

The Impact of Green Credit Policy on the Performance of Heavy Pollution Enterprises

Zhihao Yang

School of Finance, Anhui University of Finance and Economics, Bengbu 233030, China

Abstract

In the process of advancing high-quality economic development in China, addressing the contradiction between economic growth and environmental pollution to achieve sustainable development has become an urgent issue. The effectiveness of green credit policy, as a key component of green finance, and the extent of its impact have become focal points of scholarly attention. This study, based on panel data of A-share listed companies in Shanghai and Shenzhen stock exchanges from 2007 to 2022, uses the "Green Credit Guidelines" issued in 2012 as a quasi-natural experiment. It employs the Difference-in-Differences (DID) method to examine the impact of green credit policy on the performance of heavily polluting enterprises, its mediating effects, and its heterogeneity. The study finds that following the issuance of the "Guidelines," the performance of heavily polluting enterprises declined more significantly compared to non-heavily polluting enterprises. To further eliminate potential endogenous influences, a series of robustness tests such as parallel trends analysis, PSM-DID, and placebo tests were conducted. The main conclusions remain valid after these checks. Secondly, state-owned enterprises were less negatively impacted by the "Green Credit Guidelines" compared to non-state-owned enterprises. The "Guidelines" primarily suppressed the performance of small-scale enterprises. Finally, the mediation effect test shows that green credit policy reduced the asset-to-liability ratio of enterprises, thereby intensifying the policy's suppressive effect on corporate performance.

Keywords

Green Credit Policy; Heavily Polluting Enterprises; Corporate Performance; Difference-in-Differences Method.

1. Introduction

Globally, as the climate change crisis intensifies and international society increasingly focuses on environmental issues, green finance, especially green credit, has emerged as a key topic in the development of the global economy. The implementation of the "Green Credit Guidelines" represents not only China's proactive response to environmental protection at the domestic level but also a significant step in promoting the development of green finance worldwide and contributing to global environmental governance. This policy innovatively integrates environmental protection with finance by introducing financial measures to address environmental issues, setting an important precedent internationally. Under this policy, financial institutions are encouraged to limit loans to high-pollution projects while providing greater financial support to green, low-carbon projects. This approach not only facilitates the green transformation of businesses but also drives the overall societal shift towards sustainable development, aiding in the simultaneous achievement of environmental conservation and economic growth. The contradiction between economic growth and ecological environment is becoming increasingly acute. As Van Marrewijk argues, corporate sustainability involves addressing the social and environmental impacts of business operations while meeting the needs of stakeholders[1].

The green credit policy functions as a market-based regulatory mechanism from the perspective of capital supply, aiming to achieve effective source control over corporate operations [2]. As a crucial component of green finance policies, the green credit policy is playing an increasingly significant role in environmental governance related to corporate production behaviors [5]. Since its issuance by the China Banking Regulatory Commission in 2012, the "Green Credit Guidelines" have become an essential financial tool for advancing ecological civilization and sustainable development. This policy is designed to promote synergy between environmental protection and economic growth through financial institutions. Particularly for highly polluting enterprises, it not only offers financial support but also serves as an effective incentive for environmental governance and green transformation. However, implementing the green credit policy is not without challenges. Balancing economic growth with environmental protection, enhancing the enthusiasm of financial institutions to execute the policy, and ensuring that green credit achieves its intended environmental benefits are all issues that require in-depth exploration and resolution.

Existing literature primarily examines the impact of green credit on the financing and investment behaviors of heavily polluting enterprises, as well as its influence on green innovation, from a microeconomic perspective. Studies focus on aspects like corporate financing costs, financing scale, loan terms, investment scale, and investment efficiency [3,4,5,6]. On the other hand, research also pays attention to the quantity, quality, and efficiency of green innovation. It explores how green credit can fill the gap left by traditional finance in investing in green technologies, aiming to increase the quantity and efficiency of green innovations. The impact of various regulations on green innovation is discussed based on the perspective of green development [7], as well as analyzing the effects of green innovation activities on corporate environmental [8] or financial performance [9] from a resource-based view. Environmental regulatory constraints, while increasing production costs for businesses, can compel technological innovation, which not only compensates for these costs but also contributes to a win-win situation for economic growth and ecological protection [10]. Existing literature has extensively demonstrated the impact of innovation on sustainable corporate development [11,12], and scholars have interpreted how businesses can leverage their resources and capabilities to gain competitive advantages based on resource-based theory [13]. Some scholars have analyzed the current implementation of green credit in China, suggesting that there should be increased technological investment and financial support for green enterprises covered by green credit, to enhance the efficacy of the policy [14].

