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Analysis of the transmission mechanism of carbon emissions trading on green investment

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Abstract: *This study describes the internal and external transmission mechanisms that the carbon emissions pricing program has on green investment. First, it is discovered that, depending on the underlying transmission mechanism, carbon emissions trading encourages or discourages investment in green projects due to factors like cost, technological advancement, and resource allocation. Second, based on the external transmission mechanism, carbon emissions trading encourages the development of green products and technological innovation in businesses, which effectively increases green investment. The experimental findings have prompted the proposal of countermeasures to offer empirical backing for the future growth of carbon emissions pricing and green investment in China.*

Keywords: *Carbon emissions trading, Green investment, Mechanism, Pathway*

1. Introduction

Carbon emissions trading enables countries to purchase carbon dioxide in addition to enabling businesses with high carbon emissions to purchase allowances from businesses with low carbon emissions. The ensuing environmental degradation brought on by global warming has posed a substantial barrier to socioeconomic progress for people worldwide and raised awareness of the need for ecological protection. Maji S K et al. (2015) [1]research shows that one of the most important environmental issues facing the world today is climate change. In order to combat climate change and achieve sustainable development, greenhouse gas emissions must be reduced(Sari S W P et al, 2015)[2]. The way to achieving the dual-carbon goal and describing development with a low-carbon transition has emerged as the primary research direction in light of the escalating environmental issues.

Based on the national energy market, which has been determined to play a significant role in improving energy efficiency (Sharif Arshian et al., 2023), [3]as well as in product market demand and supporting sustainable development, green investment is a useful tool to attain carbon neutrality. Belad Fateh and others, 2023 [4]The majority of the material now in publication focuses on policy effects, comprehensive effects, and the impact of green investments. Based on the context of low carbon and climate change, Corfee-Morlot et al. (2012) [5]developed a framework for the green investment policy that offers the theoretical foundation and practical assurance for the advancement of green investment. During their investigation of investment options in clean energy projects in the UK, Anonymous et al. (2013)[6] found possible green investment opportunities. With an understanding of macro-prudential policies like green investment, Paola D'Orazio et al. (2019) [7]made the case that the realization of green structural change has a finite nature and that the green finance gap affects the achievement of climate goals. As a result, in this policy context, this argument can help to advance climate optimization and green lending. Through a research of green investment in Vietnam, Hung Ngo Thai et al. (2023) [8]discovered that green investment can foster technical innovation and sustainable economic development in Vietnam, offering a realistic roadmap for the pertinent sectors. When it comes to the overall impacts of green investment and policy effects, green investment has a very favorable influence on societal, technological, and economic advancements. Among them, the financial implications bring green adjustment to the energy, technology, and consumption structures. Therefore, under the role of environmental regulation for polluting enterprises, independent green investment and investment transfer can effectively promote the green transformation of industries. Musah Mohammed et al. (2023) [9]evaluated the effects of financial inclusion and green investment and concluded that it has a monotonous impact on greenhouse gas emissions. They confirmed the environmental Kuznets curve hypothesis and the pollution shelter effect, providing practical business policies for governments. Government provides effective business policies. Kapeller Jakob et al. (2023) [10]analyzed and assessed

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the green investment gap and found that it seriously underestimates the actual investment needs and compensated for the missing observations at the top of the wealth distribution through the Paletto model, effectively bridging the green investment gap that currently exists.

Research on carbon emissions trading on green development has also made significant progress. Based on the conditions of carbon emissions trading, scholars have chosen to measure the level of green growth with indicators of green innovation, green total factor, green economy, etc. Menghe L et al. (2022) [11]found that carbon emissions trading has an incentive effect on innovation, effectively promoting green innovation output. It is an effective way to enhance the efficiency of the green economy (Xin N et al., 2022)[12]. At the same time, it has a significant improvement effect on the green total factor energy efficiency has a considerable improvement effect. (Chaobo Z, et al., 2022)[13].

