

The Impact of Green Credit Policies on Corporate Environmental Responsibility Fulfillment: From an Ex Ante and Ex Post Perspective

Wang Lingyu

Business School, Capital University of Economics and Business, Business Administration
(International Accounting), China
a13403071655@163.com

ABSTRACT

Green credit policy is a new way to improve the allocation of credit resources and make enterprises abide by the great system of environmental responsibility. In this paper, the overall idea of combining pre-prevention with post-treatment is used. Taking A-share listed companies from 2007 to 2020 as samples, the two-way fixed-effects model is used to explore the realization of corporate environmental responsibility by green creation policy. The survey results show that Green credit policy will greatly promote the achievement of corporate environmental responsibility. The mechanism is as follows: by limiting the environmental access standards in the audit stage before financing, enterprises are encouraged to take preventive measures, such as developing clean technology or improving projects. By monitoring the use of money post-loan, which drives ex-post actions such as end-of-pipe treatment and pollutant disposal, thereby realizing a systematic improvement in corporate environmental governance from source to end-of-pipe. These results exhibit conditional heterogeneity: Because state-owned enterprises (SOEs) have strict inspection on the government and need to abide by the rules, they can deal with it immediately in both the pre-and post-event stages. However, enterprises that are not state-owned enterprises have a little coping ability in the post-management stage. Through the analysis of the mechanism, it is found that green credit policies play a very important role in improving the ability of banks to find risks and pass on policies. Because of this policy, banks can well discover and stop the “greenwashing” behavior of enterprises, extract credit resources from high-risk enterprises with greenwashing, and correctly pass them on to truly conscientious enterprises, and the environmental benefits of enterprises are very good.

Keywords: Green credit policies; Corporate environmental responsibility; Ex ante and ex post; Property rights heterogeneity; Risk identification

1. INTRODUCTION

The report of the 20th National Congress of the Communist Party of China clearly states that we should rely on green financial services and policy guidance to advance the rules-based activities of financial institutions and help the green transformation of the economy. The “Guiding Opinions on Further Strengthening Financial Support for Green and Low-Carbon Development” also emphasizes that we must cultivate green finance hard, and make it an important pillar to drive green development. Green credit policies are not only an important external leverage that improves the allocation of credit resources, but also help enterprises achieve sustainable development by balancing economic benefits with environmental responsibilities. The “Green Credit Guidelines” issued by the China Banking Regulatory Commission prior to 2012 raised green credit to a strategic height and made it a document for guidance for financial institutions. This policy encouraged the banking sector to include environmental risks and social responsibilities in the procedures of credit assessment. It can greatly strengthen the credit support of financial institutions in the fields of green economy and energy conservation and environmental protection. At the same time, corporate environmental responsibility is the foundation of ecological environmental protection and sustainable development at the micro level. Moreover, the quality of its implementation directly affects the final effect of environmental governance. Today, some enterprises still tend to give priority to economic benefits over environmental governance in production and operation, and the level of environmental responsibility is uneven. Therefore, effective external institutional tools for guidance and control are needed now. Green credit policy is an important institutional mechanism that combines the allocation of financial resources with the environmental performance of enterprises. By linking environmental adaptation requirements with credit review, this policy can control the disorderly expansion of enterprises with high energy consumption and serious pollution from the source, and at the same time promote enterprises to fulfill their environmental social responsibilities independently. Theoretically, Green credit can create external constraints by increasing the cost of capital and narrowing the access to capital. At the same time, through the

pre-financing review and post-financing management mechanism, we will guide enterprises to do a good job in environmental conditions in preventive countermeasures and corrective actions. In fact, the theoretical framework of green credit has been well implemented, and three clear results have been obtained: policy implementation, market response and enterprise action. Due to the introduction of higher-level policies, it is getting better and better, the scale of green credit is growing little by little, and the structure is much better. Driven by these policies, enterprises have taken the initiative to assume the responsibility of environmental protection. On the other hand, banks are also stepping up efforts to identify risks, resisting green travel, and prompting enterprises to change from passive to active responsibility. Therefore, it is of great theoretical value and practical importance to study the influence of green environmental protection policy on corporate environmental responsibility and the operating mechanism behind it for improving the framework of green finance policy and promoting the green transformation of enterprises.

Nowadays, most of the research is to investigate the overall impact of policy. There are few studies that comprehensively investigate the influence of green credit on corporate environmental responsibility from the aspects of pre-prevention and post-response. Moreover, in the scene before and after the event, property rights heterogeneity will appear in different forms, and the topic of risk identification capabilities of lending money to banks is not enough. Therefore, the paper will check the influence of green credit policies on the company's environmental response library and how it works before and after running policy. Especially under the guidance of property rights heterogeneity, we will see how the effect of policy is different, which shows that the risk identification capabilities of banks play a very important role in conveying policy.

2. LITERATURE REVIEW

2.1 Research on Green Credit Policies

2.1.1 The Meaning and Measurement of Green Credit

Green credit is often referred to as sustainable finance or environmental finance. M. Jeucken notes that sustainable finance manifests itself in banks providing loan support for sustainable business projects through their financing policies and achieving social impact through fee-based financial services (such as providing investment advice to consumers). In addition, banks can leverage their unique information advantages regarding different markets, regulations, and industry trends to promote sustainable development through the use of a variety of credit instruments. S. Labatt and R. R. White (2002) argue that environmental finance involves a range of market-based financial instruments designed to convey signals about environmental quality and manage environmental risks. P. Thompson and C. J. Cowton (2004) further define green credit as a process in which banks incorporate environmental information related to a project and its operating company into their review criteria during the loan approval process, and base their final lending decisions on this mechanism. In February 2012, the former China Banking Regulatory Commission officially issued the Green Credit Guidelines, which is regarded as the first normative policy document on green credit in China (China Banking Regulatory Commission, 2012). The Guidelines define the core essence of green credit as policy measures whereby financial institutions establish energy and environmental eligibility criteria in the financial credit sector to curb the unregulated expansion of energy-intensive and highly polluting enterprises at the source. (Shanghai Banking Regulatory Bureau Green Credit Research Task Force, 2016).

In research on the measurement of green credit, different scholars have employed varying metrics. Zeng et al. (2014) propose that green credit indicators currently consist of two quantitative measures: the proportion of green credit and the proportion of interest expenses in energy-intensive industries. In particular, the proportion of green credit reflects the extent to which commercial banks are actively supporting environmental improvement and currently constitutes the main component of green financial services in China. Zhang (2018) and Yang (2021) measured green credit using the short- and long-term loans obtained by green enterprises from various financial institutions. Ding et al. (2020) quantified the intensity of green credit policies based on bank credit structure data and employed the PSM-DID method to examine their resource allocation effects. In addition, bank credit not only plays a positive role in supporting green development but also serves to curb the growth of high-energy-consumption and high-pollution industries. Therefore, when designing green credit indicators, some scholars have proposed using the proportion of interest expenses allocated to high-energy-consumption industries as a negative indicator to complement the positive indicators. The proportion of interest expenses in energy-intensive industries (the ratio of interest expenses in the six major energy-intensive industrial sectors to total industrial interest expenses) reflects the extent to which commercial banks are curbing the deterioration of the resource and environmental situation. For example, Li (2020) used the ratio of interest expenses from enterprises outside the six major energy-intensive industries to total industrial interest expenses in each province or region to measure green credit.

2.1.2 The Economic and Environmental Benefits of Green Credit

Existing research has extensively examined the benefits of green credit policies. In terms of the specific effects of these policies, the existing literature can be summarized in three areas: the economic benefits, environmental benefits, and innovation benefits of green credit (Li 2023).

The first is the impact of green credit policy on the economy. Many studies focus on the investment and fund-raising behavior of companies, including investment efficiency (Wang et al., 2021), resource allocation (Zhang et al., 2021) and total factor productivity (Chen et al., 2024). The conclusion of these studies is that the green credit policy can improve the investment efficiency of companies, alleviate the fund-raising problem and produce good economic benefits, just like redistributing resources to less polluting industries. The current research shows that the green credit policy is mainly to improve green efficiency by letting companies reduce pollution emissions according to environmental rules (Zhao et al., 2022). Guo and Zhang (2023) said that the green credit policy is to greatly improve the overall product quality by improving the green innovation level of companies limited by green credit and reducing agency costs. Cao and Liu (2025) used the difference-in-differences (DID) method to evaluate the impact of green creation policy on the company's ESG performance and its operating mechanism, and the green creation policy is the company's ESG.

Second, the environmental effects of green credit policies. Existing research has used empirical regression models to conclude that green credit policies can promote clean production (Li et al., 2018) and facilitate the green transition of the economic structure (Wang et al., 2019). Sun et al. (2023) estimated the total factor carbon productivity of 156 Chinese cities from 2000 to 2019 and empirically tested the carbon emission reduction effects of green credit from three dimensions—productivity, intensity, and total volume—confirming that this policy can improve the regional environment. Zhang et al. (2021), adopting an environmental performance perspective, found that green credit policies significantly improved overall environmental quality.

Third, the innovation effects of green credit policies. In recent years, cutting-edge research has begun to examine the impact of green credit policies on green technological innovation, though no consistent conclusions have been reached. The main opinions are roughly divided into two parts. The first opinion is that green credit policies will make the green innovation of enterprises very good (Wang et al., 2021; Li, 2023; He et al., 2019). For example, Wang et al. (2021) uses the difference-in-differences (DID) method to grid the industries that are restricted by green creation and the industries that are not restricted before and after launching the policy. The second opinion is that due to the cost of complying with the rules and the limitation of credit, Green credit policies will inhibit the green innovation of companies that produce a lot of dirt, and will not produce porter effect (Lu et al) Cao et al., 2021; Yang et al., 2021). In addition, financing restrictions hinder the company's R&D investment and green investment, prevent technological progress (Hui, 2022), and also affect the company's behavior.

