

Green Innovation and Firm Performance: Review and Prospects

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Abstract

With the strategic goal of achieving “carbon peak, carbon neutral” and the new era of green development in mind, academic studies on the correlation between green innovation and enterprise performance have surged. A fundamental research framework has been established, nevertheless, there still remains ambiguity on the intrinsic relationship between green innovation and enterprise performance. Therefore, this article aims to systematically organize the literature on this subject. The article aims to methodically review the literature pertaining to the correlation between green innovation and enterprise performance. It focuses on summarizing the theoretical basis of how green innovation impacts enterprise performance, analyzing and clarifying the effects of green product, process, and management innovation on enterprise performance. Finally, it presents future perspectives from a theoretical research viewpoint, in order to provide theoretical references and recommendations for the implementation of a green innovation strategy and enhancement of enterprise performance.

Keywords

Green Innovation, Firm Performance, Green Product Innovation, Green Process Innovation, Green Management Innovation

1. Introduction

The 18th Central Committee of the Communist Party of China’s Fifth Plenary Session proposed the introduction of five new development concepts; “innovation, coordination, green, openness and sharing”. It directly embodied green innovation through the two development concepts of green and innovation. These concepts are organically united emphasizing that it is innovation drive that is critical for green development, and innovation must be based on improving ecological and environmental governance as the keynote and undertone, which is es-

sential in implementing new development concepts. At the seventy-fifth session of the United Nations General Assembly, the Party Central Committee, led by Comrade Xi Jinping, presented the significant strategic objective of attaining carbon peak by 2030 and carbon neutrality by 2060 (Xi & Zhao, 2022). This objective has become a crucial element of China's ecological civilization construction, and green innovation is an essential approach to accomplishing the "dual-carbon" target. To achieve the dual-carbon goal swiftly and promote green innovation-led economic development, enterprises must steadily enhance their performance while adhering to eco-friendly and low-carbon principles. From a green innovation perspective, it denotes novel or enhanced products, procedures, or management systems that augment resource utilization, minimize waste emissions, and promote a harmonious relationship between humanity and nature (Zhao, Zhang, & Cai, 2022). Its concentration is on attaining economic, environmental, and social benefits in synergy, and it constitutes not only an integral part of determining a company's overall benefits but also the crux of enterprise transformation and advancement. Amidst the increasing focus on sustainability, driven by consumers, governments, and other stakeholders, green innovation is certain to boost business performance. Therefore, it is crucial to optimize the overall performance of firms by implementing sensible and suitable green innovation. The aim of this paper is to present an impartial overview and prognosis of the effects of green innovation on enterprise performance. It also intends to serve as a reference for future research on green innovation and offer valuable management insights and strategic recommendations for enterprise practitioners.

The contribution of the article is mainly in three aspects: by thoroughly examining relevant literature and systematically explaining the meaning and evaluation system of green innovation based on the relevant theoretical framework, this study investigates the multiple dimensions of green innovation's influence on enterprise performance, analyzing the mechanism and pathway. This approach facilitates subsequent scholars' understanding of green innovation and enables them to undertake more comprehensive theoretical investigations. The study presented in this paper indicates that promoting a green innovation strategy can considerably enhance enterprise performance. This finding offers theoretical backing for adopting a green transformation approach and promotes the implementation of a green innovation strategy. Furthermore, it supports the green upgrading of enterprises to enhance their performance. This paper considers the macro-level requirements of the Twentieth National Congress report and the 14th Five-Year Plan, as well as other relevant policy documents. The aim is to assist enterprises in accurately interpreting national macroeconomic policies, and to contribute towards achieving the strategic goal of green and low-carbon development.

