater than that played by incremental innovation. This study enriches the literature on the ecological effects of the development of financial technology, and is beneficial to break through the bottlenecks in the development of green economy in reality, guarantee the development of financial technology towards greening, and achieve sustainable economic development.

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