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Green Finance for Green Innovation

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Abstract

Green finance plays an essential role in the progress of the world's green economy as a financial instrument that can achieve harmonious economic and environmental development. By summarizing the existing literature on green finance and green innovation, this paper explores the impact of green finance development on enterprise innovation and its influencing mechanism from the micro-enterprise level. It explores the internal mechanism of the effect of green finance development and enterprise innovation from the perspective of the impact of enterprise innovation on economic effect and environmental effects. Provide a policy basis for the development of green finance. The study finds that the development of green finance combined with government subsidies can significantly improve the R&D and innovation of enterprises, thus improving the competitiveness of enterprises. In addition, green innovation can improve resource utilization efficiency, reduce enterprises' energy consumption, reduce energy costs, and significantly reduce environmental pollution.

Keywords: Green Finance; green patent; corporate innovation; business.

1. Introduction

Innovation is the driving force of economic growth, and green innovation can make this growth sustainable. Unlike ordinary, innovative behavior, green innovation can not only reduce environmental pollution and improve the environmental performance of enterprises, but more importantly, it can enable enterprises to produce diversified products and effectively improve their competitiveness, thus achieving a "win-win" situation in terms of economic benefits and environmental protection. " Green innovation is a crucial way to achieve harmonious development of economic growth and environmental protection, mainly including new technologies and services that can reduce environmental pollution and promote sustainable development and so on(Rennings, 2000), which can help enterprises to achieve a win-win situation in terms of both economic and environmental benefits and is a meaningful way to mitigate the negative environmental impacts of economic activities (Horbach, 2008; Song & Yu, 2018). Amore and Bennedsen (2016) argue that green innovation has become a central tool for companies to save resources and mitigate pollution. A sustainable development approach based on ecological security and green concepts is now a common path explored by scholars and policymakers worldwide (OECD, 2008). Following the promotion of the Kyoto Protocol and the

Eco-Innovation Plan, the UN and the EU have further proposed the 17 Goals for People and Planet and the Post-2015 EU and Global Development Framework to integrate ecological conservation and sustainable development into long-term development strategies, of which green innovation is an integral part.

Based on the vital perspective of green finance, this paper will discuss whether green finance can stimulate corporate green innovation and the theoretical mechanisms by which green innovation promotes the green development of the economy, drawing on the literature and economic phenomena. The research of this paper has the following values :

(1) Exploring the impact of green finance development on enterprise innovation and its influencing mechanism from the micro-enterprise level;

(2) Based on the perspective of the impact of corporate innovation on economic effect and environmental effect, this paper explores the internal mechanism of the role of green finance development and corporate innova tion.

2. Literature review

In the relationship between finance and economic development, financial support for technological innovation is an 'old topic'; however, there is still relatively little theoretical research on the sub-sector of green finance. The most recent studies provide some empirical evidence but must directly address the relationship between green finance and economic development. This paper explores how green finance can contribute to the green development of the economy by supporting green innovation. Only some existing studies directly address this issue, including classical sustainable growth theory and the recent emergence of research on the environmental and economic impacts of green finance. Firstly, sustainable growth theory has explored the issue of long-term sustainable growth under ecological and resource constraints. A consensus in the field is that technological progress is the basis for long-term sustainable development (Shuijun & Qun, 2006; Menetetal, 2021). The modeling of sustainable growth theory has developed a relatively mature framework, and in recent years, some literature has explored green finance based on sustainable growth theory. However, the existing studies still need to address the role of finance in supporting green innovation and its impact on economic growth. Secondly, theoretical research on green finance has progressed slowly, particularly concerning the relationship between green finance and economic development.

In the last five years, as the topic of green finance has received increasing attention, the macroeconomic effects of green finance has become an important trend in this area of research. In the last three years, with the enrichment of empirical samples, scholars are increasingly inclined to believe that green finance does have the critical function of promoting green economic development(Liueta, 2019). The studies of Liu Xiliang and Wenwen Yang (2019) and Donge (2019) were early attempts to incorporate financial factors into the theoretical framework of sustainable growth. However, their studies mainly focused on the relationship between credit discrimination and environmental pollution and did not address green finance in its current sense. Meanwhile, Wen and Yang (2021, 2022) provide a theoretical model of sustainable growth in the financial sector but need to explore the internal aspects of green finance. Wen and Yang (2021, 2022) gave theoretical models of sustainable development in the financial sector, but the issue of endogenous abatement technologies still needs to be explored. The theoretical mechanisms of the relationship between green finance and economic development have yet to be explored, and there needs to be more theoretical literature that specifically addresses the mechanisms underlying the impact of green finance on economic growth through green innovation.

On the other hand, in sustainable growth theory, green innovation and technology are the core factors affecting the green development of the economy. There is currently some theoretical literature incorporating green finance into the framework of sustainable growth theory. However, it needs to consider the issue of the impact of green finance on green innovation.