By combing the literature, scholars are rich in research on carbon emissions trading and green investment. Still, there needs to be more studies combining carbon emissions trading and green investment. Therefore, this paper profoundly analyses the effect of carbon emissions trading on green investment through the external and internal conduction mechanism of carbon emissions trading on green investment to provide a solid foundation for future research on carbon emissions trading and green investment.

2. Internal Conduction Mechanism

2.1. Cost path

As is shown in Figure 1, generally speaking, carbon emissions trading reduces carbon dioxide mainly through the price mechanism to internalize the externality cost brought by corporate carbon emissions. Therefore, from the perspective of cost path, pilot cities will increase the compliance cost of enterprises when implementing carbon emissions trading. According to the Coase Theorem, the implementation of the emissions trading system restrains enterprises from profiting from polluting the environment. Enterprises with larger production scales can choose to increase green investment, optimize their own emissions system, and reduce the total emissions, or purchase emission allowances from other enterprises according to the system and their operating conditions. Therefore, analyzing the impact of carbon emissions trading on green investment through the cost path must be explored from the following aspects.

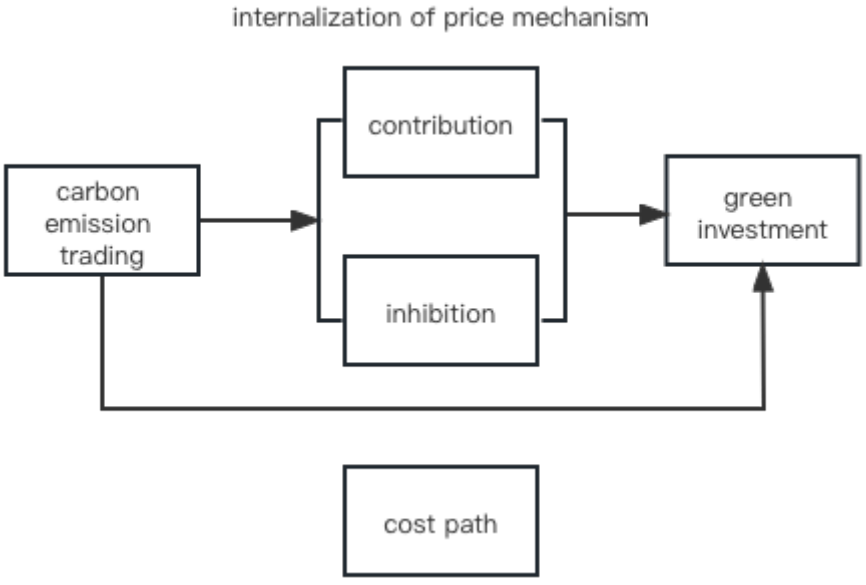

Fig. 1 Transmission mechanism of cost path

The role of the cost path mechanism will make carbon emissions trading have an impact on corporate green investment. Firstly, carbon emissions trading has a positive promotion effect on enterprise green investment. Based on environmental regulation requirements, enterprises need to control carbon dioxide emissions within the national requirements. Enterprises will choose more expensive but environmentally friendly clean energy and raw materials. Under this condition, enterprises will increase the amount of green investment, and the cost of carbon emissions will increase.

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If enterprises purchase carbon emission allowances through other enterprises, they will also increase their costs by increasing their green investments. Secondly, carbon emissions trading will inhibit enterprises' green investment. Carbon emissions trading policy encourages enterprises to invest from the perspective of technological innovation in production. Enterprises that lack carbon emission allowances can purchase emission rights.

Similarly, enterprises with surplus carbon emission quotas can also sell them on the trading market to expand their profits. In order to obtain more carbon credits for trading, they need to innovate and improve their production technology; therefore, their green investment in technological innovation will increase. Firms short of carbon credits will also try to improve their technological innovation to reduce the extra cost of purchasing carbon allowances. However, technological innovation is often uncertain: firstly, it brings more risk and uncertainty to enterprises and may even quickly hinder their normal production activities. Secondly, technological innovation is a slow process, and in the early stages of investment, the investment cost becomes a cost of production for the enterprise, and there needs to be income to offset it. As a result, firms may need more motivation to increase green investments to improve technological innovation.

