Journal of Cleaner Production 382 (2023) 135248

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Green credit and enterprise environmental and economic performance: The mediating role of eco-innovation

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ARTICLE INFO

Handling Editor: Jian Zuo

Keywords:
Green credit policy
Eco-innovation
Enterprise performance
Banking institutions
HH enterprises

ABSTRACT

In recent years, green credit has become a major policy for banking institutions to financially support the green development of enterprises. However, there has been no consensus on whether and how green credit can effectively improve enterprise performance. This study investigates the dual impact of green credit on enterprise environmental and economic performance with a conceptual framework that incorporates eco-innovation (i.e., innovation related to eco-process, eco-product, and eco-organization) as a mediator. Using the structural equation model and data from China's 376 textile manufacturing firms, this study reveals that green credit directly improved enterprise economic performance but had no significant direct effect on environmental performance. Eco-innovation showed a complete and partial mediating effect in the indirect relationships between green credit and environmental performance, and economic performance, respectively. Such a mediated path can avoid excessive green investment, alleviate financial burden, and promote the green transformation of enterprises with high pollution and high energy consumption (HH), thus contributing to the sustainable development of green credit. This study offers a valuable framework to assist business managers, bankers, and policymakers in managing green credit, strengthening eco-innovation, and improving environmental and economic performance.

1. Introduction

Capital is an indispensable production factor resource for organizational development. Resource-based theory suggests that financial resources can be flexibly transformed into other resources, and thus have a large impact on organizational performance (Belgraver and Verwaal, 2018). As the most important external financial source, credit from banking institutions is crucial for enterprise development. In particular, green credit policy, e.g., the "Green Credit Guidelines" issued by China, plays a major role when enterprises facing the dual burdens of market competition and environmental risks tend to gain competitiveness through green development.

Green credit policy guides banking financial institutions to support the green development of enterprises, thus increasing the credit lines of green enterprises and shrinking the credit lines of enterprises with high pollution and high energy consumption (HH) according to enterprise differences in pollution emissions. In this way, environmental protection could be achieved through capital distribution and the adjustment effect of economic leverage (Fatemi and Fooladi, 2013; Lagoarde-Segot, 2019). Therefore, the approval principle of green credit has shifted from maximizing enterprise shareholder value to seeking synergy between environmental and economic performance.

However, so far, there has been no consensus on whether and how green credit can effectively improve enterprise environmental and economic performance. Zhang et al. (2011) investigated the implementation of China's green credit policy at the national and provincial levels and concluded that green credit is still not fully implemented. Liu et al. (2017) found that tightening green credit would rein in investment in HH enterprises in the short term but encourage credit loans to green firms. He et al. (2019), Liu et al. (2019), and Xu and Li (2020) also concluded that green credit would increase the debt financing costs of HH enterprises. In contrast, Sun et al. (2019) argued that green credit encouraged enterprises to reduce pollutant emissions, but the long-term environmental effects of the green credit remained unclear. He et al. (2019) pointed out that enterprises with green credit support would invest excessively. This phenomenon was called the "double threshold effect" of green credit. Meanwhile, there are contradictory conclusions about the impact of green credit on the transformation of industrial

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https://doi.org/10.1016/j.jclepro.2022.135248
Received 30 August 2022; Received in revised form 29 October 2022; Accepted 18 November 2022
Available online 25 November 2022

structures. Hu et al. (2020) found that the impact was significant, while Liu et al. (2017) believed that green credit had a poor effect on industrial structure adjustment. To sum up, there has been no empirical evidence nor theoretical explanations for the positive correlation between the green credit constraints and the environmental and economic performance of the HH enterprises.

The controversial empirical results can be attributed to several factors: the ambiguity of green credit objects, the uncertainty of green credit purpose, and the constraints of the green credit policy implementation range. First, the widespread consensus is that green credit tends to grant green enterprises, but the definition of green industry is still unclear.[1] The green industry is not a statistically standard industry according to the International Standard Industrial Classification of All Economic Activities. Inconsistency between the green industry and the national economic sector would create ambiguity in determining the objects of green credit. Second, credit for green industry represents only a narrow category of green credit. The broader purpose of green credit should be to promote the real economy's investment in projects that can improve environmental performance, e.g., reducing pollutants and greenhouse gas emissions, and increasing the consumption of renewable resources, to achieve sustainable development and transformation to a green economy. Finally, the administrative measures to tighten the credit policy of HH enterprises have short-term effects and unsustainable characteristics. These administrative measures prefer to pursue short-term economic profits rather than long-term environmental performance, although banking institutions can effectively allocate green credit resources to enterprise to a certain extent. Hence, scholars recently examined the relationship between green credit and ecological innovation (eco-innovation) from the perspective of capital resources use. For instance, Zhang et al. (2022) found that the implementation of green credit policy inhibited the green innovation of all heavy-polluting enterprises in comparison to non-heavy polluting enterprises. Wang et al. (2022) found that "Green Credit Guidelines" significantly improved the green innovation quality of Chinese listed companies.

Considering the research gap mentioned above, this study aims to explore the direct and indirect impacts of green credit on enterprise performance with the mediating role of eco-innovation activities. We first theoretically illustrate the economic and environmental externalities of green credit and use environmental performance to measure the green attributes of credit funds. Second, the structural equation model (SEM) is established to empirically test the relationship between green credit and enterprise environmental and economic performance in China's textile manufacturing firms and to reveal the mediating effect of eco-innovation. Based on the empirical results, we point out the impact pathway of green credit to obtain environment and economic performance; i.e., green credit can obtain environmental performance through enterprise eco-innovation activities. Finally, we suggest using eco-innovation activities as the object of green credit based on the resource-activity-performance theoretical paradigm. This can guide banking institutions to formulate green credit standards more clearly, and thus contribute to the sustainable development of green credit.

The contribution of this study is multiple. First, it theoretically explains the source of green attributes of credit funds, which would promote the theoretical development of green credit. Second, it provides empirical evidence on the mediating effect of eco-innovation and validates the green credit's influence path on enterprise environmental and economic performance. Finally, this study takes the value chain activities as the starting point and summarizes the eco-innovation activities from the industrial engineering perspective to formulate the scale of enterprise eco-innovation, which enriches the literature on enterprise innovation.

The structure of the rest of the paper proceeds as follows. Section 2 performs a theoretical analysis of the effects of green credit on enterprise performance and puts forward the corresponding research hypotheses. Section 3 introduces the model, variables, and data sources. Section 4 presents the empirical results and discussion. Section 5 concludes the study and presents the policy implications.

2. Theoretical analysis and research hypotheses

Based on a theoretical analysis of financial supervision, stakeholders, sustainable development, and strategic management, we examined the relationships between green credit and environmental and economic performance and developed a theoretical framework that incorporates eco-innovation as a mediator. This framework attempts to explain the direct and indirect relationships between green credit and enterprise environmental and economic performance by highlighting the mediating role of eco-innovation in the indirect impact mechanism. The theoretical framework is shown in Fig. 1, and the theoretical analysis and research hypotheses are as follows.

2.1. Green credit and enterprise performance

From the perspective of new classical and neoliberal economics, the best credit strategy is to invest in the short term and pursue a high return. Hence, maximum return on loan spreads can be achieved and shareholder value can be maximized (Brigham and Ehrhardt, 2013). This view of focusing on the maximization of individual interests is recognized by mainstream new classical financial theory, but it may have disastrous effects at the collective level. For example, the 2008 financial crisis originated from over-borrowing by subprime borrowers.

Since the unregulated credit market and credit behavior will bring huge costs and risks to society, the implementation of financial supervision by the government can make up for the shortcomings of the credit market and improve the efficiency of resource allocation (Brunnermeier et al., 2009). However, the theoretical viewpoints of financial liberalization such as financial repression and deepening raise questions about the efficiency of financial supervision. The essence of the debate focuses on the inconsistency between the profits made by financial institutions and the overall benefits obtained by society (Sandberg, 2018). The purpose of government supervision is to transfer the risks or costs of credit activities from society to financial institutions. The incompatibility between government and financial institutions makes a conflict in values, especially when they face the challenge of sustainability.

While the challenge to previous mainstream financial views was mainly focused on a quantitative perspective, the rise of sustainable finance has led to a profound qualitative change (Lagoarde-Segot, 2019). Mainstream finance, such as profit privatization, cost socialization, and negative externalities has been strongly criticized by sustainability challenges represented by environmental issues (Ryszawska, 2018). Shareholders, government, society, and other stakeholders all hope that when it comes to environmental issues, the financial system can transform from a mainstream view of the single-dimensional performance of the economy to a multi-dimensional performance combining both economy and environment (Mostert, 2012). Although it may be unreasonable for financial institutions to have the dual goals of creating wealth and assuming social responsibility simultaneously, stakeholders' welfare containing environmental performance is more important than individual economic performance for shareholder value

[1] The European Union defines the green industry as an environmentally friendly product and service industry that measures, prevents, and reduces environmental hazards and related environmental issues (OECD, 1999). The British government defines it as a booming low-carbon and environmentally-friendly product and service industry, while the US Bureau of Labor Statistics defines it as an industry that provides products or services which are beneficial to the environment or save national resources (Shapira et al., 2014). The Korean government defines it as the industry that achieve low-carbon and green growth by producing goods and providing services (Ministry of Government Legislation, 2010).

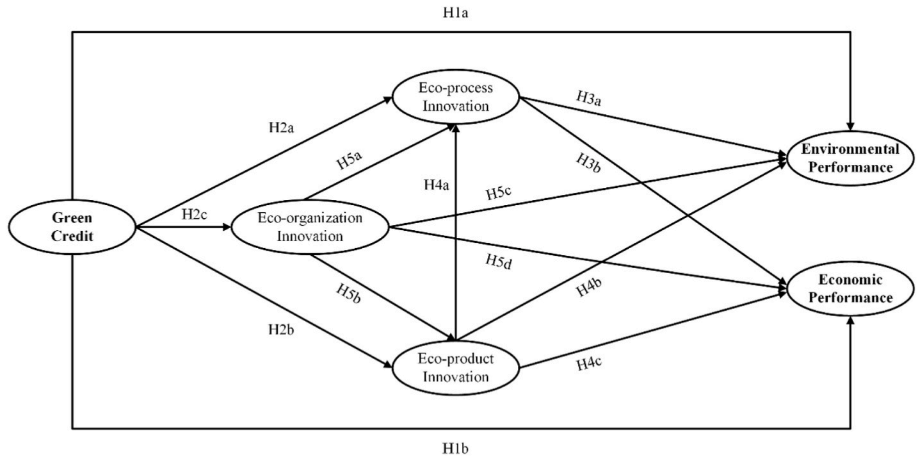

Fig. 1. Theoretical framework.

creation (J Jiao, 2010). Financial institutions need to take greater responsibility for the impact of financial activities on society (Obeid and Brychko, 2017).