Consequently, this paper, taking the "Green Credit Guidelines" issued in 2012 as the starting point, delves into how green finance affects corporate performance. This study is innovative in two main aspects: Firstly, it approaches the investigation of corporate performance from the perspective of the context of green finance and the social environment that businesses must navigate. Secondly, while considering both macroeconomic and environmental factors, this paper analyzes the mechanisms through which green credit policy influences corporate operational performance. It aims to unveil the intrinsic logic and transmission mechanisms of the impact of green credit policy on corporate performance. This analysis provides insights for corporate operational decisions, strategic choices, and the formulation of green finance policies by governments.

2. Theoretical Analysis

2.1. Green Credit and Corporate Performance

According to the theory of externalities, the negative externalities of environmental pollution result in eco-friendly products struggling to gain sufficient recognition and reasonable pricing in the market, potentially leading to losses and market exit for these enterprises. The "Green

Credit Guidelines" aim to internalize the externalities of environmental pollution through financial allocation, prompting a change in corporate behavior and facilitating a green transformation. However, for heavily polluting enterprises, this policy shift may mean increased operating costs and reduced profit margins, directly and negatively impacting their financial performance. Signal theory posits that companies can enhance their reputation and convey positive signals to the market by disclosing their financial status, publishing environmental information, and fulfilling social responsibilities, thereby demonstrating their potential for development, financial health, and social accountability [15]. Banks and other financial institutions do not have complete insight into a company's operational status and social responsibilities. To reduce risk and protect their interests, they will fully utilize the green credit policy to select loan targets and criteria. Following the implementation of the "Green Credit Guidelines," heavily polluting enterprises face stricter financing restrictions. Financial institutions impose more rigorous measures on these companies during loan approval, monitoring, and enforcement processes. This increased uncertainty and financing difficulty heightens the operational risks for these companies, potentially forcing them to scale back external economic activities or abandon potentially profitable investment projects, further negatively impacting their financial performance.

Analysis from these perspectives indicates that although the "Green Credit Guidelines" are intended to promote environmental protection and encourage the green transformation of heavily polluting enterprises, in practice, these policy shifts may impose direct financial burdens and operational risks on these enterprises, adversely affecting their financial performance. Therefore, the green credit policy has had a certain negative impact on the performance of heavily polluting enterprises. Based on this, Hypothesis H1 is proposed:

H1: The introduction of green credit policy has led to a reduction in the performance of heavily polluting enterprises.

2.2. Analysis of the Mechanism of Green Credit's Impact on Corporate Performance

In situations where enterprises are responsible for substantial pollution, the financing threshold and cost for heavily polluting companies are significantly increased [4]. Extensive empirical analysis shows that a company's debt is directly proportional to the scale of its long-term investments, and an increase in long-term investments leads to a higher leverage ratio for the company [16]. When enterprises reduce their long-term investments, this diminishes their need for bank loans and lowers their capacity to secure bank financing, thereby reducing the corporate leverage ratio. Based on this understanding, Hypothesis H2 is proposed:

H2: The introduction of the green credit policy has reduced the asset-to-liability ratio of heavily polluting enterprises.

Green credit policies have implemented measures such as restricting the debt financing scale of high-pollution industries and imposing interest penalties on industries that fail to meet environmental standards. These actions have led to increased debt financing costs for polluting industries [4]. When a company's financing channels are limited, its capital turnover is severely hindered, significantly impacting its performance. Under the guidance of green credit policies, financial institutions conduct full-cycle, dynamic supervision. Moreover, some scholars have found that financing constraints can adversely affect corporate performance [19]. When enterprises face high financing constraints, they experience limitations in funding, leading to restricted investment capacity, increased financial stress, and higher capital costs. These issues negatively affect a company's operational and financial status and its future development. Based on this understanding, Hypothesis H3 is proposed:

H3: The asset-to-liability ratio of heavily polluting enterprises plays a partial mediating role in the process by which green credit policy impacts their corporate performance.