2.2 Research on the Fulfillment of Enterprises' Environmental Responsibilities

2.2.1 The Meaning and Measurement of Corporate Environmental Responsibility

Corporate Environmental Responsibility (CER) is an integral component of corporate social responsibility and is closely linked to the sustainable development of businesses, society, and the ecological environment (Wang et al., 2021); it has attracted widespread attention and research from scholars. Research on corporate environmental responsibility first emerged in Western countries during the 1960s and 1970s. In 1973, the Confederation of British Industry issued a statement asserting that companies should fulfill "their responsibilities regarding the social consequences—including environmental consequences—arising from their business operations." Corporate environmental responsibility stems from the concept of corporate social responsibility. In "Business Ethics & Common Sense", compiled and published by Robert W. McGee in 1992, environmental issues were incorporated into the core principles of business ethics. American business ethicist Georges Enderle et al. (1998) were the first to incorporate environmental responsibility into the scope of corporate social responsibility, arguing that businesses should aim for sustainable development, conserve natural resources, and reduce the environmental burden of waste. In 2006, they further proposed that corporate social responsibility comprises three dimensions: economic responsibility, political and cultural responsibility, and environmental responsibility. Environmental responsibility primarily refers to "a commitment to sustainable development—consuming fewer natural resources and imposing less waste on the environment." Although it is currently a focus of domestic research, there is still no clear definition of the concept. Bai (2004) proposed that corporate environmental responsibility refers to "a company's obligation to fulfill its social duty to protect the environment while seeking maximum economic benefits for itself and its shareholders, and to bear a certain responsibility for the public environmental interests represented by the government." Gao (2005) proposes that corporate environmental responsibility means "while a company maximizes shareholder interests

and promotes the interests of relevant social groups, it should also give maximum consideration to the carrying capacity of the ecosystem, ensuring that the company's business operations avoid substantial harm to the entire ecosystem." Cui (2008) argues that both of these views have shortcomings and proposes that corporate environmental responsibility refers to a company's commitment to scientific production and management while seeking to maximize operational profits, in order to fulfill its social responsibility to protect the ecological environment and safeguard the public interest in the environment; this includes both the company's environmental ethical responsibility and its environmental legal responsibility.

Currently, the indicator evaluation systems developed by scholars in their research focus more on the specific behaviors and performance of companies in the process of fulfilling their responsibilities. In their study on the impact of corporate social responsibility on consumer behavioral intentions from the perspective of the general public, Lian et al. (2011) identified corporate environmental responsibility as a dimension of corporate social responsibility and outlined four factors for measuring environmental protection: the company's ability to properly handle various types of waste and hazardous materials generated during the production process; the environmental friendliness of the company's products; the company regularly sponsors and participates in environmental protection activities. Guan (2012) argues that the evaluation of corporate environmental responsibility fulfillment primarily focuses on aspects such as legal compliance and the fulfillment of commitments; therefore, he divides the evaluation system into two parts: the corporate environmental legal responsibility fulfillment indicator system and the corporate environmental ethical responsibility indicator system. Zhao et al. (2013) expanded corporate environmental responsibility to include environmental governance and environmental improvement responsibilities. They combined "resource use" and "pollutant emissions" into "environmental consumption and reduction," and adopted a regional comprehensive environmental pollution growth index to reflect corporate environmental improvement responsibilities. By quantifying corporate environmental improvement responsibilities, they constructed a framework for measuring corporate environmental responsibility. In addition, He et al. (2015), starting from a welfare-based social benefit function, proposed a formula for the corporate environmental responsibility performance index and constructed an evaluation indicator system for corporate environmental responsibility. They identified the rate of environmental cost internalization and the efficiency of environmental resource utilization as the primary factors and evaluation indicators for environmental responsibility performance.

2.2.2 Factors Influencing Corporate Environmental Responsibility

The factors influencing corporate environmental responsibility consist of both external environmental factors and internal factors. External environmental factors specifically include laws and regulations established by the government, the public's spontaneous environmental awareness, the current level of economic development, and media attention, among others. Internal factors include corporate size, corporate culture, and leadership decisions (Zhao, 2019).

From the perspective of the external environment, in terms of government regulation, environmental administrative penalties and R&D subsidies can promote the green transformation and upgrading of enterprises. Specifically, administrative penalties primarily function by strengthening enterprises' environmental governance capabilities, while R&D subsidies take effect by enhancing green technological innovation capabilities (Ma et al., 2024). Regarding public and media oversight, public environmental concern and media attention can effectively moderate the policy effects of environmental regulations; research has found that analyst attention, institutional investor attention, and media attention can all mitigate the negative effects of environmental regulations on corporate green innovation (Wang et al., 2026). In regions with stronger public oversight, firms are more inclined to adopt proactive environmental strategies; the mechanism underlying this effect lies in the fact that environmental legislation increases media attention on environmental issues and firms' perception of environmental risks (Wang & Chen, 2022). Additionally, stakeholders such as investors and consumers transmit environmental responsibility pressures to firms through channels such as responsible investment and green consumption (Wu, 2010). Yu and Zhu (2009) argue that as environmental awareness among consumers continues to rise, a trend toward green consumption has emerged in the market. This compels enterprises to optimize their production and operational methods, abandon environmentally polluting practices, and enhance their social standing and reputation—thereby improving their competitiveness and securing greater profits.

Regarding the internal factors, Zhao et al. (2015) analyzed a large sample of 4,712 listed companies in polluting industries from 2006 to 2013, and established a performance evaluation system for corporate environmental disclosure. They found that the company size, profitability, corporate environmental responsibility disclosure system, degree of marketization, the nature of state-owned shares, the proportion of external directors, the size of audit committee, senior management education, and the proportion of senior management above the average age are significantly positively related to the performance of environmental information disclosure system, thus fulfilling corporate environmental responsibility. Wang

and Guo (2021) argue that factors influencing the development of corporate environmental responsibility include company size, financial leverage, capital intensity, fixed asset status, financial condition, industry sensitivity, equity structure, stock risk, stock market performance, executive compensation incentives, executive equity incentives, and product market competition.

2.3 Research on the Impact of Green Credit Policies on the Fulfillment of Enterprises' Environmental Responsibilities

Existing literature on the relationship between green credit policies and environmental responsibility (or corporate social responsibility) of enterprises has not yet reached a consensus, with three main views: the first view is that it has a good promotion effect. For example, in the research of Si and Cao (2022), the continuous difference-in-differences model was used, and the green credit policies, through the front-end governance and green office practices of enterprises, indicated that the environmental governance of enterprises would be changed from post-processing mode to other modes. By strengthening the external restrictions (such as capital cost and financing channels) and internal management mechanism faced by enterprises, this policy makes enterprises pay attention to environmental and social responsibilities, affects the environmental behavior of enterprises, and makes use of the environmental management resources of enterprises, such as Zhong et al. (2023), and uses the natural experimental field named green finance pilot zones. Credit institutions in these experimental areas use financial leverage and credit penalty mechanisms to incorporate the cost of exogenous pollution into the financing cost of enterprises, which shows that enterprises are promoting the construction of environmental response ability well. This proves that green credit can encourage enterprises to take environmental responsibility. On the other hand, Liu and Qin (2023) constructed a difference-in-differences model to examine the impact of green credit policies on corporate financial performance and their underlying mechanisms. They found that green credit policies can improve the financial performance of enterprises by encouraging enterprises to assume environmental and social responsibilities. Secondly, there is a short-term reduction effect. Zhang and Qiang (2026) proposed an important improvement: green credit policies have obviously different effects on enterprises with different risk states. Following the implementation of the "Green Credit Guidelines", the CSR fulfillment level of high-risk enterprises temporarily declined. Mechanism analysis indicates that during the initial stages of transition, high-risk enterprises prioritized allocating resources to environmental governance and social compliance. Therefore, in the short term, corporate social responsibility will produce "crowding-out effect". The third is nonlinear effects. Wu and Ma (2025) found that the influence of green credit policies on corporate green governance behavior is multifaceted and complex. Enterprises tend to let banks know their green governance through two ways-green transition certification and environmental compliance fees. This effect will change due to factors such as the punishment intensity of external government and the educational background of internal executives.

At present, there is little research on the relationship between green credit policies and corporate environmental responsibility. However, there are many studies on the influence of green credit policies on enterprise green transformation. There is a two-way relationship of mutual help and common development between the enterprise's environmental response library and the enterprise's green transformation: the environmental response library has become the internal force driving the green transformation, and the enterprise wants to be the mood and action of environmental responsibility. Green transformation (Duan x et al.,) will be started or deepened. At the same time, green transformation is a systematic deepening of environmental response vitality, which will transform the scattered behavior of environmental response vitality into an overall change at the strategic level. Therefore, this study will further investigate the relationship between green credit policies and corporate green transformation. Wang et al. (2021) uses the Difference-in-Differences method, which shows that the green creation strategy can promote green innovation of enterprises. Lu et al. (2021) analyzed the micro-level effect of green creation strategy from the perspective of technological innovation and resource reallocation. The results show that green credit policy will not produce spillover effect. On the other hand, Liu et al. (2024) helps green credit policy to improve the total factor productivity of enterprises, but it mainly leads to beautiful mergers and acquisitions, which greatly increases green innovation. Thus, enterprises do not have enough endogenous power to make low-carbon transformation and rely more on capital integration. Su and Lian (2018) found that green credit policy greatly reduced the scale of financing and long-term leverage of dirty enterprises. At the same time, green credit policy limits the debt financing channels by improving the ESG performance of enterprises, thus making the capital structure of enterprises better. Zhi et al. (2025) used the method of panel cointegration. Moreover, it is found that there is a long-term and stable balance between green creation and corporate green transformation. However, the short-term effect is greater than the long-term effect. Green credit can help the company to make a green transition in the short term, but it has little long-term impact. It should be noted that green credit has obvious good influence on enterprises that produce a lot of dirt, but it is an obstacle to enterprises that do not produce so much dirt. In addition, Yan et al. (2025) thinks that the policy of green credit interest

subsidy can promote green technological innovation and reduce the aggregation of supply chain by solving the funding problem, and curb greenwashing behavior among heavily polluting enterprises.

2.4 Literature Commentary

Existing literature has established relatively systematic research on green credit policies and corporate environmental responsibility, respectively, and has provided preliminary empirical evidence regarding the relationship between the two. Regarding green credit policies, the academic community has largely reached a consensus on their definition and measurement methods, and has examined policy effects from three dimensions: economic, environmental, and innovation. Regarding research on corporate environmental responsibility, scholars have defined its scope from various perspectives, constructed multidimensional evaluation frameworks, and distinguished the impacts of external institutional factors and internal organizational factors on compliance levels. Concerning the relationship between the two, existing literature has preliminarily confirmed that green credit policies have a positive promotional effect on corporate environmental responsibility, with primary mechanisms including financing constraints, guidance toward environmental concerns, and governance optimization. However, some studies have also pointed out that this policy has produced a “crowding-out effect” for high-risk enterprises in the short term, and that the policy’s effects exhibit nonlinear characteristics. Furthermore, compared to direct studies of the relationship between the two, research on the impact of green credit policies on corporate green transformation is more extensive, and there is a bidirectional, mutually reinforcing, and progressive theoretical link between the fulfillment of environmental responsibilities and green transformation.