2.2. Technological Innovation Path

As is shown in Figure 2, the technological innovation path refers to the research of analyzing the impact of carbon emissions trading on enterprises' green investment under the perspective of technological innovation. In this context, there are two different types of enterprises. The first is the enterprise with more carbon emissions, which, to keep its carbon dioxide emissions within the prescribed range, will choose to innovate on carbon emission reduction and other technologies and control emissions in the technological link. The second type is the enterprise with low carbon emissions, whose carbon emissions are within reasonable limits and at the same time have excess emission allowances, which can be traded in the market to make profits. Enterprises with high carbon emissions that want to emulate this profit model will actively choose to invest in technology, thereby promoting technological innovation.

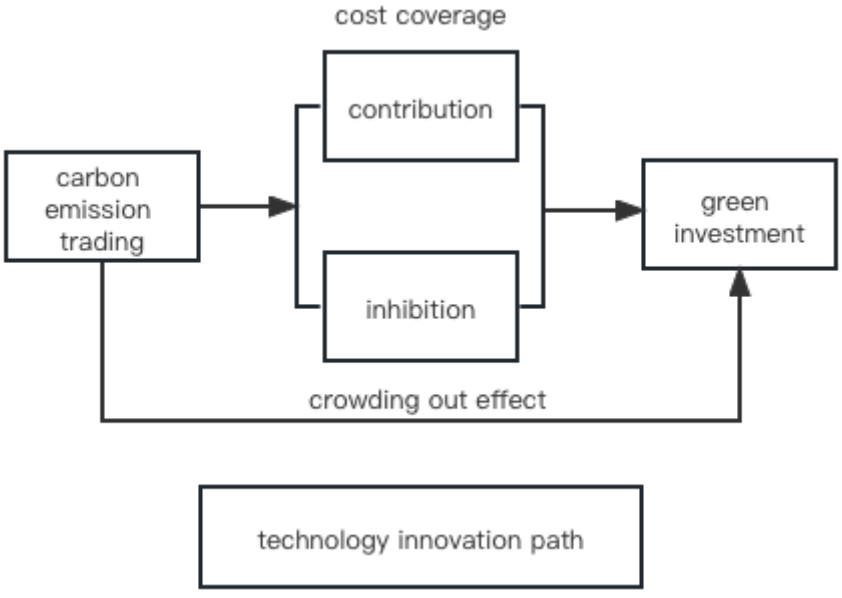

Fig. 2 Conduction mechanism of technological innovation path

The technological innovation path affects green investment in the following two ways. Firstly, the increase in green investment in technological innovation by enterprises will increase production capacity. According to Porter's hypothesis, reasonable environmental regulation can encourage enterprises to take the initiative to invest in technological innovation, thus compensating for the additional costs and excess costs of environmental regulation. Secondly, technological innovation can have a "crowding out" effect on firms' capital, reducing their working capital. When carbon emission rights are in the market for trading, environmental regulations on carbon emissions restrictions will increase the cost of enterprise input, so the enterprise technology innovation capital investment will be reduced accordingly. The short-term "crowding out effect" may occur, reducing the enterprise's green

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investment.

To sum up, carbon emissions trading through the technological innovation path can either increase or inhibit the green investment of enterprises, so whether the technological innovation path can have a promotional effect on the green investment of enterprises should take into account the reality of enterprises and the degree of influence of the two situations.