2. Connotation and Evaluation System of Green Innovation

2.1. Connotation of Green Innovation

The economist Joseph Schumpeter first proposed the theory of innovation in

1912. Since then, the scope of innovation-related research has continued to expand and deepen. Research on green innovation has gradually increased with the continuous development of the industrialization process of human society, as resource and environmental issues have received more and more attention. However, the connotation and concept of green innovation capability has not yet had an authoritative definition. Green innovation is also referred to as environmental innovation, eco-innovation and sustainable innovation, etc. These terms, which are similar in meaning, are frequently used interchangeably. [Fussler and James \(1996\)](#) contend that, in addition to providing commercial value to firms and consumers, environmental innovations significantly reduce environmental impact. [Driessen and Hillebrand \(2002\)](#) state that green innovations should have a clear benefit for the environment and should not necessarily be developed with the aim of reducing the environmental burden itself. [Beise and Rennings \(2005\)](#) define environmental innovations as new or improved processes, technologies, practices, systems and products designed to prevent or minimize environmental damage. [Yang \(2003\)](#) described green innovation as the greening of the design, process, objectives and results of innovation activities as a new innovation concept under the constraints of green system and green policy. [Su, Zhang and Cai \(2009\)](#) proposed the concept of continuity based on green innovation, and argued that green continuous innovation is a process in which an enterprise continuously realizes technological upgrade ability, economic and social benefit growth, and finally achieves sustainable green innovation capability by continuously launching green innovation projects. [Li, Bi and Sun \(2013\)](#) claim that green technological innovation incorporates environmental principles at all stages to maximize profits and counteract negative externalities of technology on the ecosystem, thus providing effective solutions to environmental problems associated with the development of polluting industries. Taking the region as the object of study, [Cao, Shi and Zhao \(2016\)](#) argue that green innovation capability is different from general innovation, where general innovation refers to the comprehensive development capability of actors to transform innovation inputs into innovation outputs. Conversely, green innovation must embody the three principles of innovativeness, competence and sustainability to ensure sustainable development of the economy, society and environment. [Liu, Song and Gong \(2017\)](#) highlighted that, from environmental resources standpoint, the green innovation capability entails the capacity to innovate while reducing negative environmental impacts and energy consumption, within the context of sustainable development. [Xiao, Li, Xiao and Zhang \(2019\)](#) assert that green innovation focuses on the coordination of technical, environmental and economic interests, with the core consisting primarily of product, technical and organizational innovations to reduce the negative impact of economic activities on the environment, thus contributing to the achievement of sustainable development objective. [Ge, Zeng, Hu and Cao \(2021\)](#) emphasized that, from a regional perspective, green sustainable innovation capacity is the ability to create new value with less resource consumption, which mainly reflects innovation, low consumption and

strong capacity.

2.2. System for Measuring Green Innovation

With the deepening of green innovation research, green innovation capability measurement studies have been conducted from various research methods, evaluation systems and research objects, including single-indicator evaluation, comprehensive-indicator evaluation and data envelopment analysis, etc., and the research objects cover various aspects of enterprises, industries and regions. [Carrión-Flores and Innes \(2010\)](#) used the number of environmental patents to measure the level of environmental innovation. They examined the relationship between environmental innovation and environmental performance using panel data from 127 manufacturing industries in the United States over the period 1989-2004. [Lanoie, Laurent-Lucchetti, Johnstone and Ambec \(2011\)](#) characterized environmental innovation inputs in terms of environmental R&D inputs, environmental policy strengths in terms of environmental taxes, etc., and environmental performance levels in terms of pollution levels, on the basis of which they explored the relationship between several factors. [Tseng et al. \(2013\)](#) constructed a framework to assess green innovation capability from four aspects: management innovation, process innovation, product innovation and technological innovation, which was combined with the entropy weight method. [Lee and Min \(2015\)](#) empirically investigated the relationship between green R&D investment, representing green innovation capability, and carbon emissions, representing environmental performance, with Japanese manufacturing firms as the study object from 2001 to 2010.

