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Research on the impact and action path of tax incentives on the green technology innovation capabilities of small and micro enterprises

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Abstract

With the increasing severity of global climate change, the role of small and micro enterprises in green technology innovation has become particularly important, as it is directly related to the environmentally friendly transformation and sustainable development of society. In this context, tax incentives, as a key tool for the government to promote enterprise technological innovation, play a vital role in motivating small and micro enterprises to invest in green technology research and development. This study deeply analyzes how tax incentives can stimulate green innovation activities of small and micro enterprises by reducing the financial burden of R&D and improving the expected return on investment. The article first outlines the role of small and micro enterprises in global environmental governance and the background of tax incentives. Then, by constructing a theoretical framework, it discusses in detail the direct and indirect effects of tax incentives on green technology innovation of small and micro enterprises. The direct effect is reflected in reducing R&D costs, enabling enterprises to invest more resources in the development of green technologies; while the indirect effect is reflected in improving the long-term investment environment of enterprises, promoting cooperation between enterprises and scientific research institutions, and enhancing the market orientation and application prospects of R&D. In addition, this paper also points out the challenges that may be encountered in the implementation of tax incentives, such as unclear policy objectives and imprecise implementation details, and puts forward corresponding optimization suggestions. Finally, it is emphasized that when designing and implementing tax preferential policies, more attention should be paid to the operability and effectiveness evaluation of the policies to ensure that they effectively promote green technology innovation of small and micro enterprises.

Keywords

Green technology innovation, small and micro enterprises, tax incentives, policy impact path.

1. Introduction

1.1. Research background

In February 2024, General Secretary Xi Jinping systematically expounded on the development of new quality productivity during the 11th collective study of the Political Bureau of the CPC Central Committee, mentioning that "it is necessary to strengthen scientific and technological innovation... cultivate new momentum for the development of new quality productivity", "pay attention to the application of green scientific and technological innovation and advanced green technology to specific industries and industrial chains, and form new green economic growth points", and promote the sustained high-quality development of China's economy. Small and micro enterprises are an important part of China's market economy, and green technology

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innovation is the only way for the green manufacturing system. How to better use preferential policies to promote the improvement of green innovation capabilities is of great significance to the survival and development of small and micro enterprises in China at present, and it is helpful to promote the development of the green economy of small and micro enterprises in China. However, in the process of green technology innovation of small and micro enterprises, there are problems such as insufficient R&D investment funds and difficulties in transforming R&D results, which leads to insufficient motivation for green R&D investment and R&D output of small and micro enterprises, and requires the guidance and incentives of tax preferential policies. But for now, the current tax policy has obvious deficiencies in terms of preferential methods and preferential strength. Therefore, it is of great significance to study the relationship between tax policies and green technology innovation of small and micro enterprises.

1.2. Research content

This study will analyze in detail how tax incentives affect the innovation capabilities of small and micro enterprises in the field of green technology. The study will first review the literature and construct a theoretical framework to sort out the implementation models of tax incentives in different countries and regions around the world and their impact on the green technology innovation of small and micro enterprises. Subsequently, this article will explore how tax incentives can reduce the risk and cost of R&D investment of enterprises through financial incentives, thereby stimulating enterprises to carry out green technology innovation. In addition, the study will analyze the role of tax incentives in promoting external cooperation, enhancing the acquisition of R&D resources, and improving the overall innovation environment of enterprises, and explore how these external mechanisms work together to promote green innovation of small and micro enterprises. By combining theoretical and policy analysis, this study aims to provide policymakers with an empirical basis to optimize and design more effective incentives.

1.3. Research objectives

The main objectives of this study are to comprehensively evaluate the impact of tax incentives on the green technology innovation capabilities of small and micro enterprises and explore the specific action paths of incentive mechanisms. First, the study will determine and analyze the direct effects of tax incentives on reducing the R&D investment costs of small and micro enterprises, including the specific effects of tax exemptions, deductions and other related fiscal incentives. Second, it will explore how these policies affect the innovation decisions and behaviors of enterprises, especially how they promote enterprises to invest in green technology projects that are high-risk but may bring long-term environmental benefits. In addition, the study also aims to reveal the role of tax incentives in promoting internal and external resource allocation of enterprises, such as strengthening cooperative relations with research institutions and improving the efficiency of technology transfer. Through these analyses, this paper hopes to provide a basis for formulating more precise and effective tax incentives to support the green innovation and sustainable development strategies of small and micro enterprises.