2.3. Analysis of the Moderating Mechanism of Green Credit on Corporate Performance

2.3.1. The Moderating Role of Corporate Ownership

The impact of green credit policies may vary depending on the nature of the enterprise. Generally, state-owned enterprises (SOEs) have larger scales, longer histories, and more assets available for collateral, making banks more inclined to lend to them considering the safety of credit funds. Additionally, the close relationship between state-owned banks and state-owned enterprises, formed during China's planned economy period, still persists to some extent. In the context of China's still-developing financial market, high industry concentration, and a few state-owned controlling banks occupying the majority of the market share, the allocation of credit funds often suffers from the influence of many non-market factors. This results in a credit fund distribution heavily skewed towards SOEs, while non-state-owned enterprises struggle to obtain sufficient credit funds. Based on this background, Hypothesis H4 is proposed:

H4: After the introduction of the green credit policy, the performance decline is more significant in non-state-owned heavily polluting enterprises.

2.3.2. The Moderating Role of Firm Size

Commercial banks exhibit clear preferences in their credit decision-making processes. Compared to small-scale enterprises, large-scale enterprises have more advantages in obtaining bank loans. Large-scale enterprises generally have good reputations and substantial social credit, which affords them a wealth of collateral assets and abundant liquid capital. These characteristics enhance their repayment capacity and lower financing constraints, allowing them to secure more loans from financial institutions. Before the introduction of green credit policies, large enterprises, due to their strong repayment abilities and low financing restrictions, obtained substantial credit funds. Therefore, after implementing green credit policies, the compensation effect of financial institutions on heavily polluting enterprises should mainly impact large-scale enterprises. For companies that initially could not secure sufficient credit, the effect of suppressing financing and reducing leverage ratios may not be significant. Based on the above analysis, Hypothesis H5 is proposed:

H5: After the introduction of the green credit policy, the performance decline is more significant in small-scale heavily polluting enterprises.

3. Research Design

3.1. Data Sources

This study primarily investigates the impact of the Green Credit Guidelines policy on the financial performance of heavily polluting enterprises. The sample period spans from 2007 to 2022, and the sample companies are A-share listed companies in China. The financial data are sourced from the CSMAR database. To meet the research requirements, the following adjustments were made to the sample: Companies in the financial sector and ST (Special Treatment) companies are excluded. Enterprises with missing research variables are also removed from the sample. To address the issue of extreme values, all continuous variables undergo winsorizing, which helps in eliminating the effects of outliers. Following these procedures, the final sample size is determined to be 9,920. These steps are crucial for ensuring the accuracy and representativeness of the analysis regarding the impact of green credit policies on the financial performance of heavily polluting enterprises within the Chinese A-share market.

3.2. Model Construction

This study employs the Difference-in-Differences (DID) model to examine the impact of green finance on the performance of heavily polluting enterprises:

$$PERF_{i,t} = \beta_0 + \beta_1 Treat_i \times Time_t + \beta_2 Controls_{i,t} + \mu_i + \gamma_t + \varepsilon_{i,t} \quad (1)$$

In this study, the dependent variable is corporate performance (PERF), which is measured using Tobin's Q value, following the approach used by Su Dongwei and others [4]. The variable Time serves as a policy dummy variable; it is set to 1 for the period after the implementation of the "Green Credit Guidelines" (i.e., $Time \geq 2012$), and 0 otherwise. Treat is a dummy variable indicating whether a company is a heavily polluting enterprise. The definition of heavily polluting enterprises is based on industry differences, according to the "Industry Classification Guidelines for Listed Companies" revised by the China Securities Regulatory Commission in 2012. This includes 16 heavily polluting industries such as coal, mining, textiles, leather, paper, petrochemicals, pharmaceuticals, chemicals, metallurgy, and thermal power. Companies in these industries are considered heavily polluting and are assigned to the treatment group ($Treat = 1$). Other listed companies are considered non-heavily polluting and are in the control group ($Treat = 0$). Controls represent control variables and include the current ratio (Fratio), asset-liability ratio (LEV), company size (Size), age since listing (Age), percentage of shares held by the top 10 shareholders (Top10), fixed asset ratio (FA), management shareholding ratio (Mshare), total asset turnover (ATO), revenue growth rate (Growth), and the size of the board of directors (Board). μ_i and γ_t represent individual fixed effects and time fixed effects, respectively. These variables help in accounting for other factors that might influence corporate performance, allowing for a more nuanced and accurate analysis of the effects of green credit policies.