Green credit can be considered as the result of the credit system opening up under external shocks such as environmental deterioration and a low-carbon economy. Given that the green transformation of the real economy requires a lot of financial support (Huwyler et al., 2014), it is difficult for banking institutions to play a key role in environmental sustainability if they make credit decisions based solely on economic indicators such as return on investment and capital loss rate.

To reduce or avoid the negative environmental impacts related to loan projects, the Equator Principles make the ambiguous environmental standards in project financing clear and specific and encourage banking institutions to invest more credit funds in activities or projects that can produce environmental performance, which has become the principal framework of due diligence (Wörsdörfer, 2015). The Equator Principles embodies the social responsibility of banking institutions and helps to show their ethical position and preference. However, due to the voluntary nature of the Equator Principles, the development of green credit has been greatly restricted by mainstream views of profit maximization. Although financial short-termism will prove to be unsustainable sooner or later, there is currently insufficient evidence to support the positive correlation between environmental performance and economic performance achieved by green credit (Liang et al., 2018; Nizam et al., 2019). Moreover, financial institutions are unwilling to embed any accountability mechanism in the voluntary principle, which will lead to a decline in the legitimacy of the Equator Principles (O'Sullivan and O'Dwyer, 2009). In addition, it is also difficult to measure the impact of the Equator Principles on the environment without a more detailed information disclosure and a standardized performance evaluation system (Macve and Chen, 2010).

The new classical market approach is no longer the only way and effective guide to achieving sustainable development (Fatemi and Fooladi, 2013). The government supervision method represented by China's green credit policy effectively guides the flow of bank credit funds, carries out purposeful resource allocation among different industries, and quickly promotes the development of green credit institutionally (Shen et al., 2013). However, issues such as the unguaranteed economic benefits of some green projects, long payback periods, and corruption that hinders the performance and stability of banking institutions have not been resolved, (J Jo et al., 2015). There are also considerable doubts about the sustainability of government supervision.

To sum up, although green credit based on stakeholder theory, financial supervision theory, and sustainable development theory has not completely overthrown mainstream financial theory, it may enable banking institutions to reduce the environmental risks they face and to benefit from the interaction between the economic and sustainability challenges. No matter under the Equator Principles of a voluntary nature or the administrative government supervision, the essence of green credit is to create diversified value by obtaining environmental performance. When the effects of green credit are measured, environmental performance should be considered a key indicator that cannot be ignored, which is the same as economic performance. Therefore, this study proposes the following theoretical hypotheses:

H1a. Green credit has a positive effect on environmental performance.

H1b. Green credit has a positive effect on economic performance.

2.2. *Green credit and eco-innovation*

It has become a theoretical consensus that credit has strengthened the transmission mechanism of traditional currencies and can promote economic growth in the short term. Although enterprises can use retained earnings to make up for the lack of external financing, internal funds and external funds are not perfect substitutes (He et al., 2016). Also, companies with limited external financing will not reduce their external financing as internal funds increase (Almeida and Campello, 2010). External financing constraints will have an impact on cash holdings, dividends, and operating benefits (Pathan et al., 2016; He et al., 2016), and will also affect enterprise innovative investment decisions.

Debt contracts may not be suitable for financing high-risk innovative activities and the sensitivity of innovation expenditure to bank credit is also controversial (Kerr and Nanda, 2015). However, the positive impact of credit on innovation is supported by a lot of empirical evidence. The development of the banking industry has affected the possibility of enterprise process innovation (Benfratello et al., 2008). Bank deregulation will have a significantly positive impact on the quantity and quality of innovation activities (Amore et al., 2013). During the financial crisis, the innovation activities of companies that have business relationships with banks and a high degree of inter-bank market reliance decreased more than other companies (Giebel and Kraft, 2019).

The mainstream view of credit is to make credit decisions based on economic factors such as the company's financial statement status, collateral value, and industry characteristics, but the key to credit decisions by green credit lies in correctly identifying the externalities of economic activities (Lagoarde-Segot, 2019). Eco-innovation is an effective way to integrate environmental policies into innovation strategies and competitiveness (Wu et al., 2016; Marzucchi and Montresor, 2017), which can promote the transformation of enterprises into a green economy (Ghisetti et al., 2015; Xavier et al., 2017). However, financial constraints are an important reason for hindering its development (Tariq et al., 2017). Therefore, we propose the following hypotheses:

H2a. Green credit has a positive effect on eco-process innovation.

H2b. Green credit has a positive effect on eco-product innovation.

H2c. Green credit has a positive effect on eco-organization innovation.

2.3. Eco-innovation and enterprise performance

Strategic management theory, innovation theory, and stakeholder theory have laid a solid theoretical foundation for enterprise eco-innovation. Factors such as competitive pressure, environmental regulation, and customer demand (Cuerva et al., 2014; de Jesus Pacheco et al., 2017) drive enterprises to adopt eco-innovation, a valuable strategy that contributes to sustainable development, reduces environmental costs and impacts (Cai and Zhou, 2014). Eco-innovation is guided by the sustainability of goals, actions, and performance. It provides enterprises with business opportunities or develops niche markets (Hojnik and Ruzzier, 2016), which is a source for enterprises to gain competitive advantage through dual externalities.

With the deepening of theories and the enrichment of empirical evidence, the connotation of eco-innovation is constantly expanding and extending. Eco-innovation is considered to be a new product and process that can significantly reduce environmental impact and provide customers with commercial value. It is also regarded as a new product, service, organization, or management method for enterprises or customers (Kemp and Foxon, 2007). Eco-innovation is a systematic and technological process (Kiefer et al., 2017), an output that can promote sustainable development achieved by enterprises (Bossle et al., 2016), or a development concept that embeds environmental awareness into organizational practices (Hazarika and Zhang, 2019). The main body of eco-innovation is the enterprise organization. Whether it is an activity, a process, a product, or a service, it is the external manifestation of the behavior of the internal enterprise elements and the final manifestation of the enterprise behavior. Therefore, it can be considered that enterprise eco-innovation is to promote the economic development of the enterprise while improving the internal environmental efficiency of the enterprise, reducing the impact of the enterprise on the external natural environment. It is a new or improved, and sustainable enterprise organizational behavior.

Although the types of eco-innovation have not been clearly defined, according to the classification of innovation in the Oslo Manual (OECD, 2005), eco-process innovation, eco-product innovation, and eco-organization innovation are generally recognized in the eco-innovation literature (Cai and Zhou, 2014; Cheng et al., 2014; García-Granero et al., 2018). Combining Porter's value chain model and enterprise capability theory, eco-process innovation, eco-product innovation, and eco-organization innovation will correspond to the innovative behaviors of enterprises in the manufacturing process, product development, and organization stages respectively for conceptualizing defining and subsequent measurement.

Eco-process innovation uses new or improved methods to change the existing process to achieve the purpose of cutting down costs, reducing energy consumption, and decreasing pollutant emissions. In the product manufacturing process, technology-focused innovations (Kemp and Foxon, 2007) are mainly concentrated on end-of-pipe solutions and integrated cleaner production technologies (Hojnik and Ruzzier, 2016). End-of-pipe solutions are usually added to process regulations to comply with environmental regulations, which are additional measures related to pollution control, waste management, and environmental monitoring. The integrated clean production technology is to adopt new green energy, clean production, and other technologies or methods to change the process regulations to reduce the negative environmental impact of the manufacturing process (Demirel and Kesidou, 2011). Therefore, we propose the following hypotheses:

H3a. Eco-process innovation has a positive mediating effect on environmental performance.

H3b. Eco-process innovation has a positive mediating effect on economic performance.

Eco-product innovation is to make products meet environmental requirements and reduce negative externalities by replacing raw materials invested in manufacturing products or changing product structure and functional characteristics. Product development is a complex iterative process, starting from conceptual design and ending with product release. The level of innovation in the product development stage directly affects the production efficiency, energy consumption, and pollutant emissions in the manufacturing stage, as well as the energy consumption during the product utility stage.

Technological progress and economic growth often lead to the shortening of product life cycles (Finnveden et al., 2009). Affected by fierce market competition and shortened product life cycles (Kiefer et al., 2017), the unique green capabilities of enterprises (Cheng et al., 2014) are manifested to a certain extent by the level of product structural design and function design, which is the source of competitive advantage of the natural resources-based perspective. Product structure and function innovation with environmental awareness can provide new products that are more market-competitive and environmentally friendly (de Jesus Pacheco et al., 2017). The material properties of raw materials directly affect the sustainability of products (García-Granero et al., 2018). Thus, we propose the following hypotheses:

H4a. Eco-product innovation has a positive effect on eco-process innovation

H4b. Eco-product innovation has a positive mediating effect on environmental performance.

H4c. Eco-product innovation has a positive mediating effect on economic performance.

Eco-organization innovation is to rely on new or significantly improved scientific management methods to change the organizational practices of enterprises to enhance environmental awareness and cultivate eco-culture. Scientific management has changed the concept of modern organizations, making the organization driven by scientific principles. As the core purpose of scientific management, the essence of improving efficiency and eliminating waste is to reduce costs and relieve environmental impact. For enterprises, the use of advanced scientific management methods to promote eco-product innovation and eco-process innovation is inseparable from continuous changes in organizational routines.