2. Literature Review

2.1. Research on factors affecting green technology innovation capability

At the enterprise level, Wu Lichao (2022) found that foreign direct investment can use knowledge spillover, demonstration effect and competition effect to cause significant spillover effects on regional green technology innovation, and play a very important role in the growth of the number of green patents. Li (2023) found that at the level of internal factors of enterprises: enterprise scale, development strategy, enterprise environment, green personnel participation, green wages and rewards, green training and performance management, green

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recruitment and selection have a positive impact on green innovation. At the government level, Mukherjee (2017) found that high taxes can reduce the role of innovation incentive policies, but since certain risks will inevitably be brought about in the innovation process, high taxes also allow enterprises to avoid many investment risks. Jin Xin (2022) studied the heterogeneous effects of seven major environmental regulatory tools on corporate green technology innovation and found that the number of environmental legislation, the amount of investment in the three simultaneous (simultaneous design, simultaneous construction, simultaneous production and use) and the amount of pollution discharge fees have a significant time lag effect on the improvement of corporate green technology innovation; the number of environmental law enforcement personnel and the intensity of environmental law enforcement have a significant immediate effect on the improvement of corporate green technology innovation. At the social level, Ye (2019) conducted a study on panel data from 30 provinces. The results showed that the economic environment, such as financial ecological environment, GDP, and foreign investment, had a significant impact on the improvement of green technology innovation efficiency. Huang Manyu (2022) analyzed the data of 266 cities in China from 2008 to 2019, and used the spatial Durbin model to analyze the impact and mechanism of the agglomeration of productive services on green technology innovation. The results showed that the agglomeration of productive services can significantly improve the level of green technology innovation in cities. Yang Zhen (2023) conducted a study and analysis using Chinese A-share listed companies from 2010 to 2019 as a sample. The results showed that media attention has a significant driving effect on the green technology innovation of enterprises, and it also has a driving effect on both green patent applications and green patent authorizations.

2.2. Research on the impact of tax incentives on the green technology innovation capabilities of small and micro enterprises

Gao (2021) studied the impact of tax incentives on R&D in the manufacturing industry and found that both the short-term and long-term costs of R&D investment were negative, indicating that R&D tax credits can promote enterprises to increase R&D investment and thus promote the development of green technology innovation. Yadav (2022) used the non-parametric matching method to conduct an empirical study on the positive impact of tax incentives on corporate R&D. Compared with non-preferential enterprises, preferential enterprises showed obvious advantages in the R&D, sales and use of new products, which shows that tax incentives have a positive effect on green technology innovation. Li Xinning (2022) pointed out that the preferential and supportive policies for green technology innovation in tax incentives should be improved, the support should be increased, diversified policy measures should be used, the policy content should be refined, and the laws and systems that encourage green technology innovation should be optimized as soon as possible. Li Xiaohong (2023) took the listed industrial enterprises of the A-shares of the main boards of the Shanghai and Shenzhen stock markets as samples, and used panel data to conduct an empirical analysis to study the impact of environmental taxes on green technology innovation of industrial enterprises. The results showed that environmental taxes had a significant incentive effect on them.

3. Theoretical Study on Tax Preferential Policies and Green Technology Innovation Capabilities of Small and Micro Enterprises

3.1. Innovation system theory

Innovation system theory provides an analytical framework to explore how various factors work together to influence an enterprise's innovation activities. In the context of green technology innovation in small and micro enterprises, this theory particularly emphasizes the

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impact of external fiscal incentives, such as tax incentives, on the internal innovation system of enterprises. Tax incentives can be regarded as an important system input that stimulates enterprises to invest more resources in innovation activities by reducing R&D costs, increasing capital availability, and reducing financial risks. This not only directly affects the scale and direction of R&D investment, but may also change the innovation strategy of enterprises, for example, by increasing the exploration of new technologies and production processes. In addition, tax incentives can also promote cooperation between enterprises and research institutions and other enterprises, because the reduced financial pressure gives enterprises the ability and motivation to seek external knowledge and technology.