3.3. Descriptive Statistics

Table 1. Descriptive Statistics of Main Variables

variable	N	mean	p50	sd	min	max
PERF	9920	1.901	1.496	1.249	0.855	9.348
Size	9920	22.57	22.46	1.331	19.50	26.15
FA	9920	0.258	0.228	0.180	0.00200	0.703
Age	9920	2.667	2.773	0.492	0	3.332
Fratio	9920	1.757	1.342	1.726	0.260	17.61
Top10	9920	53.08	52.69	15.09	22.54	90.48
Mshare	9920	1.860	0.00600	6.510	0	63.70
ATO	9920	0.665	0.574	0.449	0.0610	2.525
Growth	9920	0.358	0.0970	1.127	-0.751	8.101
Board	9920	2.189	2.197	0.193	1.609	2.708
LEV	9920	0.496	0.501	0.196	0.0510	0.979
SOE	9920	0.680	1	0.466	0	1
Time	9920	0.688	1	0.464	0	1
Treat	9920	0.374	0	0.484	0	1

Table 1 reports the statistical analysis results of the main variables. Notably, the average value for the treatment group is 0.484, indicating that heavily polluting enterprises in the treatment group account for 48.4% of the total sample. This substantial proportion of heavily polluting enterprises among China's listed companies highlights the urgent need for transformation towards more environmentally sustainable practices. The data underscores the significant role that green credit policies and other environmental regulations could play in guiding these enterprises towards greener and more sustainable operations.

4. Empirical Results Analysis

4.1. Parallel Trends Test

Before proceeding with the Difference-in-Differences (DiD) estimation, it is essential to test whether the performance of heavily polluting enterprises and non-heavily polluting enterprises followed similar trends prior to the implementation of the “Green Credit Guidelines”. As illustrated in Figure 1, the coefficients of the interaction terms are not significant before 2012. This indicates that there were no significant differences in the performance of these two types of enterprises before the implementation of the “Green Credit Guidelines”. Therefore, it is valid to proceed with the DiD analysis.

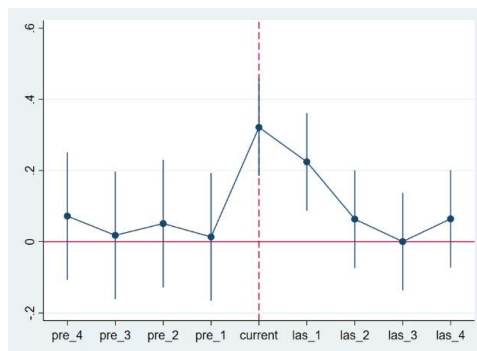


Figure 1. Parallel Trends Test

4.2. Basic Regression Analysis

Table 2. The Impact of the “Green Credit Guidelines” on Corporate Performance Results

Variables	(1)	(2)
	PERF	PERF
DID	-0.117***	-0.208***
	(0.037)	(0.035)
Size		-0.584***
		(0.019)
FA		-0.437***
		(0.102)
Age		0.230***
		(0.057)
Fratio		0.011
		(0.008)
Top10		0.006***
		(0.001)
Mshare		-0.008***
		(0.003)
ATO		0.250***
		(0.037)
Growth		-0.001
		(0.009)
Board		0.002
		(0.073)
_cons	2.324***	14.178***
	(0.033)	(0.426)
N	9920.000	9920.000
r2	0.167	0.260
firm	Yes	Yes
year	Yes	Yes

Table 2 presents the results of the empirical analysis examining the impact of the implementation of the "Green Credit Guidelines" on corporate performance. Column (1) displays the regression results without considering control variables, while column (2) incorporates control variables based on the model in column (1). The regression results remain essentially unchanged, with the coefficients of the interaction terms being negative and significant in both cases. This indicates that the introduction of the "Green Credit Guidelines" has had a significant inhibitory effect on the performance of heavily polluting enterprises, thereby confirming Hypothesis H1.