Organizational routines are an important part of organizational behavior. Enterprises change their operating functions and processes by changing routines. Organizational routines will be reflected by management systems, and an environmentally conscious management system can effectively guarantee the stability and sustainability of organizational routines in environmental protection. Organizational innovation can create better coordination and cooperation mechanisms within the organization, provide a suitable internal organization environment for the development of product innovation and process innovation (Cheng et al., 2014), and enable functional interaction between various departments of the organization (de Jesus Pacheco et al., 2017). Therefore, we propose the following hypotheses:

H5a. Eco-organization innovation has a positive effect on eco-process innovation.

H5b. Eco-organization innovation has a positive effect on eco-product innovation.

H5c. Eco-organization innovation has a positive mediating effect on environmental performance.

H5d. Eco-organization innovation has a positive mediating effect on economic performance.

3. Model, variables and data

3.1. Structural equation model

This study uses SEM to explore the impact of green credit on enterprise performance and the mediating role of eco-innovation. SEM is a multivariate statistical analysis tool that is used to measure unobserved latent variables measured by multiple indicators and to identify the relationship between them. This approach is a combination of factor analysis and multiple regression analysis and is an effective tool for analyzing the structural relationship between the measured variable and the underlying construct. SEM helps to identify and verify the causal relationship between the variables discussed in the theoretical framework and is widely used in cognitive modeling and behavioral analysis literature that requires causality. We used SPSS25.0 for data processing and exploratory factor analysis (EFA) and AMOS25.0 for confirmatory factor analysis (CFA) and SEM path analysis.

3.2. Variable measurement

3.2.1. Measurement of eco-innovation

The key to using eco-innovation as a path for green credit to obtain enterprise performance is the correct measurement of eco-innovation. There has been no fully recognized eco-innovation scale, and its measurement are still quite different in existing studies. For example, Cai and Zhou (2014) used the quality of sales staff to measure the integration ability of eco-innovation and then used the items such as low energy consumption in the production process and reducing the emission of harmful substances and wastes effectively in the manufacturing process, to measure the eco-innovation behavior (Cai and Li, 2018). Hojnik and Ruzzier (2016) measured eco-process innovation as recycling, reusing, and remanufacturing materials, while García-Granero et al. (2018) regarded it as a performance indicator of eco-product innovation. The R&D investment in eco-innovation is used as a measurement item for eco-product innovation, and it is also used to measure eco-organization innovation (Tumelero et al., 2019).

The diversity of eco-innovation measurement indicators originates from the expansion and generalization of eco-innovation concepts and research frameworks. Since Fussler and James (1996) put forward the concept of eco-innovation, the connotation of eco-innovation has been continuously enriched. From a micro perspective, some scholars believe that eco-innovation is a new product, service, production process, organization, or management structure (Fussler and James, 1996; Kemp and Foxon, 2007). From a macro perspective, eco-innovation is the idea of creating value (Foxon and Andersen, 2009), system reform (Kiefer et al., 2017), and strategic thinking (Xavier et al., 2017). As Hazarika and Zhang (2019) stated, the current description of eco-innovation has gradually transformed from an instrumental entity to a social entity, and theoretical analysis has also shifted from neoclassical cost-benefit analysis to the evolution method of bounded rationality. However, understanding the characteristics and nature of eco-innovation is essential for more effective management of eco-innovation (Xavier et al., 2017).

In our conceptual definition, eco-innovation can bring about environmental performance, and it is a novel activity and behavior that can be significantly improved for enterprises. Whether it is product design, gradual improvement, or breakthrough changes in the process, it is aimed at reducing environmental pollution and reducing energy consumption, while reducing production costs, improving production efficiency, and enhancing product competitiveness, to promote enterprise economic growth. These activities have the same content and goals as industrial engineering methods. For example, the degree of application of computer-aided design and manufacturing can reflect the automation level of enterprise information technology; the degree of application of advanced manufacturing technology can reflect the level of efficient, low-consumption, and clean production technology of the enterprise; the degree of implementation of the management system can reflect the strategic goals of the enterprise.

3.2.2. Sub-dimensions of eco-innovation

Following Cai and Zhou (2014), Cheng et al. (2014), and García-Granero et al. (2018), this study categorizes the eco-innovation of enterprises into three types: eco-organization innovation, eco-product innovation, and eco-process innovation.

(1) **Eco-organization innovation.** Its sub-dimensions include eco-culture construction, management method innovation, and management system optimization. Some of the most common items are often vague and subjective when measuring the innovation of eco-organizations in the existing literature. These items include whether the company's management often actively carries out eco-innovation activities (Cheng et al., 2014), whether they often collect and share ecological information on innovation trends (Peng and Liu, 2016), whether to exchange experiences among various departments participating in eco-innovation (Tumelero et al., 2019).

To clearly show the scope of eco-organization innovation and to use as more perceptible items for objective evaluation as possible, this study starts from the basic functions of enterprise management, and measures eco-organization innovation from three aspects originally, including culture, management methods, and management systems. We replace vague expressions in the previous scales with clearly measurable items such as the cycle of holding theme activities of environmental protection and innovation, and the difference in annual social responsibility reports. In addition, we sorted out questions such as whether to use the new system to manage eco-innovation (Peng and Liu, 2016; Tumelero et al., 2019) and whether to break the previous management process (Kiefer et al., 2017). Meanwhile, we used the level of implementation of the production modes, the implementation of on-site management functions and the frequency of continuous improvement, and other items to measure management model innovation, and used items such as the degree of implementation of the environmental management system, the degree of implementation of the quality management system, and the internal audit cycle of the management system to measure management system optimization.

(2) **Eco-product innovation.** Its sub-dimensions include conceptual design innovation, structural design innovation, and functional design innovation. The existing eco-product innovation scale pays more attention to the environmental externalities of products, such as whether the packaging of products is simplified through new technologies, whether the damage caused by waste is reduced, whether it emphasizes the recycling of new product parts, and whether to reduce the energy consumption of products after the sale (Cheng et al., 2014; Peng and Liu, 2016; Tumelero et al., 2019). There are some semantic overlapping items, such as whether the structure of the product is simplified, whether the number of product components is reduced, whether the use of raw materials is reduced, and whether to reduce energy consumption (Cheng et al., 2014; Peng and Liu, 2016; García-Granero et al., 2018; Tumelero et al., 2019). Considering that both progressive and breakthrough innovative products are closely related to the product development process, this paper passes through the three most important stages of the product development process, i.e., conceptual design, structural design, and functional design, to summarize the measurement items of eco-product innovation. We use the theory of inventive problem solving (TRIZ) and other advanced design theories, and consider ergonomic factors and the selection of new materials to measure conceptual design innovation. Also, we use advanced computer-aided design

(CAD) software, the proportion of recyclable parts in the product, and simplified product structure items such as amplitude to measure structural design innovation. Moreover, items such as product life cycle change trends, simplified product packaging cycles, and the number of patent applications related to energy conservation and environmental protection are used to measure function design innovation.

(3) **Eco-process innovation.** Its sub-dimensions include the innovative design of process regulations, innovative design of process equipment, and process improvement. Cuerva et al. (2014) believe that the use of new machinery or new production methods is a non-green process innovation practice, while the sustainable use of natural resources and environmental technologies, as well as waste recycling and disposal, are green process innovation practices. But for manufacturing enterprises, process regulations and process equipment are an integral part of the process. Process regulations are the main process documents for companies to guide product processing and worker operations, and are the basis to organize and control products for companies. The process equipment contains various tools needed to manufacture products. Changes in process regulations will lead to the adjustment of process equipment and production equipment, but under certain process regulations, the adjustment of facilities and equipment should be included in process improvement. Therefore, the proportion of computer-aided process planning (CAPP) in the process design, the frequency of updating the process in consideration of environmental factors, the proportion of clean energy in the energy consumption of the enterprise, and the degree of energy consumption considered in the process design are used to measure the innovative design of the process regulations. The innovative design of process equipment is measured by the proportion of computer-aided engineering (CAE) in the design of process equipment, the frequency of replacing or improving process equipment in consideration of environmental factors, and the proportion of energy-saving and emission-reduction equipment in the process equipment. The use of computer-aided manufacturing (CAM) in process improvement the proportion, the importance of industrial engineering methods in process optimization, the implementation of product reverse recycling and remanufacturing, and the importance of green supply chain assessment and optimization are items measuring process improvement.

These items are also a summary and integration of the previous eco-process innovation scales. For example, whether the production process will be frequently and innovatively updated to prevent pollution (Cheng et al., 2014; Peng and Liu, 2016), using cleaner technology to save and prevent pollution (Hojnik and Ruzzier, 2016), using cleaner technology to save costs and to prevent pollution (Cai and Li, 2018) are included in the innovative design of process regulations. Reuse of components and innovatively introducing new technologies or equipment in production process is included in the innovative design of process equipment (García-Granero et al., 2018; Cheng et al., 2014; Peng and Liu, 2016). Breaking the previous production process, seeking more sustainable solutions (Kiefer et al., 2017), improving manufacturing processes to recycle, reuse, and remanufacture materials or components (Tumelero et al., 2019), supplier management in sustainable supply chains (Kuo and Smith, 2018), are included in process improvement.

3.2.3. Scale design

The data in this study is obtained from questionnaires. This study follows the deductive scale development procedure to develop the scale for eco-innovation (Kiefer et al., 2017). Based on collating the previous concepts and definitions of eco-innovation, the existing eco-innovation scale is statistically summarized to determine variables and to generate items, and use a 5-point Likert scale to quantify items. The questionnaire and scale are presented in Table S1 in Appendix A in detail.

We invited three academic experts and five business managers to conduct the questionnaire preview before issuing the questionnaires on a large scale so that the accuracy of the item expression could be ensured. The three academic experts have deep attainments in business administration, industrial engineering, and management science and engineering, respectively. The five business managers include one general manager, one chief finance officer, and three production managers. They provided revised suggestions on language expression, which makes the scale more suitable for production practices.