3. Path analysis

Green innovation is an innovative behavior that aims to alleviate environmental problems and promote sustainable development. Under the current non-optimistic ecological situation, it is imperative to encourage and support enterprises to carry out green innovation, and enterprises also follow the trend to innovate. Enterprises generally enhance research and development to achieve innovation and technological progress and then improve the competitiveness of enterprises. This kind of innovation that can significantly promote the technological advancement of enterprises is called "substantive" innovation. However, due to the limited R&D capabilities of some enterprises, to obtain certain benefits, the management of the company usually carries out a kind of "strategic" innovation (Tong et al.,2014). Wang and Zhou (2022) used green utility model patents to represent the "strategic" innovation behavior of enterprises, pointing out that while green finance provides financial support to enterprises, enterprises face strict supervision rather than "substantive" innovation that is difficult and of high quality. Using the unbalanced panel data of 2058 listed companies in Shanghai and Shenzhen A-share markets from 2011 to 2020 for empirical analysis, it concluded that the development of green finance could significantly improve the R&D innovation of enterprises, and the effect on the "strategic" innovation of enterprises is more significant.

Achieving the goal of enterprise innovation requires sufficient financial support, and the difficulty of financing is still a critical issue that restricts the development of enterprises, especially SMEs(Small and Medium-sized Enterprises). Green finance has come into being to promote enterprises' green development. The development of green finance is mainly to alleviate the financing constraints through government subsidies, promote the green innovation activities of enterprises, and promote the economic and environmental effects of corporate green innovation. Let us take green bonds as an example to illustrate the mechanism of green finance: (1) For investors, due to the strong support from the government and strict supervision and screening by the regulatory authorities, the credit rating of enterprises issuing green bonds is higher, and the risk of default is lower, so investors are willing to buy green bonds at a lower coupon rate. (2) For enterprises, issuing green bonds can obtain funds at a lower cost than the average debt financing in society, thus reducing the risk of green innovation. (3) In the context of the government's efforts to promote "green" development, investors' recognition and investment enthusiasm for green bonds and high market attention can reduce the issuance cost of green bonds and bring "green" incentives to the financing side. From the above three aspects, we can see that green financial instruments can reduce the financing constraints of enterprises by reasonably matching risks and returns, thus increasing the source of funds for green R&D activities with higher risks and providing protection for enterprises' green innovation activities, and making external investors more willing to provide funds for enterprises' R&D. support, thus promoting enterprises' innovation inputs and outputs. If such a mechanism exists, it can infer that the development of green finance has a more significant impact on enterprises' innovation activities for those enterprises with more severe external financing constraints.

Public finance policy is one of the basic policies of the state to regulate economic activities. The development of green finance is inseparable from the support of fiscal policy, which can promote the development of green finance through tax policy and financial subsidies. Government subsidies to enterprises are free of charge, which can alleviate the financing constraints of enterprises and encourage them to carry out innovative activities (Lu & Li, 2016). Due to the existence of information asymmetry, the government does not have a good grasp of the actual situation of enterprises' business projects, and the government has limited access to information, so there may be bias in deciding which enterprises to give subsidies to, and some enterprises with green innovation potential have difficulties in receiving policy preferences. Studies have also shown that government subsidies have a clear tendency to favor large-scale enterprises in the allocation process. This policy bias can weaken the driving force of green finance policies for firms to undertake innovative activities.

The direct purpose of developing green finance is to reduce environmental risks and create new economic growth points. The impact of green finance on the economy and environment is mainly realized through the green innovation of enterprises. The effect of green innovation on enterprises is primarily reflected in the following aspects: First, green innovation can improve the utilization efficiency of resources, reduce the energy consumption of enterprises, and lower energy costs (Jiang & Ma, 2019); second, green technology innovation can significantly reduce environmental pollution and lower the ecological compliance costs of enterprises (Xu & Zhang, 2021). Third, green technology innovation can improve the competitiveness of enterprises and, at the same time, create an image for enterprises to fulfill their social responsibility, which helps them gain public support and increase their market share, thus enhancing their value (Chen et al., 2006; Xie & Zhu, 2021). However, to improve the environment, companies usually need to make green innovations to reduce pollution, lower energy consumption, and lower environmental management

costs, which require innovative technologies. Green non-invention patents still dominate green patents in China, and the technology level of green non-invention patents may be higher, which is challenging to meet the requirements for improving corporate environmental performance. Therefore, the role of green innovation in improving corporate environmental performance needs to be revealed. For example, Li et al. (2019) found a significant U-shaped relationship between corporate innovation and environmental performance, while the effect of corporate innovation on short-term ecological performance was not significant.

4. Conclusion

The development of green finance has a significant promotion effect on corporate innovation. However, the promotion effect of green finance development on corporate green invention patents is insignificant, while the impact on corporate green non-invention patents is significant. In addition, compared with other regions, the development of green finance plays a more substantial role in promoting innovation in areas with a high degree of intellectual property protection and non-heavy polluting enterprises. The story of green finance can also encourage enterprises to carry out green innovation activities by alleviating their financing constraints, providing impetus for innovation activities.

In green finance development, laws and regulations on intellectual property protection should be strengthened to provide a good external environment for green finance to support enterprise innovation. In the process of implementing green financial policies, we should rationally allocate green financial resources, dynamically adjust the intensity of environmental protection punishment and incentive policies, strengthen the investment and financing of heavily polluting enterprises, and give more opportunities and support to heavy polluting enterprises that want to realize transformation and upgrading.

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