4.3. Robustness Test

4.3.1. PSM-DID

Table 3. Regression Results of Propensity Score Matching

Variables	(1)	(2)
	PERF	PERF
DID	-0.134***	-0.173***
	(0.045)	(0.042)
Size		-0.615***
		(0.024)
FA		-0.216*
		(0.129)
Age		0.203***
		(0.073)
Fratio		-0.012
		(0.009)
Top10		0.006***
		(0.001)
Mshare		-0.006
		(0.004)
ATO		0.278***
		(0.044)
Growth		-0.002
		(0.016)
Board		-0.034
		(0.093)
_cons	2.334***	14.875***
	(0.041)	(0.544)
N	6236.000	6236.000
r2	0.186	0.285
firm	Yes	Yes
year	Yes	Yes

The performance differences between heavily polluting and non-heavily polluting enterprises might be caused by other time-invariant, unobservable factors, leading to potential heterogeneity bias if directly compared. To ensure that the changes in corporate investment behavior truly result from the exogenous shock of green credit policy and to eliminate sample selection bias, this paper employs the Propensity Score Matching (PSM) method. Control variables are selected as matching variables, and the 1:1 nearest neighbor matching method is

used to estimate the impact of this policy on the financial performance of heavily polluting enterprises. The two groups are matched based on their propensity scores, and regression is then conducted on the matched sample according to the baseline model. Table 3 presents the basic regression results of the propensity score matching method: the estimated coefficients for the interaction terms are -0.134 and -0.173, respectively, both significant at the 1% statistical level and negative. This further validates the robustness of the main regression results of this paper.

4.3.2. Placebo Test

To verify the non-randomness of the conclusions drawn in this study, a random sampling method was employed to select the experimental group, with those not selected forming the control group. Subsequently, the Difference-in-Differences (DiD) model was tested. The study set the number of sampling iterations to 500, obtaining the p-values of the difference coefficients after each sampling iteration. As observed in Figure 2, most of the estimated coefficients are concentrated around 0. The actual estimated coefficient of -0.208 in this study is a significant outlier. Moreover, the p-values of most estimated coefficients are greater than 0.1, indicating they are not significant at the 10% level. This suggests that the estimation results of this study are not obtained by chance and are unlikely to be influenced by unobserved variables, thereby demonstrating the robustness of the results.

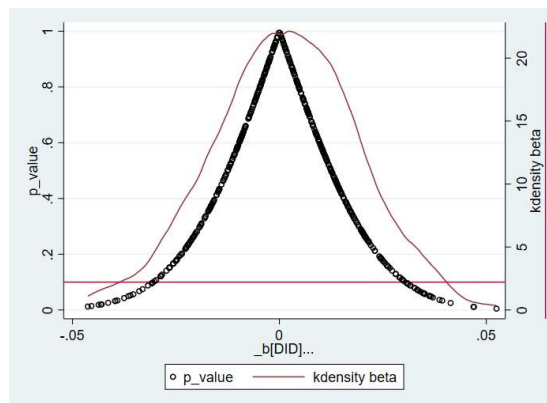


Figure 2. Placebo Test

5. Further Analysis

5.1. Mediation Effect Test

Based on the research hypotheses presented earlier, and drawing on the literature regarding mediation effect testing by Yao and Wen Zhonglin [17], this study employs the following model to examine whether capital structure acts as a conduit through which green credit policy affects corporate financial performance. In equation (2), the dependent variable $LEVi,t$ represents the asset-to-liability ratio of enterprise i in year t .