Regarding the measurement of latent variables, it is difficult to obtain real credit and enterprise environmental performance data due to business privacy. To maintain the same scale, green credit and enterprise performance are also measured by the Likert scale. We measure green credit with four items including loan interest rate, repayment period, amount, and accessibility. We use three items to measure the environmental performance of a company, including product energy efficiency, energy consumption per unit product, and pollutant emissions (García-Granero et al., 2018; Cai and Li, 2018). Three items are employed to measure the economic performance of enterprises, including net profit, return on total assets and return on net assets (Cai and Zhou, 2014). Since enterprise must take economic benefits into consideration when pursuing environmental performance, we add economic performance to the model to make comparison with environmental performance, so that the impact of green credit on enterprise performance could be better demonstrated.

3.3. Sample and data

The questionnaires are mainly subject to Chinese textile companies and leather product companies. Because China is in the process of transitioning to a sustainable production mode, eco-innovation has the most prominent impact on manufacturing (Kiefer et al., 2017). China has always been a major textile country. The industrial sales value of textiles and leather products accounted for more than 5% of China's total industrial sales value, and the export value accounted for more than 13%[2] of China's total export value. However, cotton dyeing and finishing, wool dyeing and finishing, hemp dyeing and finishing, as well as tanning of leather products in the textile industry have caused a lot of pollution. Therefore, the General Office of the China Banking Regulatory Commission issued the "Key Evaluation indicators of the Implementation of Green Credit" in 2014, clearly listing the textile and leather product industry in the restriction and control of the green credit policy, and credit approval to those two industries are cautious. Therefore, the credit of Chinese textile and leather product enterprises are closer to the essence of green credit. From 2016 to 2019, we used multiple channels to distribute questionnaires. For example, we cooperated with the Ministry of Education of China and used the Blue Fire program in August to visit industrial parks in Taizhou, Dezhou, Wenzhou, Huizhou, Baise, and other places; searched for qualified MBAs at Nanjing University of Aeronautics and Astronautics and Nanjing University of Science and Technology and other universities; issued questionnaires to relevant companies through third-party environmental testing agencies, and questionnaire survey platforms.

A total of 624 questionnaires were sent out and 376 valid

[2] The data are collected from National Bureau of Statistics of China.

questionnaires were returned, with a validity rate of 60.26%. Small and medium-sized enterprises[3] account for 94% of the 376 companies. The proportion of non-state-owned enterprises is 98.14%. The proportion of enterprises whose operating time is less than a 12-year life cycle is 85.90%. The detailed sample description is shown in Table 1.

4. Results and discussion

4.1. Reliability and validity

4.1.1. Exploratory factor analysis

As there is no universal scale for eco-innovation, EFA is first used to evaluate the validity of scale construction. The result shows that the appropriateness of KMO sampling is 0.946, which is greater than the 0.6 criteria. After Bartlett's test of sphericity, the approximate chi-square is 16706.849, and the significance probability is 0.000, indicating that the null hypothesis is rejected at the significance level of 1%, and the correlation coefficient matrix of the scale item cannot be the identity matrix. In addition, the anti-image correlation matrix shows that the smallest measure of sampling adequacy is 0.829. Therefore, this scale has good structural validity and can be used for factor analysis.

The principal component analysis (PCA) is used to extract common factors. The minimum variance of the extracted common factor is 0.596, which is much larger than 0.16, and the extraction effect is acceptable. Table S2 in Appendix B reports the explanation of the total variance. It can be seen that there are 6 factors with eigenvalues greater than 1, explaining 79.763% of the total variation of the measurement items. There is little information loss in the measurement items, so the effect of the factor analysis is relatively good.

The Promax rotation converges after 6 iterations. The factor component matrix before and after the rotation is shown in Table S3 in Appendix C. It can be seen that the convergence effect is relatively ideal. The first factor replaces the role of a total of 11 measurement variables of EPCI11-EPCI34, which are all measurement indicators of eco-process innovation, so the first factor is eco-process innovation. In the same way, the second factor replaces EOGI11-EOGI33, which can be called the eco-organization innovation factor. The third factor replaces EPDI11-EPDI33, which can be called the eco-product innovation factor. The fourth factor replaces GC1-GC4, which can be called the green credit factor. The fifth factor replaces ECP1-ECP3, which can be called the economic performance factor. The sixth factor replaces ENP1-ENP3, which can be called the environmental performance factor. The six common factors are consistent with the theoretical framework of this study, and no cross-factor distribution is generated. In summary, the questionnaire items passed the validity test.

Table 1
Descriptive statistics of the sample.

Category	Sub-category	Frequency	Percentage
Type	Textile industry	234	62.23
	Leather industry	142	37.77
Employee	Less than 300	152	40.43
	From 300 to 1000	202	53.72
	More than 1000	22	5.85
Annual operating income	Less than 20 million yuan	118	31.38
	From 20 million to 400 million yuan	232	61.70
	More than 400 million yuan	26	6.92
Property right	State-owned	7	1.86
	private	238	63.30
	others	131	34.84
Age	Less than 6 years	183	48.67
	From 6 to 12 years	140	37.23
	More than 12 years	53	14.10

[3] Small and medium-sized enterprises refer to those with less than 1000 employees or less than 400 million yuan in operating income according to the "Statistical classification standard of large, medium, small and micro enterprises" (National Bureau of Statistics [2017] No. 213).

4.1.2. Confirmatory factor analysis

The three factors of green credit, environmental performance, and economic performance are first-order latent variables, while eco-organization innovation, eco-product innovation, and eco-process innovation are all second-order latent variables, we first performed CFA for second-order latent variables. The results show that the target coefficient of CFA for the 3 s-order latent variables is 1, reflecting the good fit of the second-order factor model (Milfont and Duckitt, 2010).

Secondly, the construct validity and discriminative validity between latent variables are evaluated. The measurement model consists of green credit, environmental performance, economic performance, eco-organization innovation (i.e., eco-culture construction, management method innovation, and management system optimization), and eco-product innovation (i.e., conceptual design innovation, structural design innovation, and functional design innovation), and eco-process innovation (i.e., technological process design, manufacturing equipment design, and process improvement) and 39 measuring items.

Table 2 reports the CFA results of the measurement model. We estimate the reliability of the structure using factor loading, combined reliability (CR), and average variance extraction value (AVE). It can be seen that all factor loads are greater than 0.5 and are significant at the 1% level, indicating that there is a strong correlation between the measurement items in the scale and the latent factors. In addition, the combined reliability of all latent factors is greater than 0.7, and the AVE is greater than 0.4, indicating that the scale data has good convergence validity. We mainly used Cronbach's Alpha coefficient to test the reliability of the scale here. The results showed that the overall alpha coefficient of the scale was 0.958. The alpha coefficient of green credit, the independent variable, is 0.776. The alpha coefficients of eco-organization innovation, eco-product innovation, and eco-process innovation, the second-order intermediary latent variables, are 0.970, 0.968, and 0.972, respectively. The alpha coefficients of the dependent variable environmental performance and economic performance are 0.878 and 0.966, respectively, both greater than 0.70. Therefore, the scale is high in reliability and there is relatively good internal consistency between the variables. The specific alpha coefficient values are shown in Table 2.

Table 3 reports the correlation coefficients and the square roots of AVE of latent variables such as green credit, eco-organization innovation, eco-product innovation, eco-process innovation, environmental performance, and economic performance. It can be seen that all latent variables show a significant positive correlation at the 1% level. The AVE square roots of all latent variables are larger than all other cross-correlations below them, indicating that the scale data have good discriminative validity (Henseler et al., 2015).

Since the measurement data are collected from questionnaire surveys, it is necessary to test the common method bias (Antonakis et al., 2010). In the EFA, if a single factor accounts for more than 50% of the total variance of each measurement, there is a serious common method bias. As shown in Table S2 in Appendix B, the maximum variance explained by a single factor is 33.629%, which is less than the 50% threshold, indicating that there is no serious common method bias in this scale. Considering that the variance interpretation rate of a single factor is easily affected by the number of characteristics, a single CFA (Fuller et al., 2016), and a multiple-factor method (Podsakoff et al., 2003) are used to test the common method bias. In addition, the chi-square test was used to distinguish the validity. The results are shown in Table 4. The 6-factor hypothetical model has the best fitting effect, which further proves that the scale has good discrimination validity. The results show that the Tucker-Lewis Index (TLI) and comparative fitting index (CFI) of

Table 2
Cronbach's α and the confirmatory factor analysis for measurement model.

Construct		Items	Measure α	CR	AVE	T	Factor loading
1. Green credit		GC1	0.776	0.777	0.465	–	0.699
		GC2				10.874	0.701
		GC3				10.192	0.650
		GC4				10.372	0.677
2. Eco-organization innovation	Eco-culture construction	EOGI11	0.935	0.938	0.834	–	0.933
		EOGI12				27.052	0.871
		EOGI13				33.620	0.935
	Management method innovation	EOGI21	0.952	0.953	0.872	–	0.938
		EOGI22				36.576	0.943
		EOGI23				33.223	0.921
	Management system optimization	EOGI31	0.941	0.945	0.852	–	0.937
		EOGI32				36.079	0.943
		EOGI33				29.378	0.888
3. Eco-product innovation	Conceptual design innovation	EPDI11	0.937	0.938	0.835	–	0.927
		EPDI12				32.302	0.922
		EPDI13				28.630	0.893
	Structural design innovation	EPDI21	0.916	0.916	0.784	–	0.858
		EPDI22				23.459	0.879
		EPDI23				25.431	0.918
	Functional design innovation	EPDI31	0.915	0.916	0.785	–	0.842
		EPDI32				23.293	0.904
		EPDI33				23.753	0.911
4. Eco-process innovation	Technological process design	EPCI11	0.937	0.938	0.790	–	0.887
		EPCI12				25.698	0.890
		EPCI13				25.818	0.890
		EPCI14				25.122	0.887
	Manufacturing equipment design	EPCI21	0.905	0.904	0.759	–	0.839
		EPCI22				22.112	0.877
		EPCI23				22.785	0.897
	Process improvement	EPCI31	0.945	0.946	0.815	–	0.860
		EPCI32				27.190	0.942
		EPCI33				23.656	0.88
		EPCI34				26.027	0.926
5. Environmental performance		ENP1	0.878	0.883	0.716	–	0.806
		ENP2				18.365	0.919
		ENP3				16.848	0.808
6. Economic performance		ECP1	0.966	0.966	0.905	–	0.946
		ECP2				38.950	0.949
		ECP3				40.981	0.959

Table 3
Pearson correlation and AVE square root.