2.3. Resource allocation path

As is shown in Figure 3,according to the Coase theorem, under the condition of clear property rights, when the transaction cost is infinitely close to zero, the externality rights between subjects have a more reasonable allocation. Carbon emissions trading can improve enterprise green investment through the resource allocation path, mainly through the following two aspects of the impact: first, carbon emissions trading makes the investment subject to obtaining higher economic benefits; that is, the enterprise usually has a more advanced level of technology and innovation ability, at the same time, has a higher standard of environmental protection, which will make the investment flow into this type of higher demand for investment in the enterprise, and improve the green investment of the enterprise. Secondly, carbon emissions trading is essential for enterprises. Secondly, carbon emissions trading is a constraint policy for enterprises, so that it will pressure enterprises regarding carbon dioxide emissions. Enterprises will reconsider the allocation of internal production resources based on long-term development, i.e., reducing high-emission sectors or projects, transferring funds from high-emission sectors to low-emission sectors, increasing investment in environmentally friendly and cleaner production sectors, and decreasing investment in high-emission sectors and concentrating investment more on low-emission sectors.

From the point of view of the impact mechanism of carbon emissions trading on corporate green investment, carbon emissions trading mainly affects corporate green investment through the cost path, resource allocation path, and technological innovation path, and its specific impact is not the same, so it is necessary to analyze further the specific impact of carbon emissions trading on corporate green investment through the empirical research method.

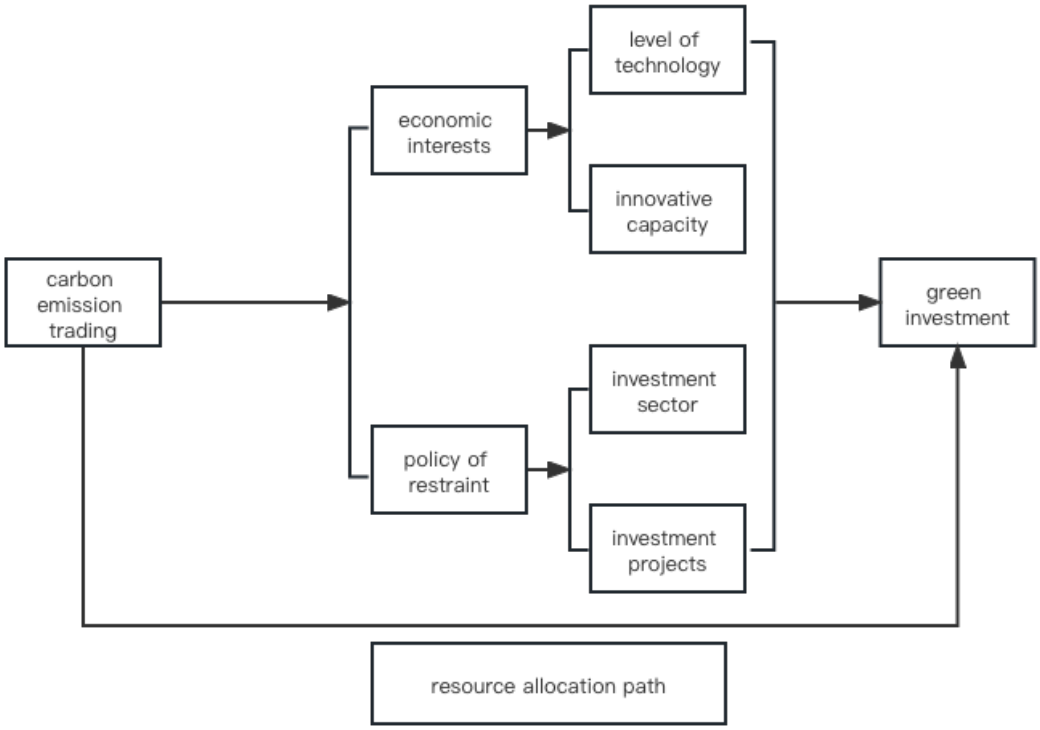

Figure 3 Transmission Mechanism of Resource Allocation Pathways

3. External Transmission Mechanism

As is shown in Figure 4,based on Porter's hypothesis, it can be seen that carbon emissions trading is

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essentially a market incentive-type environmental regulation tool, but also a market tool to take into account the low cost to achieve the effect of emission reduction and improve the productivity and environmental protection costs of enterprises through the internalization of the price mechanism of the externality cost of environmental pollution. In the process of carbon emissions trading, enterprises can either buy carbon emission allowances at market price when they are short of them, or they can choose to stop production; they will choose the optimal option based on their conditions after comparing the profitability of the two options. Similarly, suppose an enterprise obtains excess carbon emission allowances in production through emission reduction means and low-carbon technologies. In that case, it can also sell them in the market to make a profit. As shown in the figure, the following three aspects will be elaborated on: the influence path, the influence performance, and the consequences of carbon emissions trading on the impact mechanism of corporate green investment.