[Fu, Lu and Wu \(2016\)](#) took 30 provinces in China as observation objects to measure and analyze China's provincial green innovation capacity from 2006 to 2013 by establishing a green innovation evaluation index system from the three dimensions of innovation input, output and environment. [Liu et al. \(2017\)](#) measured the green innovation capacity of 30 provinces and cities in China from 2003 to 2013 on the basis of the global SBM directional distance function and the GML index, and analyzed their temporal and spatial evolution patterns. [Li, Zhao and Lin \(2018\)](#) analyzed the current situation of industrial green innovation efficiency in China's provincial-level regions based on the measurement results, using the three-stage SBM-DEA method to assess the green innovation efficiency of industrial enterprises in 30 provinces and cities in China from 2008 to 2015. [Sun, Gao and Fan \(2018\)](#) collected and collated green patent data from 30 provinces, municipalities and autonomous regions in China from 2006 to 2018. By including resource consumption, environmental pollution and green patents in the evaluation system, he explored the status quo of China's green technological innovation, change trends, regional differences and improvement paths. [Xie, Pang, Chen and He \(2019\)](#) measure and analyze the green technology innovation performance of nine domestic listed iron and steel enterprises, taking iron and steel enterprises as the observation object, and construct a multi-measurement dimension green technology innovation performance evaluation index system

from the perspective of green technology innovation manifestation. Sun, Chen and Lan (2019) constructed a system to measure and analyze the current state of innovation green capacity in China in four dimensions: innovation input, innovation output, innovation environment, and diffusion input capacity through the entropy-weighted TOPSIS method, and analyzed the current state of green innovation capacity in 30 provinces and cities in China. Ge et al. (2021) employed the covariance-coefficient of variation analysis method to identify indicators. They subsequently established an evaluation system for green innovation capacity, consisting of 46 indicators covering green innovation inputs, outputs, foundations, and other relevant aspects. They conducted an empirical analysis of the spatial pattern of green innovation capacity for the Yangtze River Delta city cluster in 2015.

3. Theoretical Foundations of Green Innovation Affecting Firm Performance

3.1. Cost-Benefit Theory

The cost-benefit theory was initially proposed by French economist Dupuit. This theory was later developed and refined by Kaldor and Hicks, eventually becoming a fundamental theory in modern corporate governance. It holds significant importance in decision-making analyses for businesses. The theory of cost-benefit posits that a transaction must achieve an equilibrium between its anticipated benefits and costs for it to occur effectively. Companies always aspire to maximize their benefits; as such, the cost-benefit ratio serves as a vital tool for determining business decisions. As far as businesses are concerned, implementing green innovation can reduce pollution emissions and help avoid additional environmental costs by not surpassing set standards. Additionally, the production of by-products through recycling can provide direct economic benefits for companies. The development of green products can also increase a company's sales and profits due to their unique characteristics and monopoly. It will initially raise their costs within short period of time, but long-term adoption of sustainable practices acquired through innovation will allow them to "innovate to compensate" for production costs.

3.2. Reputation Theory

Weigelt and Camerer (1988) define reputation as a set of characteristics that stem from a firm's past behavior. Wartick (1992) views reputation as the sum of the extent to which an organizational response, as perceived by a single stakeholder, meets the needs and expectations of a multi-organizational stakeholder. Fombrun's (1996) definition of reputation theory is widely accepted and used: it defines corporate reputation as the culmination of an organization's past actions and results that indicate its capacity to provide valuable outputs to stakeholders. Reputation is intricately connected to a company's conduct and as an intangible asset, it holds significant importance for the enterprise's sustainability and growth.

If an enterprise prioritizes environmental protection, proactively takes on social responsibility and builds a good reputation, it can help maintain positive relationships with stakeholders, gain the trust of the government and wider society, establish a unique brand identity and increase its share of the market. Therefore, enterprises that exhibit green innovation behaviors are seen as actively fulfilling their environmental responsibilities. Although this may require a significant financial investment in the short term, it can result in the establishment of a green image, the acquisition of consumers' green identity, the enhancement of the competitive advantages of enterprises, stimulation of green purchasing behaviors, and ultimately improvements in the brand value and overall performance of the enterprises, resulting in long-term development.