Variables	Mean	SD	1	2	3	4	5	6
1. Green credit	2.784	0.830	**0.682**					
2. Eco-organization innovation	2.848	1.370	0.208**	**0.949**				
3. Eco-product innovation	2.863	1.261	0.225**	0.380**	**0.978**			
4. Eco-process innovation	3.039	1.228	0.235**	0.398**	0.296**	**0.973**		
5. Environmental performance	2.601	1.259	0.183**	0.275**	0.438**	0.332**	**0.846**	
6. Economic performance	2.950	1.373	0.351**	0.507**	0.503**	0.431**	0.338**	**0.951**

Notes: (i) n = 376.
(ii) **Correlation is significant at the 0.01 level (2-tailed).
(iii) Bolded data along the diagonal are the values of the square root of AVE.

the single factor model are both less than 0.9; the root mean square approximate error (RMSEA) and the standard root mean square residual (SRMR) are both greater than 0.1; the model fitting effect is very poor. After increasing the method factor, the fitting index remained almost unchanged, and the model fitting effect was not greatly improved, indicating that there is no serious common method bias (Podsakoff et al., 2003).

To evaluate the overall fitting of the model more comprehensively and objectively, a variety of different fitting indexes such as absolute fitting index and incremental fitting index are selected. Although χ^2 is still a well-recognized fitting statistic, the chi-square P value of our measurement model is 0.000, which does not reject the null hypothesis. The reason is that we use a large sample, and the chi-square statistic is easy to reject the model (Domínguez-Escrig et al., 2019). As a supplement to the chi-square test, the ratio of chi-square degrees of freedom (χ^2/df) effectively reduces sample sensitivity, and in our measurement model $\chi^2/df = 2.339 < 3$, which meets the test criteria. In addition, the absolute fitting index also includes RMSEA and SRMR. The incremental fitting index is mainly CFI. As shown in Table 6, $CFI = 0.945 > 0.90$, $TLI = 0.940 > 0.90$, $RMSEA = 0.060 < 0.08$, $SRMR = 0.054 < 0.08$, and all fitting index data in the benchmark measurement model are within the standard range and meet the test criteria. The results show that the measurement model fits well.

4.2. Impact of green credit on enterprise performance

The effectiveness of the structural model and the path coefficient is

Table 4
Chi-square test and Common method deviation test.

Model	χ^2	*df*	$\frac{\chi^2}{df}$	TLI	CFI	RMSEA	SRMR	Differences	
								$\Delta\chi^2$	Δdf
Theoretical model	1585.892	678	2.339	0.940	0.945	0.060	0.054	–	–
Five-factor model 1	2802.007	683	4.102	0.862	0.872	0.091	0.146	1216.115	5
Five-factor model 2	2705.878	683	3.962	0.868	0.878	0.089	0.154	1119.986	5
Five-factor model 3	2161.945	683	3.165	0.903	0.911	0.076	0.076	576.053	5
Four-factor model 1	3905.414	687	5.685	0.791	0.806	0.112	0.195	2319.522	9
Four-factor model 2	3348.336	687	4.874	0.827	0.840	0.102	0.153	1762.444	9
Three-factor model	4442.837	690	6.439	0.757	0.774	0.120	0.200	2856.945	12
Two-factor model	4747.819	692	6.861	0.738	0.756	0.125	0.203	3161.927	14
Single-factor model	5413.697	693	7.812	0.696	0.716	0.135	0.197	–	–
Seven-factor model	1575.422	677	2.327	0.941	0.946	0.059	0.056	–	–

Notes: (i) The theoretical model is a six-factor model.
(ii) Five-factor model 1: Eco-organization innovation and eco-product innovation are combined into one factor.
Five-factor model 2: Eco-organization innovation and eco-process innovation are combined into one factor.
Five-factor model 3: Environmental performance and economic performance are combined into one factor.
Four-factor model 1: Eco-organization innovation, eco-product innovation, and eco-process innovation are combined into one factor.
Four-factor model 2: Eco-organization innovation and eco-product innovation are combined, and environmental performance and economic performance are combined.
Three-factor model: Eco-organization innovation, eco-product innovation, and eco-process innovation are combined, and environmental performance and economic performance are combined.
Two-factor model: Eco-organization innovation, eco-product innovation, and eco-process innovation are combined, and green credit, environmental performance, and economic performance are combined.
(iii) All measurement models are compared to the theoretical model.

Table 5
Total, direct and indirect effects for each causal relationship.

Hypothesis	Pathway	Effect		Test		Conclusion
				P	Intervals	
H1a	Green credit→ Environmental performance	Total	0.234	–	[0.109 0.351]	✓
		Direct	0.079	0.178	[-0.041 0.205]	×
		Indirect	0.154	–	[0.092 0.230]	✓
H1b	Green credit→ Economic performance	Total	0.405	–	[0.300 0.503]	✓
		Direct	0.211	***	[0.116 0.311]	✓
		Indirect	0.194	–	[0.129 0.267]	✓
H2a	Eco-process innovation→ Environmental performance	Total	0.206	–	[0.069 0.353]	✓
		Direct	0.206	***	[0.069 0.353]	✓
		Indirect	–	–	–	×
H2b	Eco-process innovation→ Economic performance	Total	0.186	–	[0.075 0.294]	✓
		Direct	0.186	***	[0.075 0.294]	✓
		Indirect	–	–	–	×
H3a	Eco-product innovation→ Eco-process innovation	Total	0.135	–	[-0.006 0.276]	✓
		Direct	0.135	0.013	[-0.006 0.276]	✓
		Indirect	–	–	–	×
H3b	Eco-product innovation→ Environmental performance	Total	0.389	–	[0.248 0.524]	✓
		Direct	0.362	***	[0.222 0.495]	✓
		Indirect	0.028	–	[0.001 0.075]	✓
H3c	Eco-product innovation→ Economic performance	Total	0.329	–	[0.214 0.432]	✓
		Direct	0.304	***	[0.188 0.415]	✓
		Indirect	0.025	–	[0.001 0.066]	✓
H4a	Eco-organization innovation→ Eco-process innovation	Total	0.381	–	[0.275 0.490]	✓
		Direct	0.335	***	[0.215 0.454]	✓
		Indirect	0.046	–	[0.000 0.104]	✓
H4b	Eco-organization innovation→ Eco-product innovation	Total	0.343	–	[0.232 0.452]	✓
		Direct	0.343	***	[0.232 0.452]	✓
		Indirect	–	–	–	×
H4c	Eco-organization innovation→ Environmental performance	Total	0.220	–	[0.092 0.361]	✓
		Direct	0.017	0.770	[-0.119 0.169]	×
		Indirect	0.203	–	[0.131 0.293]	✓
H4d	Eco-organization innovation→ Economic performance	Total	0.448	–	[0.352 0.541]	✓
		Direct	0.273	***	[0.164 0.381]	✓
		Indirect	0.175	–	[0.113 0.247]	✓
H5a	Green credit→ Eco-process innovation	Total	0.272	–	[0.145 0.388]	✓
		Direct	0.158	0.006	[0.030 0.274]	✓
		Indirect	0.115	–	[0.065 0.176]	✓
H5b	Green credit→ Eco-product innovation	Total	0.260	–	[0.135 0.376]	✓
		Direct	0.179	0.002	[0.056 0.298]	✓
		Indirect	0.081	–	[0.042 0.136]	✓
H5c	Green credit→ Eco-organization innovation	Total	0.237	–	[0.123 0.347]	✓
		Direct	0.237	***	[0.123 0.347]	✓
		Indirect	–	–	–	×

Table 6
Mediating effects of eco-innovation.

Pathway	Point estimation	Boot SE	Bias-corrected 95% CI	
			Lower	Upper
(1) Green credit→ Eco-process innovation→ Environmental performance	0.033	0.027	0.01	0.123
(2) Green credit→ Eco-organization innovation→ Environmental performance	0.004	0.028	−0.042	0.068
(3) Green credit→ Eco-product innovation→ Environmental performance	0.065	0.041	0.032	0.196
(4) Green credit→ Eco-organization innovation→ Eco-process innovation→ Environmental performance	0.016	0.012	0.008	0.059
(5) Green credit→ Eco-organization innovation→ Eco-product innovation→ Environmental performance	0.029	0.017	0.02	0.089
(6) Green credit→ Eco-product innovation→ Eco-process innovation→ Environmental performance	0.005	0.006	0.001	0.027
Total mediating effect	0.152	0.058	0.129	0.358
(1) Green credit→ Eco-process innovation→ Economic performance	0.029	0.027	0.012	0.122
(2) Green credit→ Eco-organization innovation→ Economic performance	0.065	0.038	0.055	0.208
(3) Green credit→ Eco-product innovation→ Economic performance	0.054	0.038	0.032	0.186
(4) Green credit→ Eco-organization innovation→ Eco-process innovation→ Economic performance	0.015	0.011	0.01	0.057
(5) Green credit→ Eco-organization innovation→ Eco-product innovation → Economic performance	0.025	0.015	0.021	0.084
(6) Green credit→ Eco-product innovation→ Eco-process innovation→ Economic performance	0.004	0.006	0.001	0.027
Total mediating effect	0.192	0.066	0.219	0.481

estimated. The results show that in the structural model, $\chi^2 = 1586.583$, $P = 0.000$, $1 < \chi^2/df = 2.337 < 3$, $CFI = 0.945 > 0.90$, $TLI = 0.940 > 0.90$, $RMSEA = 0.060 < 0.08$, $SRMR = 0.054 < 0.08$, each fitting index is within the criteria range and meets the test criteria. The standardized path coefficient and significance of the SEM are shown in Fig. 2.

Fig. 2 shows that the direct effects of eco-process innovation and eco-product innovation on environmental performance are positively significant at the 1% level, while the direct effects of green credit and eco-organization innovation on environmental performance are not statistically significant. Meanwhile, the direct effects of green credit, eco-organization innovation, eco-product innovation, and eco-process innovation on economic performance are all positively significant at the 1% level. In addition, the direct effects of green credit on eco-organization innovation, eco-product innovation, and eco-process innovation are also positively significant at the 1% level.