3.2. Behavioral responses to tax incentives

From the perspective of behavioral economics, this study will explore how small and micro enterprise decision makers respond to tax incentives provided by the government to promote green technology. Behavioral economics theory points out that the behavior of corporate decision makers is not only driven by the traditional principle of maximizing benefits, but also influenced by cognitive biases, risk attitudes, time preferences and other behavioral factors. Tax incentives may be seen as a positive incentive to inspire enterprises to adopt riskier green technology innovation projects. However, this response may also be affected by factors such as the enterprise's trust in policy stability, the degree of understanding of the complexity of tax incentives, and expectations of future market opportunities. Therefore, understanding the impact of these behavioral factors on tax incentive responses is crucial to designing more effective incentives.

3.3. Environmental policy effectiveness framework

The environmental policy effectiveness framework provides important guiding principles for evaluating and designing successful environmental policies. In the context of tax incentives for green technologies, this framework emphasizes that policy design must clearly define goals, have operational implementation details, and effectively monitor and evaluate policy effectiveness. Successful tax incentive policies should be able to clearly influence the behavior of enterprises, prompting them to invest in green technology innovation and maximize environmental benefits through these investments. In addition, policies should also consider long-term sustainability, including maintaining the continuity of incentives and flexibility to adapt to market and technological changes. By applying this framework, this study aims to identify the possible shortcomings of tax incentives in promoting green technology innovation of small and micro enterprises, and put forward corresponding improvement suggestions to ensure the long-term effectiveness and sustainability of policies.

4. Analysis of impact effects and action pathways

4.1. Direct Effect

Tax incentives play a key role in directly reducing the cost of green technology R&D for small and micro enterprises. The government can effectively reduce the economic pressure on enterprises in the early stages of new technology development by reducing taxes, increasing tax base deductions, or providing tax incentives for specific R&D activities. For example, providing VAT refunds for investments in the purchase of environmental protection equipment and technologies, or providing additional tax deductions for green technology R&D expenditures, can directly reduce the capital costs of enterprises, thereby encouraging them to increase their investment in environmental technology innovation. Such fiscal incentives enable small and micro enterprises to undertake high-risk R&D projects that were originally difficult to carry out due to funding constraints, and promote the activeness of enterprise technological innovation and the depth of R&D.

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4.2. Indirect effects

Tax incentives not only help to directly reduce R&D costs, but also have a wide range of indirect effects by influencing companies' investment decisions and strategic layout. These incentives improve the liquidity of enterprises' funds, allowing small and micro enterprises to have more resources for long-term investment, such as increasing the research and development and market promotion of green technologies. In addition, tax incentives may also promote cooperation between enterprises and external institutions such as universities, research institutions and other enterprises. This cross-border cooperation can not only share R&D costs, but also accelerate the innovation and application of green technologies by gathering professional knowledge and technological advantages from all aspects. This policy-guided change in corporate behavior has further promoted the flow of knowledge within the industry and the rapid iteration of technology, creating a good environment for small and micro enterprises to support innovation and promote technology commercialization.

4.3. Long-term impact

From a long-term perspective, the implementation of tax incentives will not only affect the current R&D activities of small and micro enterprises, but also have a profound impact on the sustainable development of enterprises and the ecological construction of the industry. First, by lowering the threshold for the R&D of green technologies, these enterprises can continue to innovate and improve their core competitiveness in the field of environmental protection. With the improvement of global environmental standards and the increase in consumer environmental awareness, companies with green technologies will gain more advantages in the market. In addition, tax incentives also encourage companies to build production systems that meet environmental protection requirements, which will not only help companies reduce compliance costs when environmental regulations become more stringent in the future, but also enhance corporate image through green brand building and attract more consumers and investment. In the long run, these policies will help build a business model that is conducive to economic growth and meets the requirements of sustainable development, providing impetus for the green transformation of small and micro enterprises and even the entire society.