While the existing literature has laid a solid foundation for studying the microeconomic effects of green credit policies, it still has the following shortcomings:

First of all, the indicators to measure corporate environmental responsibility can’t distinguish the upstream and downstream of production and business activities well. In previous studies, a multi-dimensional index system for evaluating corporate environmental responsibility has been established, which reflects the overall level of environmental responsibility to a certain extent, but it is impossible to distinguish whether a branch is committed to preventive countermeasures or improving countermeasures in production and business activities. In fact, the motives and consequences of corporate environmental responsibility are very different in different stages of action. Active prevention shows the company’s positive environmental strategy, while subsequent response and improvement shows passive compliance. Previous studies have not paid enough attention to the characteristics of “looking at the whole process” and “step by step” in fulfilling environmental responsibilities. Because few studies want to formulate measurement indicators from the perspective of enterprise production process as a whole, it is difficult to provide data support for correctly evaluating the different effects of green credit policies.

Secondly, institutional analysis mostly focuses on the characteristics of firm level, but does not pay enough attention to the important role of conveying policies-the function of discovering corporate risks. From the perspective of policy operation mechanism, so far, the research mainly focuses on the communication channels at Firmlevel, such as financing constraints, executives’ environmental awareness, and green innovation, rather than green guidance. However, green credit policies are actually a control method targeting financial institutions. To achieve the purpose of policies, it depends to a great extent on the implementation of the first lender, commercial banks. How to find the environmental risks of enterprises in the pre-loan assessment and how to evaluate the environmental performance of enterprises at any time in the post-loan management directly determines whether the policies can be implemented in every enterprise. Previous studies show that Chinese commercial banks have encountered practical problems in the practice of green credit. There are some problems, such as asymmetric information, insufficient environmental risk assessment, and no unified risk identification standard. The results after the implementation of policy may be different from expectations. However, previous studies have included “bank risk identification” as a mechanism variable in the empirical framework. How can green credit policies enhance the role of Bank risk identification, thus affecting the implementation of corporate environmental responsibility? Therefore, we cannot deeply analyze the direct impact of green environmental protection policies on the implementation of corporate environmental responsibility.

Thirdly, sample analysis and heterogeneity investigation are insufficient. On the other hand, the heterogeneity analysis spanning the pre-implementation and post-implementation stages is not enough. At present, many literature examine the effect of green credit policy implementation from the whole level, but it is not enough to have a comprehensive process view to divide the policy effect into the stages of prevention before implementation and improvement after implementation. Enterprises should bear environmental responsibility before loan review and after loan management. On the other hand, it is not enough to investigate the heterogeneity of different types of enterprises. At present, the research mainly focuses on

the different effects of green credit policy on different types of enterprises, but there is no systematic comparison of the differences between state-owned enterprises and non-state-owned enterprises in their responses to policies. On this basis, there is no cross-analysis combining stage heterogeneity and enterprise heterogeneity. Because there are few types of sample analysis, it is difficult to express the structural characteristics of policy effects as a whole.

3. THEORETICAL ANALYSIS OF THE IMPACT OF GREEN CREDIT POLICIES ON CORPORATE ENVIRONMENTAL RESPONSIBILITY AND THEIR MECHANISMS

3.1 A Theoretical Analysis of the Impact of Green Credit Policies on Corporate Environmental Responsibility

3.1.1 A Theoretical Analysis of the Overall Impact of Green Credit Policies on Corporate Environmental Responsibility

Green credit policies primarily influence companies' fulfillment of environmental responsibilities through resource allocation channels and by sending signals.

In terms of resource allocation, the policy leverages financing constraints and the disincentive effect of investment to alter enterprises' cost-benefit structures. On the one hand, green credit policies utilize the cost-benefit and channel benefits derived from financing constraints to encourage enterprises to improve their environmental and social responsibility performance. For enterprises that proactively implement environmental management and meet relevant environmental protection requirements, green credit policies provide positive incentives—such as lower loan interest rates and priority credit lines—enabling them to gain substantial financing conveniences and cost advantages for actively fulfilling their environmental responsibilities; On the other hand, for high-pollution and high-energy-consumption enterprises, the policy imposes rigid constraints by raising financing thresholds, increasing interest rates, and even reducing credit limits, ensuring that failure to fulfill environmental responsibilities faces direct financial consequences. Driven by this dual “incentive-constraint” mechanism, green credit policies deeply link enterprises' fulfillment of environmental responsibilities to their economic interests. Enterprises are gradually transforming from passive compliance-seekers into proactive stakeholders, receiving positive feedback in the form of credit resources by improving their environmental performance.

In addition to direct financial benefits and restriction mechanism, green credit policies also has a significant impact on enterprises' performance of environmental responsibilities through signal transmission mechanism. From the reason of sending signals, green credit policies sends three signals to the market. First, to convey to banks and other financial institutions that the allocation of resources should follow the policy signal of environmental protection, so that banks can pay more attention to the risks and management level related to the enterprise environment in the management before and after the loan review (Wu and Ma, 2025). Second, to convey the system signal to enterprises, that is, whether or not to fulfill environmental responsibilities is directly related to the ease and cost of fund raising, and to promote enterprises to adjust their business methods (Si and Cao, 2022). Third, it sends a huge signal that green development has become a major national strategy to the whole society, and guides social funds to gather in green industries and enterprises (Xu et al., 2018). By successfully finding and responding to these signals, the company can know the development direction of institutional evolution in advance (Li, 2023; Zhang and Qiang, 2026). Therefore, the signal transmission mechanism of green credit policies will not only directly affect the current company's behavior on the environment. Through the expectation of the company's future system trend, guide the company to take the initiative to incorporate the concept of green development into the medium and long-term planning. In this way, we can fundamentally change from passive obedience to active responsibility.

In a word, the green credit policy directly links the enterprise's performance of environmental responsibility with the enterprise's economic interests through the incentive and restriction mechanism of financing. At the same time, through the policy signal mechanism, guide enterprises to make correct expectations for the future policy direction. Working together, these two methods can urge enterprises to give priority to environmental responsibility when making business decisions, and finally achieve the goal of developing economic benefits and environmental management together.

Based on this, this paper proposes the following hypothesis:

Hypothesis 1: Green credit policies can promote corporate environmental responsibility.

3.1.2 A Theoretical Analysis of the Ex Ante and Ex Post Effects of Green Credit Policies on Corporate Environmental Responsibility

Doing a good job in corporate environmental responsibility is a full-cycle process from production to work operation. In terms of the time and scope of the company's environmental protection, this process is divided into two stages: first, take action to fulfill environmental responsibilities; After things happen, fulfill environmental responsibilities. Taking action first and fulfilling environmental responsibility means taking preventive measures before the company starts production or work and before the dirty things come out. This mainly includes foreseeable environmental measures such as developing cleaner production technology, purchasing environmental protection devices, and transforming production processes into green ones. The purpose of the center is to reduce the amount of pollution produced in production. On the other hand, fulfilling environmental responsibility after an accident is the last treatment measure taken by the company after the sewage appears. These measures are mainly taken for passive or auxiliary environment. For example, the harmless treatment of "three wastes"(wastewater, waste gas" and solid waste, the treatment of taking out dirty things in compliance with regulations, and the restoration of ecosystems. The main purpose is to eliminate or mitigate negative environmental impacts that have already occurred. From the perspective of the implementation mechanism of green credit policies, these two categories of environmental responsibility fulfillment correspond to different management stages within the bank's credit process: pre-emptive environmental responsibility fulfillment is primarily incentivized and regulated through institutional design in the pre-loan approval stage, while post-hoc environmental responsibility fulfillment is primarily guided and standardized through institutional design in the post-loan management stage.

(1) Institutional Design of the Pre-Loan Approval Process and Compliance with Environmental Responsibilities

Pre-loan approval is the core institutional arrangement through which green credit policies influence enterprises' fulfillment of environmental responsibilities prior to lending. The "Green Credit Guidelines" explicitly stipulate that banking financial institutions shall conduct due diligence on environmental and social risks based on client characteristics; credit shall not be granted to clients that fail to meet environmental and social performance standards. For clients involving significant environmental and social risks, loan contracts shall require borrowers to provide environmental and social risk reports, which must include representations and warranties regarding environmental and social risk management (China Banking Regulatory Commission, 2012). This institutional design implies that, prior to extending loans, banks must conduct a systematic assessment of the borrowing enterprise's environmental strategy, clean production plans, emission reduction targets, and environmental management system, treating the enterprise's pre-loan fulfillment of environmental responsibilities as a core eligibility criterion for credit approval.

From the perspective of micro-level transmission mechanisms, the pre-loan approval system uses environmental access constraints to compel enterprises to incorporate environmental factors into their core business decisions at the project initiation stage or the very beginning of production planning. Specifically, during due diligence, commercial banks focus on reviewing whether enterprises have established a comprehensive environmental management system, whether they have clean production transformation plans and clear emission reduction targets, and whether they have implemented effective pollution prevention and control measures at the source in their production and operations. For projects lacking awareness of ex ante environmental responsibilities or posing high environmental risks, banks will refuse to accept applications or suspend the credit approval process. This mechanism has formed a clear convention when enterprise accepts credit: if it does not show that it has fully fulfilled its prior environmental responsibilities before obtaining financing, it will lose the opportunity to directly accept bank credit. Green environmental protection policy is an external restriction, such as higher capital cost and narrower channels for raising funds, which greatly improves the possibility of enterprises using green office in the early stage (Si and Cao, 2022). In addition, combined with environmental taxes and fees, green credit will also encourage a large number of polluting enterprises to strengthen management from the starting point in the early stage. Thereby encouraging enterprises to invest in pollution source management technology (Shu and Liao, 2022). Then let enterprises fulfill their environmental responsibilities. The system design of pre-financing review process closely combines the performance of environmental responsibility with the conditions for obtaining credit, effectively encourages enterprises to make predictable environmental investments such as green technology r&d and clean production from the starting point of production and activities, thus helping enterprises to change from passive protection behavior to active prevention and management behavior, thus fulfilling their environmental responsibilities.