Table 5 reports the test results of the theoretical hypothesis. It can be seen that although the direct effect of green credit on environmental performance is not statistically significant, the indirect effect is significant, and the total effect does not contain 0 in the 95% confidence interval. Therefore, green credit has a positive and complete mediating effect on environmental performance, and hypothesis H1a is supported. The direct, indirect, and total effects of green credit on economic performance are all statistically significant, and hypothesis H1b is supported. The direct effects of eco-process innovation on environmental performance and economic performance have passed the P value test and the interval test, assuming that both H2a and H2b are supported. Although the confidence interval of the direct effect of eco-product innovation on eco-process innovation contains 0, the P value test is significant at the 5% level, and the lower limit of the confidence interval is −0.006, which is very close to 0. Therefore, we believe that hypothesis H3a is also supported. The direct effects of eco-organizational innovation on environmental performance have not passed the test, but the indirect effects and total effects have passed the confidence interval test. The complete mediating effect of eco-organizational innovation on environmental performance supports hypothesis H4c. The remaining hypotheses are also supported.

Green credit is the policy means that promotes sustainable development of the economy, social and ecological environment by differentiated interest rates and targeted credit distribution mechanisms in the process of credit granting by banking financial institutions, and that is based on national environmental protection policies and related industrial policies, with social responsibility as the core value orientation. The core purpose of green credit is to promote the coordinated and sustainable development of economic performance and environmental performance. Therefore, credit without environmental performance cannot be called green credit in a complete sense.

Following the resource-activity-performance paradigm based on the resource-based view, we regard credit funds as the resource layer of the enterprise. The activity layer of the enterprise includes eco-innovation and other activities. The performance layer is divided into

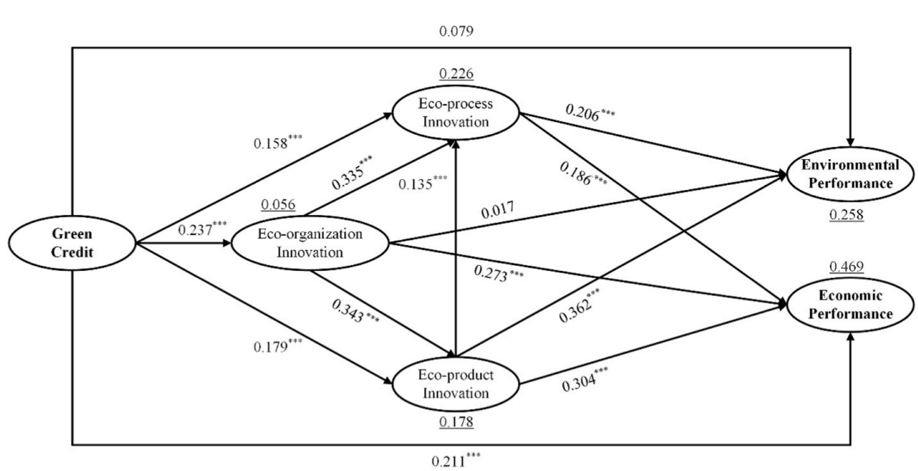

Fig. 2. Standardized path coefficient and significance of SEM.

environmental performance and economic performance. The path of green credit to obtain environmental and economic performance is discussed, as shown in Fig. 3.

The current consensus in academic and financial world is to define green credit as expanding credit exposure to green industry such as renewable energy, energy conservation, and environmental protection, and tightening credit approvals for HH enterprises (Mostert, 2012; Fatemi and Fooladi, 2013). This is an industry-oriented credit policy, which can also be called green industry credit. The potential awareness of this kind of credit policy, on the one hand, is that compared with HH enterprises, the inflow of credit funds into green enterprises can generate a smaller negative impact on the environment, thereby achieving environmental performance. On the other hand, it aims to restrict the inflow of credit funds into HH enterprises and control the investment scale of HH enterprises through external financing channels to achieve environmental performance. The flow path of credit funds is shown by the red line in Fig. 3.

Although the green industry is the basis for promoting the construction of ecological civilization, industry policies cannot be focused on due to the relatively macro and abstract concept of “green” as well as different boundaries of green industry, and there is a phenomenon of “pan-greening”. Among them, the renewable energy industry and the environmental protection industry are the pillar of green industry. However, due to many constraints such as resource endowments and technological policies, the current renewable energy industry and environmental protection industry cannot completely replace the traditional energy industry’s contribution to the national economy, limiting the proportion of green industry credit in the entire credit system, and thus easily lead to problems such as over-investment. Moreover, treating green industry credit as green credit narrows the definition of the connotation of green credit. On the other hand, the supporting role of HH enterprises on the national economy cannot be ignored. Excessive compression of the credit scale will result in pseudo-environmental protection that gains environmental performance at the cost of the economic growth of HH enterprises. The pecking order hypothesis believes that there is an inverse relationship between the use of internal funds and external funds (He et al., 2016), that is, the reduction of external financing will be supplemented by internal financing, and it is difficult to achieve economic transformation of traditional HH enterprises simply by controlling credit exposure through supervision.

Eco-innovation is deemed to be an effective mechanism and solution to help companies reduce negative environmental impacts (Kuo and Smith, 2018), and a way to achieve environmental sustainability (Kanda et al., 2018). Our results show that the direct impact of green credit on innovation of eco-organization, eco-process, and eco-product is positively significant at the 1% level, indicating that as a company’s stakeholders, the demand of banking institution for environmental performance can be satisfied by green credit which drive enterprises to carry out eco-innovation. Breaking through the existing framework of green credit standards based on industry characteristics, eco-innovation activities can be used as green credit standards, because only when credit funds are used for enterprise activities that can achieve environmental performance can the green nature of credit funds be displayed, as shown in the green line in Fig. 3. This path of eco-innovation to achieve environmental performance for green credit can effectively avoid over-investment in green industry, ease financing difficulties in general industry, and promote the green economy transformation of HH enterprises, which is advantageous to the continuous development of green credit.

4.3. Mediating effect of eco-innovation

Since eco-innovation has mediating effect in the process of green credit’s impact on enterprise performance, the structural model is a multi-chain mediating model. Therefore, the non-parametric bias-corrected percentile Bootstrap (Preacher and Hayes, 2008) is adopted to test the mediating effect. After that, repeat random sampling is performed and 5000 Bootstrap samples are drawn from the sample data. The results also verified this point of view. The structure, reliability, and validity of the scales of eco-organization innovation, eco-product innovation, and eco-process innovation exceed the general standards, indicating that our scale is credible and effective. Although it is not an easy task to choose a complete combination of indicators among different types of eco-innovation (García-Granero et al., 2018), we regard enterprise eco-innovation activities as the intersection of enterprise financing and bank green credit based on the characteristics of eco-innovation and green credit that both have typical dual externalities of economics and environment. From the perspective of industrial engineering, we regard enterprise value chain activities as indicators for measuring eco-innovation, which are beneficial to the accurate measurement of enterprise eco-innovation. It also helps to improve the credit review indicators for green credit and provides new ideas and directions for future research.

First, without intermediary variables, the direct impact of green credit on environmental performance is positively significant, and the direct impact on economic performance is also positively significant. After adding eco-innovation as an intermediary variable, the direct impact of green credit on environmental performance is not statistically significant, but the mediating effect based on 5000 bootstrap samples correcting biases within 95% confidence intervals is positive and significant, as shown in Table 6. Except for the "green credit→ eco-organization innovation → environmental performance" path, the 95%

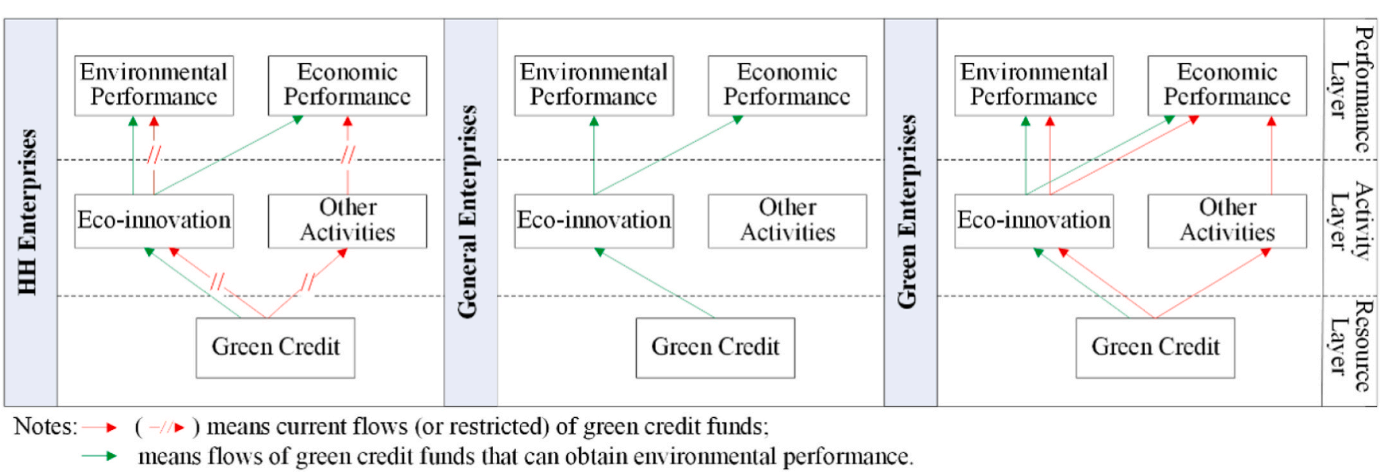

Fig. 3. Paths to obtain environmental and economic performance through green credit.

confidence intervals of the other five indirect paths do not contain 0, indicating that the coefficient product is significant (Preacher and Hayes, 2008) and the mediating effect of eco-innovation is evident. Therefore, eco-innovation plays a complete mediating role in the impact of green credit on environmental performance. At the same time, since the direct impact of green credit on economic performance is statistically significant, eco-innovation plays a partial mediating role in the impact of green credit on economic performance.