3.3. Ecological Modernization Theory

The theory of ecological modernization, proposed by German scholar Huber, focuses on utilizing ecological development's advantages to expedite social modernization. Its ultimate goal is to attain a mutually beneficial outcome of economic development and environmental conservation. The theory suggests a novel approach to development—building an ecological modernization and developing an ecological economy. To attain sustainable social development, it is essential to achieve harmonized and unified development of economic progress and ecological conservation, without prioritizing the economy over the environment. Eco-modernization theory highlights the significance of environmentally oriented innovation as fundamental to confronting the disconnection of the economy's growth and ecological degradation (Pataki, 2009; Sarkis, Zhu, & Lai, 2011). The theory posits that the adoption of a green innovation strategy by businesses can, firstly, lessen the detrimental impact of economic activities on the environment, by implementing a waste recycling mechanism, conserving resources, enhancing the efficiency of resource usage, mitigating environmental pollution, and evading environmental penalties. On the other hand, green innovation facilitates the research and development of new eco-friendly products by enterprises. This, in turn, allows the formation of a differentiation advantage, leading to the enhancement of market competitiveness, and an improvement in economic benefits. Consequently, this results in the attainment of the simultaneous growth objectives of environmental protection and economic benefits at the enterprise level. In developing green innovations, enterprises can create valuable, rare, inimitable, and irreplaceable resources that can enhance sustainable competitive advantages and drive enterprise performance. With the growing concern for environmental issues by governments, consumers, and other stakeholders, many enterprises are considering implementing green innovation as an effective opportunity to fulfil their social roles and responsibilities while balancing economic growth and environmental protection objectives (Lin et al., 2019). This has gradually become a crucial means to achieve the theory of ecological modernization.

4. Research on the Impact of Green Innovation on Firm Performance

Green innovation is a crucial element of a company's strategy regarding sustainable development, which has a considerable effect on the company's performance. There are two contrasting views regarding the impact of green innovation on firm performance—positive and uncertain. On the positive side, the majority of studies support the notion that green innovation has a constructive effect on firm performance. [Dangelico and Pontrandolfo \(2013\)](#) determined in their research that green innovation can decrease production costs and enhance enterprise performance through increased utilization of natural resources. Nevertheless, some scholars express concerns about the connection between green innovation and corporate performance, highlighting potential negative effects or a non-linear relationship. [Huang and Li \(2017\)](#) contend that green innovations lead to increased environmental investments, bring additional costs for firms, occupy their limited resources, and negatively impact firm performance. In addition, [Yang and Li \(2015\)](#) discovered through a questionnaire survey of manufacturing enterprises that green innovation can aid businesses to adjust to environmental changes and enhance performance. Nonetheless, enterprises face an inertia-induced pressure, which is directly proportional to the degree of green innovation, ultimately causing a decline in economic performance. As a result, there exists an inverted “U”-shaped relationship between green innovation and enterprise performance.

A literature review demonstrates that prior research has principally investigated the influence of green innovation on corporate performance using diverse performance metrics. It is evident that firms who participate in green innovation can augment their economic as well as environmental performance. [Wang, Li and Wang \(2021\)](#) conducted an empirical study on the non-linear relationship between green innovation and the environmental and economic performance of enterprises, using sample information collected from 642 industrial enterprises. The study concluded that green innovation can efficiently improve the allocation of factors, enhance the environmental performance, and subsequently elevate the economic performance of enterprises. Green innovation has an impact on the economic and environmental performance of firms, as well as their social performance due to the positive image it creates. In a study conducted by [Zhang and Zhang \(2013\)](#) using manufacturing firms in China, it was discovered that the implementation of green innovation leads to an enhancement of firms' social reputation, a higher level of social legitimacy, and an improvement in social performance.