(2) Institutional Design for Post-Loan Management and the Fulfillment of Post-Event Environmental Responsibilities

Post-loan management is another important institutional mechanism that green credit policy affects the realization of corporate environmental responsibility. Banks must strengthen the post-lending management of customers who may bring

great risks to the environment and society, and formulate and implement targeted post-lending management measures. When a customer has a major environmental and social risk accident, the bank must take immediate measures and report to the regulatory authorities (China Banking Regulatory Commission, 2012). On the working level, banks generally require green credit money to be used only for certain purposes when managing after loans. Banks will track and monitor the flow of money all the way to ensure that the credit money is really used for environmental protection activities after the loan, such as pollution control, equipment renewal, pollutant treatment, ecosystem restoration and so on.

The central logic of this institutional design completely limits the use of the company's credit funds to environmental remediation activities afterwards. In this way, enterprises can avoid spending money on other production and work, and directly ensure that enterprises get the money they need to complete their environmental responsibilities afterwards. Commercial banks is a way of post-loan management, which strengthens on-site confirmation, tells to stop loans, reduces credit limits and terms, and enterprises use green loans for other things (Zhang and Qiang, 2026). By monitoring the use of funds and notifying risks in advance, institutional design in the later management stage found that credit funds are really end-of-pipe remediation actions for enterprises.

Generally speaking, green credit policies adopts two mechanisms: pre-financing approval and post-financing management, which should deal with the stage before and after the enterprises perform their environmental responsibilities. Therefore, the incentive and rule mechanism covering the whole process of enterprise production and operation has been formulated. Approve the use of environmental admission restrictions before financing, prevent pollution at the source, and encourage enterprises to strengthen environmental protection investment. On the other hand, post-financing management is to use funds for specific purposes and ensure that credit resources turn to drainage outlets and other terminal treatment countermeasures. These two mechanisms are connected and work together to promote corporate environmental responsibility from source prevention to terminal governance system.

Based on this, this paper proposes the following hypotheses:

Hypothesis 2: Green credit policies promote the ex ante fulfillment of corporate environmental responsibilities through institutional designs in the pre-loan approval process.

Hypothesis 3: Green credit policies promote the ex post fulfillment of corporate environmental responsibilities through institutional designs in the post-loan management process.

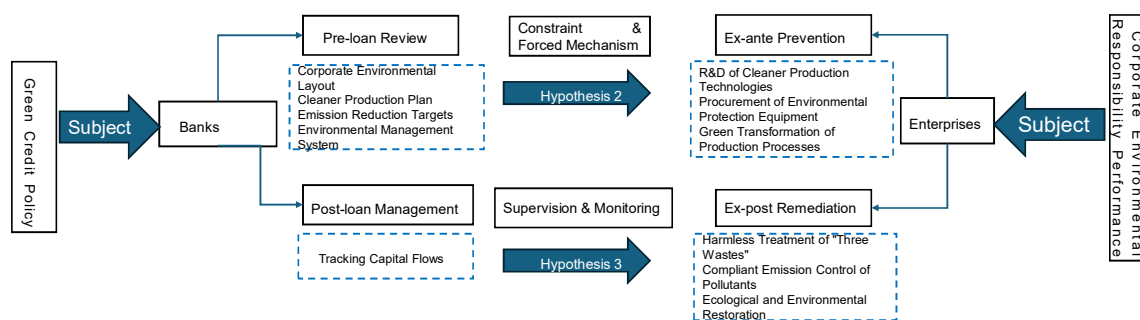


Figure 1. Theoretical Framework Diagrams for Hypotheses 2 and 3

3.2 A Theoretical Analysis of the Mechanism Through Which Green Credit Policies Influence Corporate Environmental Responsibility

Whether green credit policies can motivate enterprises to fulfill their environmental responsibilities depends on whether banks, as the main sponsors of green loans, can turn regulatory pressure into specific risk confirmation efforts. The implementation of green credit policies will improve the ability of banks to distinguish environmental risks through regulatory constraints and market-based incentives. At the regulatory level, the “Green Credit Guidelines” and subsequent incorporation into assessments such as the Macprudential Assessment and Green Finance Evaluation directly link environmental risk management to banks’ regulatory ratings and profitability. At the market level, banks have gained internal motivation from market competition and actively improved their ability to identify environmental risks. Interest

rate liberalization has intensified the competition among banks, which has changed the focus of competition from price competition to the ability to distinguish environmental risks. If banks can't correctly identify the benefits of the company's activities in the real environment, they can't be in a favorable position in the competition for good green projects. The provisions of the system will become external support, and the encouragement of the market mechanism will cultivate the ability to choose. If these two forces work together, the ability of banks to distinguish environmental risks will generally improve. Centered on this, green credit policy will change the cost and profit structure of the company in fulfilling its environmental responsibilities through correct resource allocation and different risk pricing methods.

First of all, the correct division of resources will change the cost-benefit structure of the company's environmental responsibility fulfillment. The important point of the bank's environmental risk identification capabilities is to solve the information asymmetry. If this resolution is not enough with the real "genuinely green" company "greenwashing", Banks can't distinguish between companies that incorporate environmental investments into their production processes and "green washers" who only muddle through their reports, thus confusing credit resources. If the bank has real discrimination, its operation will no longer be limited to paper reports, but will appear outside as countable credit constraints. Before the launch of loan, the bank evaluated the company's environmental management system, clean production plans and source management strategies, and provided preferred credit and preferential interest rates for companies with perfect environmental structure. In the stage after the launch of loan, the bank will track all the use methods of funds to confirm whether the credit funds are really used for end-of-pipe processing and equipment updating. Companies that abide by environmental rules will have better loan renewal conditions. On the other hand, companies that use money improperly will reduce the loan limit and may be prevented from lending. This credit allocation mechanism of "praising good deeds and punishing bad deeds" changes the company's environmental responsibility from a simple compliance fee to a key factor in obtaining financing and financing fees. This great change in the cost and profit structure urges companies to take environmental responsibility as the central idea of business judgment, rather than dealing with it as an external rule.

Second, differentiated risk pricing will establish a continuous dynamic incentive mechanism throughout the lifecycle. Banks should not only correctly divide the quantity and ease of use of credit resources, but also improve their ability to discover environmental risks. From the perspective of financing costs, they should dynamically encourage enterprises through differential pricing. According to the old practice, the pricing of green credit generally only determines the scope of green project and uses the same interest rate. If enterprises abide by the minimum rules, there is no better economic motivation to devote themselves to environmental protection. This restriction has disappeared as banks systematically improve their ability to detect risks. Banks decide different loan interest rates and credit conditions according to the actual situation of how many environmental responsibilities enterprises have fulfilled. Enterprises with good environmental commitment and low environmental risk can get more credit at lower interest rates. On the contrary, enterprises with poor environmental commitment and high environmental risks will face the pressure of higher interest rates and stricter credit ceiling. By improving the risk identification ability of banks, we can cross the limit of static pricing. Through the dynamic monitoring after the loan, when the enterprise plays a good or bad role in the environment, the bank will immediately adjust the financing cost accordingly. Only when you go through the credit formalities, you will say your commitment to the environment. If you don't implement it later, the financing conditions will become harsh. If we maintain a good environmental working relationship at work, the gradual decline in financing costs will be transformed into long-term practical benefits. This "real-time feedback and dynamic pricing" mechanism changes environmental responsibility from one-time compliance with rules to follow-up incentives covering the whole lifecycle.

Generally speaking, driven by institutional arrangements and market returns, green credit policy has greatly improved the ability of banks to discover environmental risks. As a result, the effect of the policy is transmitted to enterprises through two ways. The first is the correct way to allocate resources. On this road, the loan mechanism of praising good enterprises and punishing bad enterprises fundamentally links the environmental responsibility of enterprises with the availability and cost of financing. Then, change the cost and benefit mechanism of environmental protection responsibility. The second is the pricing approach of different risks. By transforming small changes in environmental conditions into immediate small adjustments in financing costs, the pressure of observing one-off rules is transformed into the enthusiasm that continues to spread throughout the work. Through these two roads working together, a small mechanism of green credit policy effectively transferred from the banking field to the enterprise field is formed. In addition, in view of the policy effect described earlier, that is, the review before financing promotes prevention beforehand, and the management after financing ensures management afterwards, it provides a mechanism explanation at the level of bank implementation.

Based on this, this paper proposes Hypothesis 4: Green credit policies promote the fulfillment of corporate environmental responsibilities by enhancing banks' risk identification capabilities.

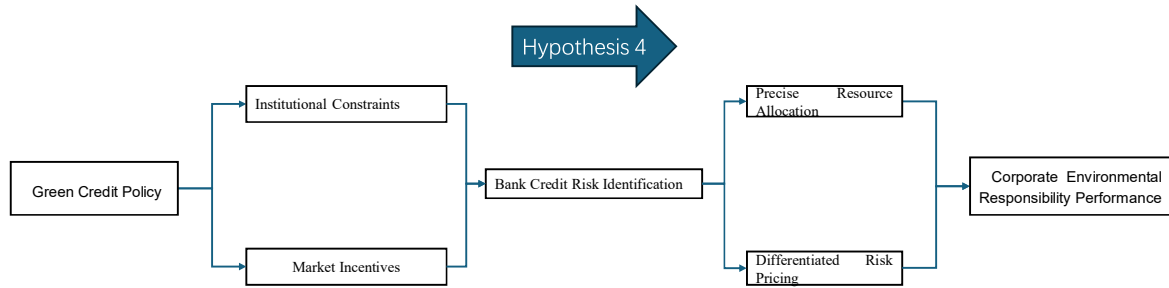


Figure 2. Theoretical Framework Diagram for Hypothesis 4

4. EMPIRICAL ANALYSIS

4.1 Data Sources and Variable Definitions

4.1.1 Sample Selection and Data Sources

This study uses A-share listed firms in heavily polluting industries from 2007 to 2020 as the research sample, rather than all A-share listed firms. The choice of heavily polluting industries is consistent with the institutional logic of green credit policies: these industries face stronger environmental access constraints, higher pollution-control obligations, and more intensive post-loan environmental risk monitoring, making them the most direct subjects through which the policy affects corporate environmental responsibility. In selecting industries, this paper follows the principle of retaining sectors characterized by high energy consumption, high emissions, and high environmental risk, and excludes firms outside these sectors to ensure that the measures of ex ante prevention and ex post treatment are comparable and policy-relevant. The data sources primarily include the following: (1) green credit policy data derived from policy documents related to green credit policies on the websites of provincial and municipal people's governments, covering the period from 2017 to 2020; (2) annual reports of listed companies; (3) the Wind database; and (4) the CSMAR database. After excluding observations with missing data, firms in the finance and insurance sectors, and ST and *ST firms, a total of 34,095 firm-year observations are retained.