Green credit can effectively alleviate the obstacles of insufficient funds when enterprises carry out eco-innovation (Tariq et al., 2017). It is a more important and effective driving force than internal driving forces such as competitive pressure and technological capability (Cai and Li, 2018). Our empirical results confirm this opinion. The direct impact of green credit on environmental performance is statistically insignificant, which indicates that when companies use credit funds for other activities that are not eco-innovations, they will not gain access to the environmental performance growth. The positive impact of green credit on environmental performance takes eco-innovation as a path. This is a complete mediating effect, that is, all the environmental performance that green credit can obtain comes from eco-innovation. Although the direct impact of eco-organization innovation on environmental performance is not statistically significant, the direct impacts of eco-process innovation and eco-product innovation on environmental performance are both positively significant at the 1% level, and the direct impacts of eco-organization innovation on eco-process innovation and eco-product innovation are also positively significant at the 1% level. The indirect effect of eco-organization innovation on environmental performance has also passed the Bias-corrected Bootstrap test. This result is consistent with Abid et al., (2022) , which shows that green innovation is an effective tool to reduce environmental pollution and financial development is closely related to environmental sustainability. However, here we further reveal the mediating role of eco-innovation between financial development and environmental performance. Thus, the feasibility and effectiveness of using eco-innovation as a path for green credit to obtain environmental performance can be sufficiently explained.

On the other hand, the dual externalities of eco-innovation have also been verified. The direct impact of eco-organization innovation, eco-process innovation, and eco-product innovation on economic performance are all positively significant at the 1% level, which is consistent with Ch'ng et al. (2021), Cheng et al. (2014), and Hojnik and Ruzzier (2016). Different from environmental performance, the direct impact of green credit on economic performance is significant, which indicates that eco-innovation has a partial mediating effect on the impact of green credit on economic performance. It can be seen from Fig. 3 that when green credit funds are used for other activities that are not eco-innovations, they will bring economic performance, but will not achieve environmental performance. The direct effect of green credit on economic performance is 0.211, greater than its indirect effect of 0.194, which to a certain extent reflects that the return on investment of eco-innovation is lower than that of the other activities. Although end-of-pipe treatment in eco-process innovation is an additional measure of the manufacturing process, it does not contribute to the improvement of production technology and is often regarded as a cost burden by enterprises. However, eco-innovation has a positive effect on improving resource efficiency and reducing costs (Hojnik and Ruzzier, 2016). From a long-term perspective, the organizational inertia with a dual awareness of the environment and innovation cultivated by eco-innovation is a unique ability that is hard to imitate in a company, and it is also the true source of a company's competitive advantage in the face of environmental risks.

5. Conclusion and policy implications

This study aims to explore the impact of green credit on enterprise performance with the mediating role of eco-innovation. Using China's 376 textile manufacturing firms as a case study, the findings reveal that the direct effect of green credit on environmental performance is not significant, but the indirect effect is positive, which is a complete mediating effect. In addition, the direct effect of green credit on economic performance is significant, and the indirect effect is also positive, which is a partial mediating effect. Overall, eco-innovation has exerted positive mediating effects on the relationships between green credit and enterprise environmental and economic performance. The conclusion of this study offers some policy implications for business managers, bankers, and policymakers.

First, eco-innovation activities should be incorporated into the support direction of green credit guidelines to lay equal stress on project loans and working capital loans, and to avoid a one-size-fits-all industrial credit policy. At a macro level, incorporating eco-innovation activities to break through the current definition of project loans and to obtain environmental performance, helps banking institutions to carry out green credit based on working capital loans. We suggest that banking institutions pay more attention to working capital loans based on eco-organization innovation and eco-product innovation and project loans based on eco-process innovation activities such as enterprise end treatment and equipment renovation. Moreover, setting the actual use of loan funds as one major criterion for credit granting can ease the policy constraints of the bank when reviewing the credit granting of class B enterprises[4] that belong to the HH industry and enhance the green credit statistics of class C enterprises that belong to the general industry. It is suggested that the China Banking Regulatory Commission specifies the types of activities in which the loans are invested in the green credit statistics summary table to facilitate the approval and statistics of green credit. In addition, using green credit funds for eco-innovation activities helps to promote enterprises' eco-innovation from the capital supply side and realize green economic transformation, thus contributing to achieving the green credit goal of obtaining environmental performance through economic leverage. We suggest that banking institutions classify green credit businesses consciously to guide enterprises to apply for green credit.

Second, eco-innovation should be integrated into enterprise green rating systems to enrich the due diligence content of green credit. The green rating on enterprises is an important support for banking institutions to carry out green credit evaluations. Eco-innovation based on value chain activities reflects to a certain extent the degree and potential of enterprise investment in the environment, social responsibility, and governance. It is suggested that enterprises integrate eco-innovation in the green rating system to facilitate banking institutions' assessment of the effectiveness of credit funds use when conducting due diligence.

Third, the post-loan assessment of green credit on environmental performance should be strengthened. At present, the environmental performance measurement of green credit statistics system is based on the environmental performance data or measurement model in the project approval document, where great distortion and uncertainty may appear. It is suggested that banking institutions determine the environmental performance of green credit through post-loan assessment to ensure the authenticity of environmental performance statistics.

Green credit policy has exerted increasing impacts on the environmental and economic performance of China's manufacturing enterprises. Meanwhile, green credit significantly determines how eco-

[4] The bank categories enterprises into three classes based on their faced environmental risks when implementing the green credit guidelines. Class A refers to the enterprises whose construction, production and operation activities may seriously change the original environment and the adverse environmental and social consequences are not easy to eliminate. Class B refers to the enterprises whose construction, production and operation activities will produce adverse environmental and social consequences, but are easier to eliminate through mitigation measures. Class C refers to the enterprises whose construction, production and operation activities will not produce obvious adverse environmental and social consequences.

innovation improves enterprise performance. While researchers ignore the mediating role of eco-innovation between green credit and enterprise performance, our research covers that (Wu et al., 2022). In addition, this study incorporates enterprise value chain activities into the eco-innovation scale from the perspective of industrial engineering based on a developed theoretical framework, considering that banking institutions may lack professional knowledge to assess enterprise eco-innovation. The results verify that the scale is reliable and valid. Owing to the fuzzy boundary of green credit, the conclusions of this study are limited to heavy-polluting textile and leather manufacturing firms. There is still a need for in-depth research and verification on whether the research conclusions of this study apply to other green and general enterprises.

CRediT authorship contribution statement

Sheng Wu: Data curation, Validation, Methodology, Visualization, Writing – review & editing. **Xiaoyong Zhou:** Conceptualization, Supervision, Investigation, Writing – review & editing. **Qianjin Zhu:** Formal analysis, Writing – original draft.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Acknowledgments

We are grateful for the financial support from the National Natural Science Foundation of China (No. 72064005), the Natural Science Foundation of Guangxi Province (No. 2020GXNSFAA159041), the High-level Talent Research Project of CIT (YN22102), and the Research Basic Ability Enhancement Project of Young and Middle-aged Teachers in Guangxi Universities (No. 2022KY0770). We would also like to thank anonymous referees for their helpful comments.

Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jclepro.2022.135248.

References

Abid, N., Ceci, F., Ahmad, F., Aftab, J., 2022. Financial development and green innovation, the ultimate solutions to an environmentally sustainable society: evidence from leading economies. J. Clean. Prod. 369, 133223.

Almeida, H., Campello, M., 2010. Financing frictions and the substitution between internal and external funds. J. Financ. Quant. Anal. 45 (3), 589–622.

Amore, M.D., Schneider, C., Žaldokas, A., 2013. Credit supply and corporate innovation. J. Financ. Econ. 109 (3), 835–855.

Antonakis, J., Bendahan, S., Jacquart, P., Lalive, R., 2010. On making causal claims: a review and recommendations. Leader. Q. 21 (6), 1086–1120.

Belgraver, H., Verwaal, E., 2018. Organizational capital, production factor resources, and relative firm size in strategic equity alliances. Small Bus. Econ. 50 (4), 825–849.

Benfratello, L., Schiantarelli, F., Sembenelli, A., 2008. Banks and innovation: microeconometric evidence on Italian firms. J. Financ. Econ. 90 (2), 197–217.

Bossle, M.B., de Barcellos, M.D., Vieira, L.M., Sauvée, L., 2016. The drivers for adoption of eco-innovation. J. Clean. Prod. 113, 861–872.

Brigham, E.F., Ehrhardt, M.C., 2013. Financial Management: Theory & Practice. Cengage Learning.

Brunnermeier, M., Crockett, A., Goodhart, C.A., Persaud, A., Shin, H.S., 2009. The Fundamental Principles of Financial Regulation, vol. 11. ICMB, Internat. *Center for Monetary and Banking Studies*, Geneva.

Cai, W.G., Zhou, X.L., 2014. On the drivers of eco-innovation: empirical evidence from China. J. Clean. Prod. 79, 239–248.

Cai, W., Li, G., 2018. The drivers of eco-innovation and its impact on performance: evidence from China. J. Clean. Prod. 176, 110–118.

Ch'ng, P.C., Cheah, J., Amran, A., 2021. Eco-innovation practices and sustainable business performance: the moderating effect of market turbulence in the Malaysian technology industry. J. Clean. Prod. 283, 124556.

Cheng, C.C., Yang, C.L., Sheu, C., 2014. The link between eco-innovation and business performance: a Taiwanese industry context. J. Clean. Prod. 64, 81–90.

Cuerva, M.C., Triguero-Cano, Á., Córcoles, D., 2014. Drivers of green and non-green innovation: empirical evidence in Low-Tech SMEs. J. Clean. Prod. 68, 104–113.

de Jesus Pacheco, D.A., Carla, S., Jung, C.F., Ribeiro, J.L.D., Navas, H.V.G., Cruz-Machado, V.A., 2017. Eco-innovation determinants in manufacturing SMEs: systematic review and research directions. J. Clean. Prod. 142, 2277–2287.

Demirel, P., Kesidou, E., 2011. Stimulating different types of eco-innovation in the UK: government policies and firm motivations. Ecol. Econ. 70 (8), 1546–1557.