5. Policy Recommendations

5.1. Recommendations for policymakers

In order to design effective tax incentives to support green technology innovation of SMEs, policymakers need to ensure that these incentives are both specific and targeted. First, the policy should clearly define the target technology areas and eligibility conditions to ensure that the incentives can accurately benefit those enterprises that are truly engaged in green technology research and development. Second, the intensity and duration of tax incentives should match the scale of enterprise R&D investment and the innovation cycle to ensure that enterprises can obtain sufficient financial support in the early stages of R&D to facilitate the smooth progress of projects. In addition, policymakers should also consider establishing a multi-level incentive system that combines direct tax exemptions and other non-fiscal support measures, such as technical consultation and market access priority, to fully support green innovation of SMEs.

5.2. Response strategies

The implementation of tax incentives may encounter various challenges in promoting green technology innovation among small and micro enterprises. First, ensuring the continuity and stability of policies is a major challenge, as frequently changing policies may affect the long-term investment decisions of enterprises. Secondly, how to accurately assess the qualifications and R&D results of enterprises and prevent potential abuse and fraud is also an important

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aspect of policy implementation. Countermeasures include establishing a strict review and evaluation mechanism, strengthening follow-up audits of applicant enterprises, and ensuring that funded enterprises meet the requirements of green technology innovation. Finally, it is also critical to enhance public awareness of policies and the participation of enterprises, which requires the government to invest more resources in policy promotion and publicity to ensure the wide coverage and effective implementation of policies.

5.3. Future policy direction

Looking ahead, tax incentives need to be further developed in promoting green technology innovation in small and micro enterprises. First, policymakers should consider combining tax incentives with other government support measures, such as financial subsidies, innovation funds, and technical assistance, to form a comprehensive support system. In addition, the possibility of cooperation with the private sector can be explored to encourage the private sector to participate in the green technology innovation of small and micro enterprises through venture capital or cooperative research and development. Finally, policies should pay more attention to the commercialization and market application of green technologies, support the transformation of mature technologies to the market, and improve the economic benefits and social impact of the innovation results of small and micro enterprises. Through these multi-dimensional policy adjustments, the innovation potential of small and micro enterprises can be more effectively stimulated and the sustainable development of society and the environment can be promoted.

6. Conclusion

6.1. Summary of research findings

This paper provides in-depth insights into how tax incentives affect small and micro enterprises' green technology innovation through theoretical analysis. The study shows that tax incentives directly reduce the economic burden of small and micro enterprises on green technology research and development, and enhance the ability and willingness of enterprises to invest in new environmental protection technologies. These policies enable enterprises to take on R&D risks that they may otherwise avoid due to costs by providing significant financial incentives. Indirect effects include promoting cooperation between enterprises and scientific research institutions and other enterprises, and enhancing the market competitiveness of enterprises, which are achieved by improving the innovation environment and resource allocation. In addition, tax incentives also affect the long-term development strategies of enterprises, prompting them to adopt sustainable business models, which is important for coping with future environmental regulations and changes in market demand.

6.2. Research significance

From a theoretical and practical perspective, it is of great significance to understand how tax incentives affect green technology innovation of small and micro enterprises. This not only helps policymakers design more effective economic incentives, but also provides small and micro enterprises with a specific way to achieve green transformation. Seeking a balance between economic growth and environmental protection has increasingly become the core of policy making around the world. Therefore, strategies to stimulate green innovation through tax incentives can provide a practical framework and effective tools for achieving this balance. In addition, these insights also provide a theoretical basis and practical guidance for how to support small and micro enterprises in coping with increasingly severe environmental challenges through policy tools.

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6.3. Future research directions

Given the findings and limitations of the current study, future research should further explore how to optimize tax incentives to maximize their positive impact on environmental sustainability. First, more specific tax incentive policy designs need to be studied, especially how to set the conditions, standards and deadlines for tax reductions to ensure the accuracy and effectiveness of the policy. Second, the differences in responses to tax incentives among different industries and enterprises of different sizes should be evaluated in order to formulate more personalized policy measures. In addition, future research should also consider the combined use of tax incentives with other policy tools (such as direct subsidies, technical assistance, etc.) to study how their synergistic effects can further promote green technology innovation in small and micro enterprises. These studies will help build a more comprehensive and effective policy system to support small and micro enterprises in playing a greater role in global environmental governance.

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