4.1.2 Variable Definition

(1) Dependent Variables: Corporate Environmental Responsibility Performance: Ex-ante Environmental Responsibility Performance (FrontActWord) and Ex-post Environmental Responsibility Performance (EndTreatword).

To characterize corporate environmental responsibility fulfillment across the two stages of ex-ante prevention and ex-post remediation, this study constructs the following two indicators: ex-ante environmental responsibility fulfillment and ex-post environmental responsibility fulfillment. Drawing on Li Zhe (2018), we employ text analysis to conduct a word frequency analysis of relevant statements in corporate annual reports. The specific procedure is as follows:

First, the source of terms for text retrieval was defined. Based on the Environmental Protection Law, relevant laws and regulations applicable during the sample period—including the Law on the Prevention and Control of Environmental Pollution, the Natural Resources Protection Law, the Ecological Protection Law, the Resource Recycling Law, and the Energy Conservation and Emission Reduction Law—were systematically organized to extract relevant terms related to corporate environmental strategies and environmental actions.

Second, a keyword dictionary for text retrieval was created. Based on the list of terms derived from the legal provisions, a primary search dictionary was constructed using text analysis methods. Keyword scanning was then performed in relevant sections of listed companies' annual reports, including notes to the financial statements, management's discussion and analysis, and board of directors' reports. Given that the sample companies, while all belonging to heavily polluting industries, operate in different sub-sectors, this study uses "same industry and same fiscal year" as the basic statistical unit. The raw word frequencies were standardized to eliminate biases caused by differences in disclosure density across industries.

Regarding the composition of the dictionary, following Li Zhe's (2018) classification framework, corporate environmental information disclosure is divided into two categories of word frequencies: First, corporate environmental strategic information, which refers to planning-related information formulated to prevent environmental pollution and ecological

damage and to improve environmental quality. The main dictionary covers environmental strategy (e.g. “in compliance with national and regional environmental policies,” “low consumption,” low pollution, high recycling”), sustainable development (e.g. “comprehensive resource utilization plans,” “coordinated development of the environment and the economy”), environmental planning (e.g. “environmental education,” “research on environmental protection technologies”), and environmental assessment (e.g. “environmental monitoring,” “pollution source identification,” “environmental pre-assessment”). This category of term frequencies primarily reflects a company’s environmental planning and strategic commitments prior to the commencement of production activities; this paper aggregates these to construct the concept of “pre-emptive fulfillment of environmental responsibilities.” Second is information on corporate environmental actions, which refers to specific measures taken to address environmental damage caused by existing pollution and to prevent and control pollution. The main lexicon covers pollution discharge expenditures (such as pollution discharge fees and solid waste disposal fees), expenditures on environmental protection facilities (e.g. purchase of environmental protection equipment, coal-fired boiler retrofitting costs, etc.), expenditures on environmental protection technologies (e.g. clean production processes, comprehensive utilization of “three wastes,” etc.), expenditures on workplace environmental compensation, restorative environmental expenditures (e.g. environmental restoration and remediation guarantees, greening fees, etc.), preventive expenditures, and special environmental expenditures. The frequency of terms in this category primarily reflects the end-of-pipe treatment and remedial actions taken by enterprises after pollutants have been generated; this paper aggregates these to construct the concept of post-event fulfillment of environmental responsibilities.

(2) Key explanatory variable: Green credit policy (CGLoanSubsidy)

Green credit volume (CGLOANSUBSIDY): This word indicates the amount of green credit that enterprises get. We wrote in the “Instructions for Completing the Green Credit Statistics Form” in 2013: First, Starting from the financing indicators and definitions of energy-saving and environmental protection projects and services written in the former China Banking Regulatory Commission (CBRC)’s Instructions for Completing the Green Credit Statistics Form in 2013, we manually compiled 257. Then, using R software, we confirmed these 257 keywords together with the annual reports and semi-annual reports of all enterprises during the sample period. From 2017 to 2020, if there are words of energy-saving and environmental protection projects in enterprise announcements, the number is 1. If there is no such word in the enterprise announcement during the sample period, set the number to 0. Through this screening process, we ultimately identified 34,095 green credit enterprises; Finally, to ensure the scientific rigor and accuracy of the text analysis method, we conducted a manual analysis following the approach of Uotila (2009). A random sample was selected, and the results were compared with those generated by the software. The findings were found to generally align with the objectives of the text analysis.

(3) Mechanism Variables: Green Credit Risk Identification (HighGwl2016)

As for the variable of Loan_Asset of green credit, this study measures the quality of green credit supply by the proportion of Green credit to the total credit. This ratio shows the actual investment of bank in green credit business.

Regarding the risk identification variable (HighGwl2016) of green credit, this study uses the research method of Huang (2020) and establishes the variable based on the “greenwashing” behavior of enterprises. This variable depends on whether the “green climate” degree of the enterprise in 2016 is in the top 50% of all samples. If the enterprise has a clear “greenwashing” behavior, hit 1, otherwise hit 0. On this basis, the interactive item between this variable and green credit policy (HighGwl2016_CGS) is made to investigate how the risk identification ability of bank plays a role in conveying policies.

(4) Control Variables

To control for other characteristics affecting corporate social responsibility, this study introduces a series of control variables, including those at the firm and city levels.

Firm-level control variables include: ① Ownership Type (SOE): Classified by the nature of the firm’s actual controller; state-owned enterprises are assigned a value of 1, and non-state-owned enterprises a value of 0. ② Firm Size (Size): Measured using the natural logarithm of annual total assets. ③ Debt-to-Asset Ratio (Lev): Total liabilities at year-end divided by total assets at year-end. ④ Return on Assets (ROA): Net profit divided by the average balance of total assets. ⑤ Asset Turnover Ratio (ATO): Sales revenue divided by the average of total net assets between the beginning and end

of the period. ⑥ Cash Flow Ratio (Cashflow): Cash flow from operating activities divided by total assets. ⑦ Revenue Growth Rate (Growth): The ratio of current-year revenue to the previous year's revenue, minus 1.

Control variables at the city level include: ① Per Capita Regional GDP (pGDP): Regional GDP divided by the region's year-end permanent resident population. ② City Total Credit as a Percentage of Regional GDP (TC): Year-end loan balance of urban financial institutions divided by regional GDP. ③ City Secondary Industry Output as a Percentage of Regional GDP (IS): Value added of the city's secondary industry divided by regional GDP.

The descriptive statistics for the main variables are shown in Table 1.

Table 1. Descriptive Statistics for Key Variables

Key Variable	Observed value	Mean	Median	Standard deviation
FrontActWord	34095	5.5254	1.0000	15.6880
EndTreatword	34095	1.2863	0.0000	1.8428
CGLoanSubsidy	34095	0.0514	0.0000	0.2209
SOE	34095	0.4866	0.0000	0.4998
Size	34095	21.7688	21.6102	1.3892
Lev	34095	0.4450	0.4346	0.7115
ROA	34095	0.0400	0.0396	0.1027
ATO	34095	1.5632	1.0108	5.9283
Cashflow	34095	0.1708	0.1285	0.4072
Growth	34095	1.7389	0.1309	67.1269
pGDP	34095	10.9781	11.0657	1.2745
TC	34095	1.5057	1.4967	0.6580
IS	34095	42.9830	44.8000	10.9223

4.2 Model Specification

To examine the impact of green credit policies on corporate environmental responsibility, this paper constructs a two-way fixed-effects model for empirical analysis.

$$\begin{aligned}
 \text{FrontActWord}_{it} &= \alpha + \beta_1 \cdot \text{CGLoanSubsidy}_{it} + \sum \gamma_k \cdot \text{FirmControls}_{it} + \\
 &\quad \sum \lambda_m \cdot \text{CityControls}_{it} + \mu_i + \lambda_t + \varepsilon_{it} \\
 \text{EndTreatWord}_{it} &= \alpha + \beta_1 \cdot \text{CGLoanSubsidy}_{it} + \sum \gamma_k \cdot \text{FirmControls}_{it} + \\
 &\quad \sum \lambda_m \cdot \text{CityControls}_{it} + \mu_i + \lambda_t + \varepsilon_{it}
 \end{aligned} \tag{1}$$

Here, the subscript i denotes the firm, t denotes the year, *FirmControls* denotes the firm-level control variables, and *CityControls* denotes the city-level control variables. μ_i and λ_t represent the firm-level fixed effects and time-level fixed effects, respectively, while ε_{it} is the random error term.

4.3 Benchmark Regression Analysis

Table 2. Regression Results on the Relationship Between Green Credit Policies and Corporate Environmental Responsibility Compliance

	(1)	(2)	(3)	(4)	(5)	(6)
	FrontActWord	FrontActWord	FrontActWord	EndTreatWord	EndTreatWord	EndTreatWord
CGLoanSubsidy	0.9893** (0.3480)	0.8767** (0.3504)	0.8449** (0.3562)	1.2345*** (0.3555)	1.1195*** (0.3539)	1.0862*** (0.3603)
SOE		-0.1633 (0.4315)	-0.1783 (0.4405)		-0.3735 (0.4694)	-0.3828 (0.4769)
Size		1.2695*** (0.1558)	1.2751*** (0.1568)		1.1946*** (0.1369)	1.2007*** (0.1376)
Lev		1.0393* (0.4926)	1.0305* (0.4871)		1.1862** (0.4531)	1.1768** (0.4478)
ROA		7.0838*** (1.2288)	7.0855*** (1.2352)		6.5168*** (1.1679)	6.5211*** (1.1755)
ATO		-0.0136 (0.0098)	-0.0136 (0.0098)		-0.0138 (0.0100)	-0.0137 (0.0100)
Cashflow		1.6177** (0.6515)	1.6504** (0.6516)		1.1813* (0.5790)	1.2113* (0.5779)
Growth		0.0004 (0.0008)	0.0004 (0.0008)		0.0005 (0.0008)	0.0005 (0.0008)
pGDP			-0.0958*** (0.0186)			-0.1182*** (0.0233)
TC			-0.4870*** (0.1605)			-0.4349*** (0.1397)
IS			0.0229* (0.0119)			0.0210* (0.0106)
_cons	6.4398*** (0.0212)	-22.3092*** (3.4787)	-21.5684*** (3.7893)	5.3798*** (0.0216)	-21.6034*** (3.0426)	-20.6252*** (3.3056)
N	34095	34095	34095	34095	34095	34095
Adj. R2	0.7299	0.7316	0.7317	0.7310	0.7326	0.7327
F	8.0837	19.1955	38.9486	12.0611	24.6191	48.1128

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively; the same applies throughout.