Although academics have recently investigated the broad impact of green innovation on firm performance from various viewpoints, detailed studies have highlighted variations in the effectiveness of different forms of green innovation on firm performance. Regarding the classification of green innovation, most scholars adhere to the traditional division of innovation dimensions, which in-

cludes product, process (technological), system, and management (organizational) dimensions. Such dimensions are classified from the perspectives of technological and managerial innovations. The managerial innovations are also considered technological innovations in a broad sense. [Chen, Shi and Zhao \(2006\)](#) divide green innovation of businesses into two categories: green product innovation and green process innovation. [Sarkis, Gonzalez-Torre and Adenso-Diaz \(2010\)](#) approach green management practices from an ideological perspective, and extends Chen's framework to include the dimension of green management innovation. This entails evaluating the implementation of corporate strategies against enterprises' internal management standards. Based on this, Chen and Sarkis' classification method is used to categorize green innovation into three dimensions: green product innovation, green process innovation, and green management innovation.

4.1. Impact of Green Product Innovation on Firm Performance

Green product innovation refers to the integration of environmental protection concepts into the selection of raw materials, product design, product packaging and other aspects ([Sarkis et al., 2010](#)). Its purpose is to improve the quality and design of existing products or introduce new ones to minimize the product's adverse impact on the environment throughout its life cycle. Green product innovation aligns with the concept of environmental protection and demonstrates enterprises' social responsibility to actively take responsibility for the environment. This fosters a positive image in the public and motivates them to make purchases ([Lin, Geng, & Tan, 2013](#)). It also assists in the creation and development of a green innovation platform for enterprises from the source, thus enhancing their economic efficiency and social performance.

Affected by resource shortages, enterprises are engaging in green product innovation. This has the potential to improve productivity and resource utilization across the entire product life cycle ([Zeng, Liu & Li, 2020](#)), while also reducing production costs, minimizing raw material inputs, and avoiding unnecessary waste of resources. The enterprise should also utilize alternative resources to develop innovative, eco-friendly products. This approach can help address the current shortage of raw materials, achieving differentiation while satisfying consumer demands for sustainability and creating a competitive advantage. Ultimately, this will lead to improved overall performance of the enterprise. [Liu and Li \(2021\)](#) conducted a meta-analysis to re-analyze and evaluate data from 56 papers. Results indicate that green product innovation has a significant positive relationship with environmental performance and economic performance. [Chan, Yee, Dai and Lim \(2016\)](#) investigated the impact of green product innovation on enterprise performance and contended that green practices not only improve cost efficiency but also promote profitability. Even in a dynamic environment, green product innovation can advance corporate performance in terms of both cost efficiency and profitability. [Amores-Salvadó, Castro and Navas-Lopez \(2014,](#)

2015) discovered that eco-friendly product innovation and a green corporate image can assist firms in reaching favorable outcomes in numerous economic benchmarks, resulting in increased market share and sales growth and benefiting the social performance of firms. However, there are scholars who have presented slightly varied empirical findings. As an illustration, Medina, Guevarar, Campo-verdere and Paredes-Aguirre (2022) discovered no notable correlation between green product innovation and environmental performance after working with a sample of 214 manufacturing firms in South America. In addition, green product innovation positively impacts enterprises' competitive advantage and corporate image (Yang & Shi, 2015). Enterprises engage in green product innovation not only to comply with relevant state-issued green policies, but also to demonstrate their commitment to producing environmentally-friendly and healthy products. This displays the enterprise's role in the era of protecting the environment, respecting nature, and demonstrating concern for public well-being, ultimately better positioning them to serve the green market and win consumer trust. Consequently, this behavior stimulates green purchasing (Medina et al., 2022).

In summary, despite a few studies indicating that green product innovation does not positively influence environmental performance, a considerable number of studies have affirmed that green product innovation facilitates environmental performance. These studies have developed a more cohesive understanding; any divergent empirical results could be contingent on a unique local market environment.