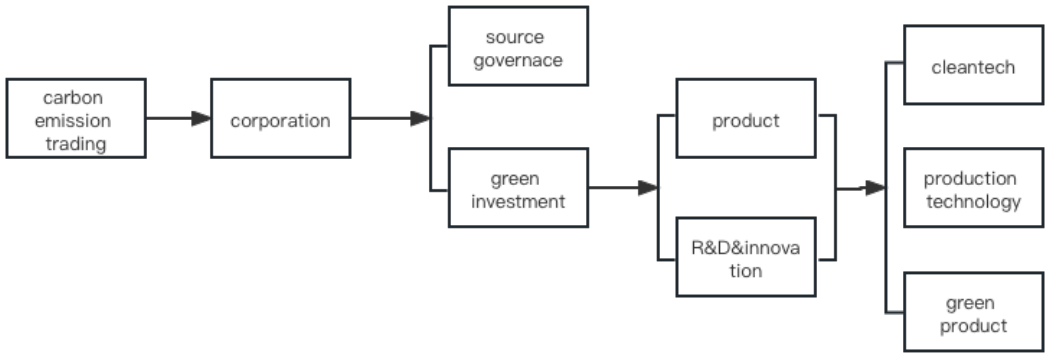

Fig. 4 Diagram of external transmission mechanism

3.1. Influence Path

Enterprises are the primary carriers affected by environmental regulations and policies. More and more investors are aware of the extra costs that will be brought about by excessive carbon emissions and, at the same time, are more concerned about their social responsibility regarding environmental protection. Traditional energy-consuming and high-emission companies will achieve energy saving and emission reduction through two paths: firstly, reprogramming their production and development, i.e., genuinely reducing energy consumption and CO2 emissions at the source. The second is for industries with high demand for energy consumption, such as chemical, steel, and paper making, which cannot reduce energy consumption and emissions at source, so enterprises can choose to enhance green investment and develop environmentally friendly projects and other ways to control emissions. Carbon emissions trading belongs to a kind of environmental regulation, and enterprises affected by the policy can avoid the extra costs arising from excess emissions. Furthermore, at the same time, they can trade the remaining emission allowances, which will cause extra income for the enterprises.

3.2. Impact Performance

Firstly, carbon emissions trading raises the production cost of enterprises. Based on the requirements of environmental regulation, enterprises need to control carbon dioxide emissions within the scope of national requirements; enterprises will choose more expensive but environmentally friendly clean energy and raw materials. under this condition, enterprises will increase the amount of green investment, the additional cost of carbon emissions will increase. If enterprises purchase carbon emission allowances through other enterprises, they will also increase their costs by increasing their green investments. Secondly, carbon trading will stimulate R&D and innovation. Companies with a shortage of carbon allowances can buy them, and companies with a surplus can sell them on the market to increase their profitability. In order to obtain more carbon emission rights for trading, it is necessary to innovate and improve the production technology. Therefore, enterprises will increase their green investment in technological innovation.

3.3. Consequences

Carbon emissions trading has an impact on green investment. Firstly, it will lead to the

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improvement and upgrading of clean technology and increase the use of clean products to achieve the purpose of reducing emissions. Secondly, it will promote the transformation of production technology to improve production efficiency. Finally, it will shift investors' investment preferences and enhance the competitiveness of green products.