Table 2 shows the impact of green credit policies on the response performance of firms environment: baseline regression results. Columns (1) to (3) use ex ante environmental responsibility performance (frontactword) as the dependent variable, and columns (columns) use ex post environmental responsibility performance (EndTreatWord) as the dependent variable. All Columns use the method of adjusting time-fixed effects and firm-level fixed effects and adding control variables little by little: Columns (1) and (4) use only core explanatory variables; Columns (2) and (5) and also add firm-level control

variables, Columns (3) and (6) on the basis of the previous add city-level control variables to examine the robustness of the estimation results.

According to the regression results of Columns (1) to (3), the estimation coefficient of green credit scale (CGLoanSubsidy) is robust and meaningful in all settings. In the setting of all variables that control Column (3), the coefficient of CGLoanSubsidy is 0.8449. This means that CGLoanSubsidy will increase by 1 unit, and FrontActWord will increase by 0.8449 unit. The average value of FrontActWord is 5.5254, so the impact is about 15.29% of the average value of the sample. When CGLoanSubsidy increases the standard deviation, that is, by 0.2209, FrontActWord will increase by 0.1866 units. It can be seen that the influence of green credit policy is not only statistically significant, but also economically significant. The possible reason is that in the initial stage of production before the loan, the green credit policy can well encourage enterprises to carry out source prevention activities such as research and development of clean technology and green transformation of production process, and on the other hand, in the stage before the loan review, the restriction of environmental access will have a mandatory impact. This proves that Hypothesis 2. In other words, the green credit policy is an assumption that enterprises can fulfill their environmental responsibilities in advance through the system design before loan approval.

The regression results from column (4) to column (6) show that the amount of green credit is more effective in helping to implement environmental responsibility afterwards. In column (6), the coefficient of CGLoanSubsidy is 1.0862, which means that when CGLoanSubsidy is increased by one unit, EndTreatWord will be increased by 1.0862 units. Since the average value of EndTreatWord is 1.2863, this coefficient is about 84.44% of the sampling average. When CGLoanSubsidy increases by one standard deviation, EndTreatWord increases by about 0.2399 units. Compared with the effect of implementing environmental responsibility beforehand, the economic benefit of post-event management is greater, and the policy of green environmental protection shows that it will promote the treatment of pollutants and the final treatment of waste gas drainage more effectively. The possible reason is that green credit's policy encourages enterprises to increase more resources for pollutant treatment and final treatment of waste gas and wastewater by monitoring the use of funds after financing and risk early warning mechanism. This confirms that Hypothesis 3 is correct. In other words, green credit's policy is to promote the implementation of environmental responsibility afterwards by establishing a mechanism for post-financing management stage.

In a word, Hypothesis 1 is correct. Green credit policies greatly help enterprises to implement environmental responsibilities. Whether it is the prevention stage beforehand or the treatment stage afterwards, the effect is very meaningful. As for the control variables, Columns (3) and (6) show that firm size (Size) and return on assets (ROA) are of great benefit to the achievements of environmental responsibility beforehand and afterwards. This means that the larger and more profitable enterprises are, the stronger their ability to use resources in environmental management. Cash flow ratio (Cashflow) is greatly increased in the preset setting, indicating that there are enough internal funds to support the initial prevention activities. Debt-to-asset ratio (Lev) plays a great positive role in post-event setting, which may reflect that the supervision of banks by enterprises with more debts becomes stricter after financing, which will increase investment in grass-roots processing. Generally speaking, the results of control variables are consistent with the basic conclusion that the equity and financing status of enterprise resources affect the implementation of environmental responsibility.

4.4 Robustness Tests

To ensure the reliability of the baseline findings, this paper conducts robustness tests by substituting the dependent variable. As noted in the theoretical analysis above, the core of ex-ante environmental responsibility lies in reducing resource consumption and pollution generation at the source of production, whereas the focus of ex-post environmental responsibility is on end-of-pipe treatment and emission reduction of pollutants that have already been generated. Based on this distinction, this paper replaces the original dependent variable with two types of indicators: "energy conservation" and "pollutant emissions." Enterprise energy savings (EnEV) are used as a proxy for ex-ante environmental responsibility fulfillment; a higher value indicates greater efforts by the enterprise to reduce resource consumption and pollution generation at the production front end. we use a firm's pollutant emission intensity (PoEm) as a reverse proxy for ex post environmental responsibility fulfillment; a smaller value of this indicator implies that the firm has achieved more significant results in end-of-pipe treatment and pollutant emission reduction. Both sets of regressions control for all firm-level and city-level control variables, as well as firm-specific and time-specific fixed effects. The regression results are reported in Table 3.

Table 3. Results of Robustness Tests

	(1)	(2)
	EnEV	PoEm
CGLoanSubsidy	0.0201*** (0.0075)	-0.0071** (0.0035)
SOE	-0.0333 (0.0203)	0.0117 (0.0095)
Size	0.0439*** (0.0030)	0.0057*** (0.0014)
Lev	0.0050 (0.0142)	-0.0024 (0.0067)
ROA	0.0414* (0.0232)	0.0106 (0.0109)
ATO	-0.0001 (0.0003)	-0.0001 (0.0001)
Cashflow	0.0216 (0.0152)	0.0117 (0.0071)
Growth	-0.0000 (0.0000)	-0.0000 (0.0000)
pGDP	0.0014 (0.0015)	0.0007 (0.0007)
TC	-0.0049 (0.0062)	0.0070** (0.0029)
IS	-0.0020*** (0.0004)	0.0004* (0.0002)
_cons	-0.7402*** (0.0699)	-0.1257*** (0.0327)
N	34095	34095
Adj. R2	0.5131	0.6647
F	24.2994	3.0478

The results in Column (1) show that the estimated coefficient of green credit volume (CGLoanSubsidy) for energy savings (EnEV) is 0.0201, which is significantly positive at the 1% level. In terms of economic magnitude, a one-unit increase in CGLoanSubsidy increases EnEV by 0.0201 units. Using the standard deviation of CGLoanSubsidy, 0.2209, as a more moderate change, a one-standard-deviation increase in CGLoanSubsidy is associated with an increase of approximately 0.0044 units in EnEV. This indicates that the larger the volume of green credit, the more significant the energy savings achieved by enterprises. Since energy conservation constitutes a front-end behavior by which enterprises reduce resource

consumption at the source of production, this result further validates the positive impact of green credit policies on the fulfillment of ex ante environmental responsibilities.

The results in Column (2) show that the estimated coefficient for green credit volume on pollutant emission intensity (PoEm) is -0.0071, which is significantly negative at the 5% level. Economically, a one-unit increase in CGLoanSubsidy reduces PoEm by 0.0071 units. A one-standard-deviation increase in CGLoanSubsidy reduces PoEm by approximately 0.0016 units. This implies that the expansion of green credit is associated not only with stronger environmental disclosure or responsibility wording, but also with a measurable reduction in pollutant emission intensity. Since the decline in pollutant emission intensity directly reflects the effectiveness of enterprises' efforts in end-of-pipe treatment and pollution reduction, this result validates, from a reverse perspective, the promotional role of green credit policies in the fulfillment of ex post environmental responsibilities.

Combining the results from Columns (1) and (2), regardless of whether forward-looking energy-saving indicators or backward-looking pollutant emission indicators are used, the scale of green credit exhibits a significant impact consistent with theoretical expectations. The results therefore support the robustness of the baseline regression conclusions from both the dimensions of source prevention and end-of-pipe treatment, indicating that the core findings do not depend on specific measurement methods of the explained variables.

4.5 Heterogeneity Analysis

The baseline regression in the previous section confirmed the overall positive effect of green credit policies on corporate environmental responsibility. However, this effect may vary significantly across firms with different ownership structures. To examine the structural characteristics of the policy effect, this study divides the sample into two groups based on ownership structure—state-owned enterprises (SOEs, where SOE = 1) and non-state-owned enterprises (SOEs, where SOE = 0)—and conducts group-specific regressions along the dimensions of ex ante prevention and ex post remediation.

4.5.1 Property Rights Heterogeneity in Ex-ante Environmental Responsibility Compliance

Table 4 reports the results of the group-specific regression on ex-ante environmental responsibility compliance. Column (1) presents the results for the full sample, Column (2) for the SOE subsample, and Column (3) for the non-SOE subsample. In the full sample, the estimated coefficient for green credit volume is 0.8449, which is significant at the 1% level, consistent with the findings of the baseline regression. In terms of subgroups, the estimated coefficient for the scale of green credit in the SOE subsample is 1.9925, which is significantly positive at the 1% level; in contrast, in the non-SOE subsample, this coefficient fails to pass the statistical significance test. This discrepancy indicates that the promotional effect of green credit policies on ex ante environmental responsibility fulfillment is primarily concentrated among SOEs, while effective incentives for ex ante preventive behavior have not yet been established for non-SOEs.

Table 4. Test of Property Rights Heterogeneity in the Fulfillment of Ex Ante Environmental Responsibilities

	(1)	(2)	(3)
	FrontActWord	FrontActWord	FrontActWord
CGLoanSubsidy	0.8449*** (0.2758)	1.9925*** (0.5306)	0.3287 (0.3049)
SOE	-0.1783 (0.7374)	0.0000 (0.0000)	0.0000 (0.0000)
Size	1.2751*** (0.1114)	1.4489*** (0.1946)	1.3978*** (0.1345)
Lev	1.0305** (0.5196)	-0.2680 (0.8978)	3.4730*** (0.6447)

Table 4. (continued) Test of Property Rights Heterogeneity in the Fulfillment of Ex Ante Environmental Responsibilities

	(1)	(2)	(3)
	FrontActWord	FrontActWord	FrontActWord
ROA	7.0855*** (0.8476)	9.9710*** (1.7073)	5.6903*** (0.9249)
ATO	-0.0136 (0.0092)	-0.0078 (0.0104)	-0.2053*** (0.0534)
Cashflow	1.6504*** (0.5538)	-2.3180** (1.1407)	2.2444*** (0.6181)
Growth	0.0004 (0.0008)	-0.0001 (0.0009)	0.0047** (0.0020)
pGDP	-0.0958* (0.0556)	-0.0130 (0.1593)	-0.0747 (0.0552)
TC	-0.4870** (0.2241)	-0.7548** (0.3302)	-0.2593 (0.3154)
IS	0.0229 (0.0159)	0.0839*** (0.0250)	-0.0349* (0.0206)
_cons	-21.5684*** (2.6032)	-27.8990*** (4.7389)	-22.8308*** (3.0779)
N	34095	14477	19618
Adj. R2	0.7317	0.7079	0.7612
F	21.2329	13.5772	19.9664

It can be seen from this difference that state-owned enterprises usually require stricter supervision and compliance with rules. Therefore, in order to meet the requirements of the rules, they tend to take the initiative to show and make all the environmental management systems and make a clean production plan when accepting the review before financing. At the same time, state-owned enterprises usually have a more stable cooperative relationship with banks, and banks have a more detailed understanding of their environmental risk. As a result, the control of environmental access before financing has become stricter. On the contrary, non-state-owned enterprises often think that the environment in the pre-financing stage is extra cost and the response will be slow. Because their decision method mainly depends on whether they make money. Environmental investment beforehand is difficult to enter and takes a long time, so it will conflict with their short-term goal of making money. In the pre-financing review stage, these factors can not be a strong motivation for them to invest in advance. Therefore, this policy has limited effect on non-state-owned enterprises to fulfill their pre-environmental responsibilities.