4.2. Impact of Green Process Innovation on Firm Performance

Green process innovation, such as cleaner production technology innovation and end-of-pipe management technology innovation, means decreasing the production of unsafe substances, cutting down on pollutant emissions and increasing energy efficiency by improving current production processes or developing new ones (Miroshnychenko, Barontini, & Testa, 2017). This technique highlights minimizing the environmental impact during manufacturing, use and disposal, and converting primary emissions into harmless substances via additional measures (Xie, Huo, & Zou, 2019). Green process innovation ensures that a company's production process remains clean, suppressing environmental pollution externally and preventing pollution spillover.

Green process innovation enhances the production efficiency, waste treatment level and resource utilization of enterprises by overhauling the production procedure and setting up a waste utilization mechanism. It can also result in supplementary revenue (Rennings, Ziegler, Ankele, & Hoffmann, 2006) by recycling and converting waste into by-products that are subsequently sold in the market. Moreover, incorporating recycled materials and alternative resources and raw materials can decrease pollutant emissions, cut down the use of resources or energy, and diminish the adverse impact on the environment (Li, Xu, Li, Du, &

Ye, 2021). This practice also guarantees that the company's manufacturing procedures align with environmental regulations, thus sidestepping environmental pollution penalties, while elevating the company's economic returns and environmental performance. However, some studies have suggested a non-linear correlation between green process innovation and financial performance. For instance, Xie, Hoang and Zhu (2022) have discovered a "U"-shaped effect of green process innovation on financial performance, whereby it has an initially negative impact but becomes positive as green process innovation increases.

Green process innovation not only enhances the economic and environmental performance of firms, but also advances their social performance. According to Dahan and Yusof (2020), green process innovation has been demonstrated to promote the social performance of firms in a study that analyzed 45 empirical literatures published between 2006 and 2017. The company's implementation of green process innovation behaviors facilitates greener and more environmentally friendly production processes. This aligns with the principles of environmental responsibility, national policies and stakeholder demands, contributing positively to environmental protection, generating widespread social recognition and boosting the company's social performance. At the same time, the government imposes economic penalties on enterprises that violate environmental protection regulations by limiting technology and pollutant emission standards. Zhang and Wu (2016) have shown through empirical research that government-issued environmental protection regulations prompt businesses to fulfil their environmental responsibilities and undertake green process innovation to achieve green production, reducing environmental pollution.

In the conclusion, the adoption of green process innovation behavior by companies has a significant impact on economic, environmental and social performance, but due to the influence of the internal and external environment, green process innovation may produce different results on financial performance. Nonetheless, green process innovation can help businesses convey their green credentials to stakeholders, thereby enhancing trust in the market.

4.3. Impact of Green Management Innovation on Firm Performance

Green management innovation refers to an enterprise's sustainable development efforts that utilize low-carbon and environmentally-friendly management technologies, methods, and ideas to enhance resource efficiency and environmental protection during production and operations (Zhao, Zhao, Zeng, & Zhang, 2015). This innovation pertains to various areas of enterprise management, such as green cost management, green marketing, and green supply chain management innovation. Green management innovation begins within the enterprise, and continuously enhances the green management and operational practices to prevent the enterprise from incurring environmental penalties.

Green management innovation typically increases the efficiency of resource acquisition, allocation and use by using green technologies and management

strategies (Ma, Hou, Yin, Xin, & Pan, 2018). It also strengthens the green learning capabilities of enterprises, enabling them to capitalize on market opportunities and bolster sustainable development performance in the competitive market (Huang & Li, 2017). Green management innovation can enable enterprises to align with national environmental policies, thus acquiring scarce resources such as government tax incentives and special funds for environmental governance. At the same time, it can assist enterprises in establishing a positive stakeholder relationship network, fulfilling the green market demands of stakeholders, and enhancing the enterprise's green cultural identity (Dwyer, Pane Haden, Oyler, & Humphreys, 2009). This, in turn, fosters the enhancement of the comprehensive performance of the enterprise. Companies that take the lead in implementing green management innovation can assist managers in weighing the environmental impact of their actions, avoiding penalties, and enhancing the environmental performance of their organizations. Santolaria, Oliver-Sola, Gasol, Morales-Pinzon and Rieradevall (2011) conducted a study in which firms were asked to choose between different environmental attitudes, including proactive, reactive, indifferent, and negative. The reactive and indifferent attitudes were found to be detrimental to firms' economic performance as they are not proactive in adopting green innovation and eco-design measures. Green management innovation can also signal to the outside world that companies are actively taking on social responsibility, which has a positive reputational effect (Miroshnychenko et al., 2017). It promotes an environment of environmental protection and can improve corporate social performance.