Domínguez-Escrig, E., Mallén-Broch, F.F., Lapiedra-Alcamí, R., Chiva-Gómez, R., 2019. The influence of leaders' stewardship behavior on innovation success: the mediating effect of radical innovation. J. Bus. Ethics 159 (3), 849–862.

Fatemi, A.M., Fooladi, I.J., 2013. Sustainable finance: a new paradigm. Global Finance J. 24 (2), 101–113.

Finnveden, G., Hauschild, M.Z., Ekvall, T., Guinée, J., Heijungs, R., Hellweg, S., et al., 2009. Recent developments in life cycle assessment. J. Environ. Manag. 91 (1), 1–21.

Foxon, T., Andersen, M.M., 2009. The greening of innovation systems for eco-innovation–towards an evolutionary climate mitigation policy. In: DRUID Summer Conference-Innovation, Strategy and Knowledge, vol. 28.

Fuller, C.M., Simmering, M.J., Atinc, G., Atinc, Y., Babin, B.J., 2016. Common methods variance detection in business research. J. Bus. Res. 69 (8), 3192–3198.

Fussler, C., James, P., 1996. Driving Eco-Innovation: a Breakthrough Discipline for Innovation and Sustainability. Financial Times/Prentice Hall.

García-Granero, E.M., Piedra-Muñoz, L., Galdeano-Gómez, E., 2018. Eco-innovation measurement: a review of firm performance indicators. J. Clean. Prod. 191, 304–317.

Ghisetti, C., Marzucchi, A., Montresor, S., 2015. The open eco-innovation mode. An empirical investigation of eleven European countries. Res. Pol. 44 (5), 1080–1093.

Giebel, M., Kraft, K., 2019. External financing constraints and firm innovation. J. Ind. Econ. 67 (1), 91–126.

Hazarika, N., Zhang, X., 2019. Evolving theories of eco-innovation: a systematic review. Sustain. Prod. Consum. 19, 64–78.

He, L., Zhang, L., Zhong, Z., Wang, D., Wang, F., 2019. Green credit, renewable energy investment and green economy development: empirical analysis based on 150 listed companies of China. J. Clean. Prod. 208, 363–372.

He, Z., Chen, X., Huang, W., Pan, R., Shi, J., 2016. External finance and dividend policy: a twist by financial constraints. Account. Finance 56 (4), 935–959.

Hojnik, J., Ruzzier, M., 2016. The driving forces of process eco-innovation and its impact on performance: insights from Slovenia. J. Clean. Prod. 133, 812–825.

Hu, Y., Jiang, H., Zhong, Z., 2020. Impact of green credit on industrial structure in China: theoretical mechanism and empirical analysis. Environ. Sci. Pollut. Control Ser. 27 (10), 10506–10519.

Huwyler, F., Käppeli, J., Serafimova, K., Swanson, E., Tobin, J., 2014. Conservation Finance: Moving beyond Donor Funding toward an Investor-Driven Approach. Credit Suisse. WWF, McKinsey & Company, Zurich, Switzerland.

J Jiao, Y., 2010. Stakeholder welfare and firm value. J. Bank. Finance 34 (10), 2549–2561.

J Jo, H., Kim, H., Park, K., 2015. Corporate environmental responsibility and firm performance in the financial services sector. J. Bus. Ethics 131 (2), 257–284.

Kanda, W., Hjelm, O., Clausen, J., Bienkowska, D., 2018. Roles of intermediaries in supporting eco-innovation. J. Clean. Prod. 205, 1006–1016.

Kemp, R., Foxon, T., 2007. Typology of eco-innovation. Project Paper: Measur. Eco-Innovat. 5 (1), 10–23.

Kerr, W.R., Nanda, R., 2015. Financing innovation. Ann. Rev. Financ. Econ. 7, 445–462.

Kiefer, C.P., Carrillo-Hermosilla, J., Del Río, P., Barroso, F.J.C., 2017. Diversity of eco-innovations: a quantitative approach. J. Clean. Prod. 166, 1494–1506.

Kuo, T.C., Smith, S., 2018. A systematic review of technologies involving eco-innovation for enterprises moving towards sustainability. J. Clean. Prod. 192, 207–220.

Lagoarde-Segot, T., 2019. Sustainable finance. A critical realist perspective. Res. Int. Bus. Finance 47, 1–9.

Liang, L.W., Chang, H.Y., Shao, H.L., 2018. Does sustainability make banks more cost efficient? Global Finance J. 38, 13–23.

Liu, J.Y., Xia, Y., Fan, Y., Lin, S.M., Wu, J., 2017. Assessment of a green credit policy aimed at energy-intensive industries in China based on a financial CGE model. J. Clean. Prod. 163, 293–302.

Liu, X., Wang, E., Cai, D., 2019. Green credit policy, property rights and debt financing: quasi-natural experimental evidence from China. Finance Res. Lett. 29, 129–135.

Macve, R., Chen, X., 2010. The "equator principles": a success for voluntary codes? Account Audit. Account. J. 23 (7), 890–919.

Marzucchi, A., Montresor, S., 2017. Forms of knowledge and eco-innovation modes: evidence from Spanish manufacturing firms. Ecol. Econ. 131, 208–221.

Milfont, T.L., Duckitt, J., 2010. The environmental attitudes inventory: a valid and reliable measure to assess the structure of environmental attitudes. J. Environ. Psychol. 30 (1), 80–94.

Ministry of Government Legislation, 2010. Framework Act and its Presidential Decree on Low Carbon, Green Growth in Korea.

Mostert, W., 2012. Mainstreaming framework conditions for environmental finance–the role of the public sector. In: Greening the Financial Sector. Springer, Berlin, Heidelberg, pp. 31–52.

Nizam, E., Ng, A., Dewandaru, G., Nagayev, R., Nkoba, M.A., 2019. The impact of social and environmental sustainability on financial performance: a global analysis of the banking sector. J. Multinatl. Financ. Manag. 49, 35–53.

Obeid, H., Brychko, M.M., 2017. Stakeholder's financial relations and bank business management efficiency: evidence from Ukraine. Financ. Markets Institut. Risks 1, 12–29.

OECD, 1999. The Environmental Goods and Services Industry: Manual for Data Collection and Analysis. Organisation for Economic Co-operation and Development (OECD).

OECD, 2005. Guidelines for Collecting and Interpreting Innovation Data. A joint publication of OECD and Eurostat, *Statistical Office of the European Communities*.

O'Sullivan, N., O'Dwyer, B., 2009. Stakeholder perspectives on a financial sector legitimation process: the case of NGOs and the Equator Principles. Account Audit. Account. J. 22 (4), 553–587.

Pathan, S., Faff, R., Méndez, C.F., Masters, N., 2016. Financial constraints and dividend policy. Aust. J. Manag. 41 (3), 484–507.

Peng, X., Liu, Y., 2016. Behind eco-innovation: managerial environmental awareness and external resource acquisition. J. Clean. Prod. 139, 347–360.

Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y., Podsakoff, N.P., 2003. Common method biases in behavioral research: a critical review of the literature and recommended remedies. J. Appl. Psychol. 88 (5), 879.

Preacher, K.J., Hayes, A.F., 2008. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. Behav. Res. Methods 40 (3), 879–891.

Ryszawska, B., 2018. Sustainable finance: paradigm shift. In: Finance and Sustainability. Springer, Cham, pp. 219–231.

Sandberg, J., 2018. Toward a theory of sustainable finance. In: Designing a Sustainable Financial System. Palgrave Macmillan, Cham, pp. 329–346.

Shapira, P., Gök, A., Klochikhin, E., Sensier, M., 2014. Probing "green" industry enterprises in the UK: a new identification approach. Technol. Forecast. Soc. Change 85, 93–104.

Shen, B., Wang, J., Li, M., Li, J., Price, L., Zeng, L., 2013. China's approaches to financing sustainable development: policies, practices, and issues. Wiley Interdisciplin. Rev.: Energy Environ. 2 (2), 178–198.

Sun, J., Wang, F., Yin, H., Zhang, B., 2019. Money talks: the environmental impact of China's green credit policy. J. Pol. Anal. Manag. 38 (3), 653–680.

Tariq, A., Badir, Y.F., Tariq, W., Bhutta, U.S., 2017. Drivers and consequences of green product and process innovation: a systematic review, conceptual framework, and future outlook. Technol. Soc. 51, 8–23.

Tumelero, C., Sbragia, R., Evans, S., 2019. Cooperation in R & D and eco-innovations: the role in companies' socioeconomic performance. J. Clean. Prod. 207, 1138–1149.

Wang, H., Qi, S., Zhou, C., Zhou, J., Huang, X., 2022. Green credit policy, government behavior and green innovation quality of enterprises. J. Clean. Prod. 331, 129834.

Wörsdörfer, M., 2015. Equator principles: bridging the gap between economics and ethics? Bus. Soc. Rev. 120 (2), 205–243.

Wu, K.J., Liao, C.J., Chen, C.C., Lin, Y., Tsai, C.F., 2016. Exploring eco-innovation in dynamic organizational capability under incomplete information in the Taiwanese lighting industry. Int. J. Prod. Econ. 181, 419–440.

Wu, S., Wu, L., Zhao, X., 2022. Can the reform of green credit policy promote enterprise eco-innovation? A theoretical analysis. J. Ind. Manag. Optim. 18 (2), 1453.

Xavier, A.F., Naveiro, R.M., Aoussat, A., Reyes, T., 2017. Systematic literature review of eco-innovation models: opportunities and recommendations for future research. J. Clean. Prod. 149, 1278–1302.

Xu, X., Li, J., 2020. Asymmetric impacts of the policy and development of green credit on the debt financing cost and maturity of different types of enterprises in China. J. Clean. Prod. 264, 121574.

Zhang, B., Yang, Y., Bi, J., 2011. Tracking the implementation of green credit policy in China: top-down perspective and bottom-up reform. J. Environ. Manag. 92 (4), 1321–1327.

Zhang, Z., Duan, H., Shan, S., Liu, Q., Geng, W., 2022. The impact of green credit on the green innovation level of heavy-polluting enterprises—evidence from China. Int. J. Environ. Res. Publ. Health 19 (2), 650.