4.5.2 Property Rights Heterogeneity in Ex Post Compliance with Environmental Responsibilities

Table 5 presents the results of the subgroup regression analysis on ex post compliance with environmental responsibilities. In the full sample, the estimated coefficient for the scale of green credit is 1.0591, which is significant at the 1% level. The segmented results show that in the state-owned enterprise (SOE) subsample, the estimated coefficient for the scale of green credit is 2.2169, which is significant at the 1% level; whereas in the non-state-owned enterprise (non-SOE) subsample, the

coefficient is 0.4972, which is significant only at the 10% level. Therefore, the green credit policy has a stronger impact on state-owned enterprises.

Table 5. Test of Property Rights Heterogeneity in the Fulfillment of Post-Event Environmental Responsibilities

	(1)	(2)	(3)
	EndTreatWord	EndTreatWord	EndTreatWord
CGLoanSubsidy	1.0591*** (0.2681)	2.2169*** (0.5117)	0.4972* (0.2992)
SOE	-0.3866 (0.7172)	0.0000 (0.0000)	0.0000 (0.0000)
Size	1.2051*** (0.1084)	1.2675*** (0.1878)	1.3653*** (0.1320)
Lev	1.1945** (0.5053)	-0.2476 (0.8664)	3.6679*** (0.6327)
ROA	6.5263*** (0.8243)	9.4627*** (1.6479)	5.2075*** (0.9076)
ATO	-0.0137 (0.0090)	-0.0077 (0.0100)	-0.2134*** (0.0524)
Cashflow	1.2086** (0.5385)	-1.9842* (1.1011)	1.7804*** (0.6066)
Growth	0.0005 (0.0008)	-0.0001 (0.0009)	0.0049** (0.0020)
pGDP	-0.1154** (0.0540)	-0.1001 (0.1538)	-0.0896* (0.0541)
TC	-0.4313** (0.2179)	-0.7352** (0.3187)	-0.1249 (0.3095)
IS	0.0219 (0.0154)	0.0882*** (0.0241)	-0.0398** (0.0202)
_cons	-20.8021*** (2.5312)	-24.5071*** (4.5732)	-22.7317*** (3.0204)
N	34095	14483	19612
Adj. R2	0.7324	0.7064	0.7625
F	20.8474	13.1937	20.6147

Consistent with the findings from the pre-lending stage, green credit policies have a significantly stronger promotional effect on the post-lending fulfillment of environmental responsibilities by state-owned enterprises (SOEs) than by non-state-owned enterprises. This shows that SOEs not only actively responded to the requirements of green credit policies in

the early stage of financing, but also received stricter and longer-term supervision on the use of funds in the follow-up management of financing. In this way, they will continue to make the final investment. non-state-owned enterprises also responded slightly in the later stage of financing, but to a small extent. By comparing all the stages in Tables 4 and 5, it can be found that state-owned enterprises respond better to the green creation strategy when fulfilling their environmental responsibilities, whether it is pre-prevention or post-improvement. State-owned enterprises perform environmental responsibilities in accordance with administrative rules in the whole process. They not only showed the countermeasures from the source in the early stage of financing, but also received stricter supervision over the use of funds in the follow-up management of financing. Therefore, they often respond well before and after the activity. In the case of non-state-owned enterprises, fulfilling environmental responsibilities after the incident means—for example, by renovating the end-of-pipe pollution treatment facilities, or by implementing compliance-based emission control measures, the scale of investment is manageable, and the results come out in a short time. From the perspective of economic cost, facing the post-loan regulatory constraints under green credit policies, for non-state-owned enterprises, instead of undertaking systemic transformations of production processes, it is better to strengthen end-of-pipe treatment, which makes it easier to meet the requirements of bank compliance review in a shorter time. The results show that ownership attributes has a moderating effect in conveying policies: the effects of policies are not exactly the same, but transmitted structurally through differentiated compliance incentives and financing constraints based on enterprises' equity structures.

5. MECHANISM ANALYSIS

5.1 Specification of Mechanism Variables and Model Construction

From the theoretical analysis in the previous part, it can be seen that the improvement effect of green credit policy on corporate environmental responsibility lies in whether the company, as the biggest role of borrowing money, can turn the pressure from the system into the actual power to discover environmental risks. There are two ways for banks to turn the ability to discover environmental risks into the substantive incentive for enterprises to fulfill their environmental responsibilities. One is the correct allocation of resources, and the other is the pricing according to different risks. In order to test the structure of this communication, this paper uses the method of Jiang Ting(2022). This method establishes the model of test structure based on correct theoretical logic, and carefully interprets the speculative results in the framework of finding out the reasons. In order to explore the chain that green credit policy affects the implementation of corporate environmental responsibility through the bank's risk discovery ability, the paper followed Jiang Ting's suggestion. Starting with the logic of determining cause and effect, combined with theoretical analysis, in order to clearly convey the internal structure of the policy effect, we make the following structural test model.

Green credit policies prompt banks to exercise their risk identification functions, thereby improving the quality of bank credit allocation, which in turn leads to enhanced corporate environmental responsibility. This transmission chain can be tested through the following empirical framework.

First, we examine the impact of green credit policies on the quality of bank credit allocation, specifically investigating whether banks can effectively identify and curb corporate “greenwashing” behavior. The following regression model is specified:

$$\text{Loan_Asset}_{it} = \alpha + \beta_1 \cdot \text{CGLoanSubsidy}_{it} + \beta_2 \cdot \text{HighGwl2016}_{it} + \beta_3 \cdot \text{HighGwl2016_CGS}_{it} + \sum \gamma_k \cdot \text{Controls}_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (2)$$

Loan_Asset_{it} represents the quality of green credit, measured as the proportion of green credit relative to total credit volume, reflecting the extent of banks' substantive investment in green credit operations. HighGwl2016_{it} is the corporate greenwashing risk variable. Drawing on the research design by Huang Rongbing (2020), it uses the criterion of whether a firm's “greenwashing” level in 2016 was in the top 50% of the full sample; if a firm exhibits significant “greenwashing” behavior, it is assigned a value of 1, otherwise 0. $\text{HighGwl2016_CGS}_{it}$ is the interaction term between the scale of green credit and corporate greenwashing risk, and is the core variable of focus in this paper. If banks possess effective environmental risk identification capabilities and can identify and curb “greenwashing” firms, the estimated coefficient of the interaction term, β_3 , should be significantly negative—that is, the higher a firm's greenwashing risk, the lower the proportion of green credit allocated by the bank. The set of control variables remains consistent with the baseline regression discussed earlier, where μ_i and λ_t represent firm-level and time-level fixed effects, respectively.

The above model examines whether green credit policies guide banks to systematically withdraw credit resources from enterprises with high greenwashing risks, thereby achieving an optimal allocation of credit resources. Building on this, it further examines whether improvements in the quality of bank credit allocation are effectively transmitted to the level of corporate environmental responsibility fulfillment. To this end, the following regression model is specified:

$$\begin{aligned} \text{FrontActWord}_{it} &= \alpha + \beta_1 \cdot \text{Loan_Asset}_{it} + \sum \gamma_k \cdot \text{Controls}_{it} + \mu_i + \lambda_t + \varepsilon_{it} \\ \text{EndTreatWord}_{it} &= \alpha + \beta_1 \cdot \text{Loan_Asset}_{it} + \sum \gamma_k \cdot \text{Controls}_{it} + \mu_i + \lambda_t + \varepsilon_{it} \end{aligned} \quad (3)$$

We use ex ante environmental responsibility fulfillment (FrontActWord_{it}) and ex post environmental responsibility fulfillment (EndTreatWord_{it}), as dependent variables, with green credit quality (Loan_Asset_{it}) as the key independent variable. If improvements in the quality of banks' green credit allocation—that is, the withdrawal of credit resources from “greenwashing” firms and their precise allocation to firms that genuinely fulfill environmental responsibilities—can effectively drive firms to improve their environmental performance, then β_1 should be significantly positive.

The two sets of models described above together constitute a comprehensive mechanism testing framework: the former is used to verify whether green credit policies have enhanced banks' risk identification capabilities, thereby optimizing the quality of credit allocation; the latter is used to verify whether improvements in credit allocation quality ultimately lead to a substantial increase in corporate environmental responsibility fulfillment. These two components are interconnected, revealing the complete causal pathway of “green credit policies → bank risk identification → corporate environmental responsibility fulfillment.”