5. Outlook for Future Research

Green innovation is an effective initiative to promote environmentally-friendly transition of enterprises and a crucial strategic decision to attain sustainable development. In the context of green development, green innovation has been extensively promoted and has become a key approach to improving enterprise performance. Numerous internal and external factors play a role in enhancing enterprise performance, and the capability for green innovation is among the internal factors. Previous research has extensively examined the effect of green innovation on diverse forms of enterprise performance, yet there exists a research gap regarding the influence of the three dimensions of green innovation on enterprise performance. Based on a thorough review and analysis of existing literature, this study begins by defining the concept and evaluation framework of green innovation. It then examines the cost-benefit, reputation, and ecological modernization theories and explores the potentially positive or uncertain effects of green product, process and management innovation on enterprise performance. The study elucidates the relationship between the dimensions of green innovation and enterprise performance, and identifies a gap in the literature regarding the impact of green innovation on enterprise performance. The limitations of current research, specifically the literature addressing the effects of green

innovation on enterprise performance in various aspects, are more prevalent. However, research on the impact of the three dimensions of green innovation on enterprise performance is scarce.

To enhance understanding of the effect of green innovation on enterprise performance and aid the implementation of enterprise green transformation strategy, as well as elevate enterprise performance, this paper presents the following suggestions regarding potential future theoretical research in the area of green innovation and enterprise performance.

1) Research on green bonds in the field of green innovation under the new development pattern. The state's promotion of the green development policy and strategy of creating an ecological China, along with the vigorous promotion of green transformation and upgrades of enterprises, raises the question of whether such actions will affect the issuance of green bonds by real enterprises in China. Additionally, how will it affect the financing efficiency of these enterprises? Will the adoption of green practices increase the financial risk for enterprises? Further research can explore the relationship between green transformation and bond issuance by enterprises in the context of the new double-cycle development pattern. This research could investigate the specific mechanisms and pathways through which green transformation affects financing efficiency.

2) Enriching research on green innovation and corporate employee performance in the context of "dual carbon" is a crucial endeavor. Over the past five years, the Party Central Committee, led by Comrade Xi Jinping, has implemented measures aimed at strengthening ecological environmental protection and promoting low-carbon green development. Under the strategic goal of "double carbon", the 2023 government work report highlights the promotion of green transformation as the key focus of economic and social development. The correlation between green innovation and corporate employee performance has become a significant area of research. However, there is insufficient literature on green innovation and enterprise employee performance. In future research, scholars should actively focus on the topic of green innovation and its effect on employee performance in business enterprises. They should endeavor to conduct innovative research in this field, enrich the relevant theoretical results, and provide guidance to businesses.

3) A new policy has been introduced to promote green innovation in order to enhance the financial performance of corporations. The Central Economic Work Conference held on 15-16 December 2022 emphasized the need to bolster positive fiscal policies and make them more effective, implement a stable and robust monetary policy, and maintain reasonably ample liquidity levels. The conference advocated for a strong emphasis on the economy and its growth. Will the introduction of new economic policies facilitate the development of eco-friendly innovations, and will these investments by enterprises surge as a result of policy backing and improved internal capital liquidity? This, in turn, is expected to drive the enhancement of enterprise performance. Researchers can examine the profound effects of ecological innovation on enhancing the financial performance

of companies from the viewpoint of the new policy. This may aid in better guiding business practices.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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