4. Conclusion and Countermeasure Suggestions

4.1. Conclusion

In order to reduce carbon dioxide emissions, seven provinces and municipalities, Beijing, Tianjin, Shanghai, Hubei, Guangdong, Shenzhen, and Chongqing, have carried out carbon emissions trading pilot work one after another after the carbon emissions trading policy was put forward, which has aroused widespread concern in the academic community. Therefore, based on the perspective of green investment, this paper analyses the theoretical mechanism of carbon emissions trading on the green investment of high-carbon enterprises, explores the impact of carbon emissions trading on corporate green investment, and draws the following conclusions: First, under the conditions of the internal conduction mechanism path, carbon emissions trading on green investment through the cost, technological innovation and resource allocation path to carry out a detailed study found that the carbon emissions trading on green investment, that is, it will have a promotional effect and inhibitory effect. Firstly, under an internal transmission mechanism path, carbon emission trading promotes and inhibits green investment. Secondly, under the condition of the external transmission mechanism path, according to the analysis of the impact path, impact performance, and impact consequences, carbon emissions trading has a positive promotion effect on green investment.

4.2. Countermeasures Suggestions

4.2.1. Explore more integrated policies between the government and the market

The government and the market carbon emission reduction measurement of the light side communication are currently less. The government and the market are usually for the actual needs of enterprises, which will lead to a lack of integration between the government's decision-making and the market regulation of the communication channels. In theory and practice, the market has the risk of market failure, so it can not be a one-sided emphasis on the market regulation mechanism. Therefore, the role of the government and the market should be achieved to complement each other, reduce information asymmetry, improve the fit between the government and the market on the actual needs of enterprises, and truly achieve the influential role of the government and the market co-regulation, guidance and encouragement in the competition of enterprises, to carry out the process of maximizing the regulation of the policy better to promote the long-term development of the green cause.

4.2.2. Improve the adaptability of carbon emissions trading to technological innovation

Carbon emissions trading can continuously promote environmental regulation and technological innovation and has a guiding effect on the market to enhance environmental regulation. The future development tasks of carbon emissions trading are still diversified, embodied in carbon capture, carbon emissions, and carbon sinks. At the same time, the research and development of carbon emission reduction technology innovation is also widely diversified. Therefore, strengthening technological innovation and improving the adaptability of carbon emissions trading and technological innovation have become the key challenges we must overcome.

4.2.3. Improve the carbon emissions trading system and guide enterprises to reduce emissions

In recent years, the Chinese government has gradually taken environmental protection and resource conservation seriously. In this context, a series of policies and regulations have been introduced, among which, the pressure on enterprises as the largest applicant of the policies has gradually increased. The implementation of carbon emissions trading undoubtedly has a significant impact on enterprises; based on this process, the government needs to increase reasonable guidance to enterprises to prevent the enterprise because of the constraints of policies and regulations and the enthusiasm of the frustration. At the same time, the primary implementers of carbon emissions trading are mainly enterprises, and the participants are slightly single. In the future, it can be appropriate to encourage institutional investors and individuals other than enterprises to participate in implementing the carbon emissions trading process to improve the degree of participation in carbon emissions trading, activity, and stability, to make carbon emissions trading more complete.

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4.2.4. Actively regulate green investment and disclosure issues

The problem of enterprises' disclosure of information on green investment and environmental governance is serious, and there needs to be uniform standardization and systematic sorting out in various enterprises' statistical yearbooks and annual reports. This will cause enterprises, institutional investors, and individuals to be unfamiliar with the market information, seriously hindering their investment enthusiasm. With the gradual systematization of China's carbon emissions trading market, the team of participating enterprises will gradually expand, and the relevant trading information will become more transparent. Therefore, strictly regulating the disclosure of "green investment," "carbon information," and other information of enterprises can effectively promote the stakeholders to better access to the information related to green investment and promote the future development of green investment and the rapid improvement of the carbon emissions trading market. The disclosure of green investment information can effectively promote stakeholders' better access to green investment information and promote the future development of green investment and the rapid improvement of the carbon emissions trading market.

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