5.2 Regression Analysis of Mechanisms

Table 6. Results of the mechanism test

	(1)	(2)	(3)	(4)
	Loan_Asset	Loan_Asset	FrontActWord	EndTreatWord
CGLoanSubsidy	0.0473*** (0.0067)	0.0454*** (0.0068)		
HighGwl2016	0.0000 (0.0000)	0.0000 (0.0000)		
HighGwl2016_CGS	-0.0508*** (0.0094)	-0.0503*** (0.0094)		
SOE		0.0033 (0.0139)	-0.1260 (1.5227)	-0.3274 (1.5316)
Size		0.0058*** (0.0021)	1.2589*** (0.2635)	1.1921*** (0.2557)
Lev		0.0470*** (0.0104)	0.7975 (1.1899)	0.9756 (1.1400)
ROA		0.0300* (0.0171)	6.8535*** (1.5441)	6.3040*** (1.5288)
ATO		-0.0007 (0.0007)	-0.0133 (0.0154)	-0.0134 (0.0153)

Table 6. (continued) Results of the mechanism test

	(1)	(2)	(3)	(4)
	Loan_Asset	Loan_Asset	FrontActWord	EndTreatWord
Cashflow		0.0129 (0.0109)	1.5956* (0.9103)	1.1473 (0.8738)
Growth		-0.0000 (0.0000)	0.0004 (0.0008)	0.0005 (0.0008)
pGDP		-0.0011 (0.0011)	-0.0896 (0.0557)	-0.1107* (0.0573)
TC		0.0089** (0.0041)	-0.4732 (0.5211)	-0.4061 (0.4680)
IS		-0.0001 (0.0003)	0.0293 (0.0522)	0.0299 (0.0499)
Loan_Asset			5.8231*** (1.3984)	5.6435*** (1.3900)
_cons	0.0198*** (0.0009)	-0.1291*** (0.0498)	-21.5465*** (5.7071)	-20.9097*** (5.4713)
N	34095	34095	34095	34095
Adj. R2	0.2407	0.2510	0.7333	0.7339
F	25.7488	7.8298	6.8891	6.5070

Table 6 shows the results of the two-stage regression analysis of institutional verification. Columns (1) and (2) indicate the regression of the first stage when the variable to be explained is set as green credit quality (Loan_Asset), and columns (3) and (4) indicate that the variable to be explained should be executed with environmental responsibility (FrontActWord) and ex post environmental responsibility fulfillment (EndTreatWord) in advance, respectively. All regressions control time fixed effect and individual fixed effect, and use robust standard error. Column (1) is investigating the influence of green credit policy on the quality of bank credit distribution. When only the fixed effect is controlled without adding other control variables, the main effect coefficient of green credit scale (CGLoanSubsidy) is 0.0473, which is a meaningful positive value at the level of 1%. The result shows that with the implementation of green credit policy, the proportion of green credit allocated by banks will increase. Because the coefficient of HighGwl2016 risk variable (2016) is close to zero, and it doesn't pass the significance test, it shows that the risk of green washing itself has no independent influence on the credit allocation of banks, and its influence is mainly reflected in the interaction with the scale of green loans.

For the estimation result of alternating term (HighGwl2016_CGS), the coefficient is negative, which is significant at 1% level. This result directly confirms that banks has a good ability to find and punish firms that do "greenwashing". Compared with firms with high risk of green climate, banks significantly reduced the proportion of green crisis. Banks did not simply expand the size of the same green credit. While expanding the total amount, we have made different assessments on whether the environmental information disclosed by enterprises is true or not, and improved the limited green environmental protection resources from the seemingly "green environmental protection" enterprises. This discovery will provide a direct empirical basis for the theoretical analysis of banks' ability to identify environmental risks.

After confirming that the bank can find the company doing "greenwashing" and stop, all the control variables are added in Column (2). The estimated value of interaction term is -0.0503, which is still obviously negative at the level of 1%. This shows that the conclusion is firm. The estimation results of control variables show that firm size (Size), debt-to-asset ratio

(Lev) and return on assets (ROA) are all obviously beneficial to the distribution quality of green credit, which means that the bigger the company, the higher the leverage and the stronger the profitability, the easier it is to get the support of Green Credit.

Next, we examine whether improvements in the quality of bank credit allocation ultimately translate into enhanced corporate environmental responsibility. In Column (3), with ex ante environmental responsibility (FrontActWord) as the dependent variable, the estimated coefficient for green credit quality (Loan_Asset) is 5.8231, which is significantly positive at the 1% level. When banks withdraw more credit resources from “greenwashing” firms and precisely channel them toward enterprises with genuine environmental initiatives, firms receive significant positive incentives for source prevention measures—such as R&D in clean technologies and green process upgrades—at the production front end. Environmental risk screening and credit access constraints during the pre-loan approval process do indeed compel firms to strengthen their pre-emptive environmental management systems.

Column (4) uses post-event environmental responsibility fulfillment (EndTreatWord) as the dependent variable, and the estimated coefficient for green credit quality is 5.6435, which is also significantly positive at the 1% level. Banks’ continuous monitoring of fund usage during post-loan management ensures that green credit funds are effectively channeled toward end-of-pipe treatment, pollutant disposal, and other post-implementation environmental actions, effectively curbing enterprises’ diversion of green funds for other purposes.

Combining the results of the two-stage regression, the complete transmission mechanism is empirically supported. Green credit policies have driven improvements in banks’ risk identification capabilities, enabling them to effectively detect corporate “greenwashing” and optimize credit allocation accordingly, significantly reducing the proportion of green credit extended to firms with high greenwashing risks; meanwhile, the improvement in credit allocation quality—specifically, the reallocation of credit resources from “greenwashing” firms to those genuinely fulfilling environmental responsibilities—has further significantly promoted the simultaneous improvement in firms’ levels of preemptive prevention and post-event remediation.

This mechanism also provides systematic empirical support for the theoretical analysis presented earlier. Green credit policies do not simply act directly on enterprises through aggregate expansion; rather, by stimulating banks’ risk identification capabilities and altering enterprises’ cost-benefit structures through precise resource allocation, they ultimately drive enterprises to internalize environmental responsibility as a core consideration in their production and operational decisions. Thus, Hypothesis 4 is confirmed: green credit policies promote the fulfillment of corporate environmental responsibilities by enhancing banks’ risk identification capabilities.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

This paper uses A-share listed companies from 2007 to 2020 as its research sample to assess the impact of green credit policies on corporate environmental and social responsibility. In the empirical analysis, this paper adopts a full-process perspective encompassing both ex ante prevention and ex post governance. It constructs two dependent variables—ex ante environmental responsibility fulfillment and ex post environmental responsibility fulfillment—and employs a two-way fixed-effects model for baseline regression. We exchanged dependent variables (energy savings and pollutant emission intensity) and made Robustness tests. On this basis, through the heterogeneity analysis of ownership structure, the paper analyzes the mechanical test mode with banks’ risk identification capabilities as the center. The main conclusions are as follows.

First of all, green credit policy clearly promotes enterprises to fulfill their environmental responsibilities. The results of benchmark regression show that the scale of green credit has a significant positive impact on the performance of environmental responsibility before and after the event. This conclusion is still correct after replacing the dependent variables with energy service and mechanism testing model. This shows that the central result does not depend on a specific measurement method.

Secondly, the influence of green creation strategy is obvious in ex-ante prevention and ex-post remediation stages. Before approving loans, environmental access restrictions will force enterprises to take preventive measures from the source, such as clean technology r&d and green process upgrades. On the other hand, the post-loan management mechanism and risk early warning to monitor the use of funds will greatly increase the investment of enterprises in grass-roots treatment and pollutant disposal. Green credit policy has created a reward and restraint mechanism covering the whole process of

enterprise production and operation, and is systematically improving environmental management from the source to the end.

Third, the influence of green credit policy, if all structures are different, will be greatly deviated. Whether in the prevention stage or the improvement stage, the response of state-owned enterprise to policies is much greater than that of non-state-owned enterprise. Non-state-owned enterprise have only a little reaction in the post-processing stage, and the effect of policies can hardly be seen in the pre-processing stage. The results show that the constraints and rewards of green credit policy are obviously different among enterprises with different ownership structures. State-owned enterprise has a great response because of the strong pressure of administrative monitoring and the great requirement of complying with policies.

Fourthly, green credit policies promotes corporate environmental responsibility by improving the risk identification ability of banks. The mechanism test results show that this policy will help banks find and control the “greenwashing” behavior of enterprises, and greatly reduce the proportion of issuing green credit extended to firms with high greenwashing risks. At the same time, the quality of credit distribution has been improved, specifically, credit resources have been transferred from “greenwashing” enterprises to truly conscientious enterprises, and the ability of enterprises to prevent beforehand and respond afterwards will be greatly improved. This transmission chain provides a mechanistic explanation for the policy’s effects at the bank implementation level.

6.2 Relevant Recommendations

Based on the findings of the above study, this paper offers the following policy recommendations with the aim of providing guidance for improving the green credit policy framework and promoting the green transition of enterprises.

First, decision-making bodies should further refine the pre-loan environmental eligibility criteria and the post-loan fund usage tracking system for green credit. Specifically, minimum compliance requirements for enterprises in areas such as clean production and the establishment of environmental management systems should be clearly defined and incorporated as mandatory thresholds in the credit approval process. At the same time, banks should be required to implement end-to-end tracking of green credit funds, regularly disclose the flow of funds and the implementation status of environmental protection projects, and prevent the diversion of credit funds for other purposes. By establishing an environmental responsibility transmission mechanism covering the entire credit process, the overall guiding influence of policies on corporate environmental behavior can be continuously strengthened.

Second, enterprises should deal with two stages after preventive measures and accidents, and take the initiative to undertake environmental responsibilities. In the prevention stage, enterprises should put the investment in raw materials such as clean technology research and development and green engineering improvement into the audit process before obtaining financing, so that the environmental management system can really play a role. In the post-implementation stage, enterprises will ensure that the funds of green credit are used for post-emission treatment measures, such as the operation of pollutant treatment and emission reduction facilities, so as to prevent “exaggeration” and misuse of funds. Only by combining the advance planning with the follow-up investment can enterprises improve the convenience of financing and the environmental results in the mechanism of green credit policy.

Third, it is necessary to establish a special green transformation space for non-state-owned enterprises and lower the entry threshold for early environmental investment. In order to solve the problem of insufficient response of non-state-owned enterprises in the prevention stage, policy banks should introduce special green transition loans for these enterprises, give interest subsidies below the market level and simplify the examination and approval procedures. At the same time, commercial banks should also explore new models, moderately reduce the guarantee and guarantee requirements for the pre-investment of non-state-owned enterprises in the fields of clean technology R&D and engineering improvement, and take the expected environmental benefits as the basis for financing approval. By alleviating the financing inconvenience faced by non-state-owned enterprises in the stage of source prevention, they can be promoted to change from passive obedience to rules afterwards to active and responsible behavior beforehand.

Fourth, establish a dynamic environmental performance pricing mechanism based on banks’ risk identification capabilities. Regulatory authorities should guide commercial banks to establish uniform standards for identifying corporate “greenwashing” and comprehensively utilize technologies such as big data and artificial intelligence to cross-verify the authenticity of corporate environmental disclosures. On this basis, banks should translate marginal improvements or deteriorations in corporate environmental performance into real-time adjustments to loan interest rates: gradually lowering rates for enterprises that consistently improve their environmental performance; and promptly raising rates and reducing credit limits for enterprises found to be “greenwashing” or experiencing deteriorating environmental performance.

Through a mechanism of “real-time feedback and dynamic pricing,” banks’ risk identification capabilities can be transformed into a continuous incentive for enterprises to fulfill their environmental responsibilities.

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