$$Lev_{i,t} = \beta_0 + \beta_1 Treat_i \times After_t + \beta_2 Controls_{i,t} + \mu_i + \gamma_t + \varepsilon_{i,t} \tag{2}$$

$$PERF_{i,t} = \alpha_0 + \alpha_1 Treat_i \times After_t + \alpha_2 Lev_{i,t} + \alpha_3 Controls_{i,t} + \mu_i + \gamma_t + \varepsilon_{i,t} \tag{3}$$

In column (1) of Table 4, the coefficient of the interaction term is significantly negative, indicating that the implementation of green credit policy has reduced the asset-to-liability ratio of heavily polluting enterprises. In column (2) of Table 4, the regression coefficient of LEV (asset-to-liability ratio) is significantly positive, suggesting that the asset-to-liability ratio of a

company has a significant positive impact on its performance. These results indicate that the asset-to-liability ratio has a mediating effect. Specifically, the implementation of the green credit policy reduces the asset-to-liability ratio of enterprises, which in turn leads to a decrease in corporate performance. Therefore, Hypothesis H3 is supported.

Table 4. Test for the Mediating Effect of the “Green Credit Guidelines” on Corporate Performance

Variables	(1)	(2)
	LEV	PERF
DID	-0.020*** (0.004)	-0.202*** (0.035)
LEV		0.329*** (0.087)
	(0.002)	(0.019)
FA	-0.033*** (0.012)	-0.426*** (0.102)
Age	-0.002 (0.007)	0.231*** (0.057)
Fratio	-0.044*** (0.001)	0.026*** (0.009)
Top10	-0.001*** (0.000)	0.006*** (0.001)
Mshare	-0.003*** (0.000)	-0.007** (0.003)
ATO	-0.022*** (0.004)	0.258*** (0.037)
Growth	0.004*** (0.001)	-0.002 (0.009)
Board	0.010 (0.009)	-0.002 (0.073)
_cons	-0.459*** (0.051)	14.329*** (0.427)
N	9920.000	9920.000
r2	0.286	0.261
firm	Yes	Yes
year	Yes	Yes

5.2. Property Rights Heterogeneity

To test whether corporate ownership affects the impact of the “Green Credit Guidelines” on corporate performance, the sample is divided into state-owned and non-state-owned enterprises, represented by the dummy variable SOE. When a company is state-owned, SOE is set to 1, and the regression results are shown in column (1) of Table 5. Otherwise, for small-scale heavily polluting enterprises, designated as Size = 0, regression is performed separately, with results shown in column (2) of Table 5. The interaction term coefficient for state-owned enterprises is -0.157, while for small-scale enterprises, it is -0.256, both passing the 1% significance level test. This indicates that the implementation of the “Green Credit Guidelines” has a negative impact on corporate performance. The absolute value of the interaction term

coefficient for state-owned enterprises is smaller than that for non-state-owned enterprises, suggesting that state-owned enterprises are less negatively impacted by the “Green Credit Guidelines” compared to non-state-owned enterprises, thereby confirming Hypothesis H4.

Table 5. Test Results for Property Rights Heterogeneity

Variables	(1)	(2)
	PERF	PERF
DID	-0.157***	-0.256***
	(0.039)	(0.074)
Size	-0.539***	-0.610***
	(0.022)	(0.037)
FA	-0.460***	-0.415*
	(0.111)	(0.222)
Age	0.103	0.367***
	(0.071)	(0.104)
Fratio	0.030***	-0.026*
	(0.010)	(0.013)
Top10	0.002	0.010***
	(0.001)	(0.002)
Mshare	-0.031**	-0.008**
	(0.013)	(0.004)
ATO	0.184***	0.373***
	(0.040)	(0.079)
Growth	-0.006	-0.006
	(0.009)	(0.020)
Board	-0.048	0.133
	(0.080)	(0.152)
_cons	13.780***	14.069***
	(0.501)	(0.848)
N	6746.000	3174.000
r2	0.258	0.285
firm	Yes	Yes
year	Yes	Yes

5.3. Scale Heterogeneity

In this study, the sample companies are categorized based on their size (Size). Companies larger than the median size are classified as large-scale heavily polluting enterprises, designated as Size=1, with regression results shown in column (1) of Table 6. Companies smaller than the median are classified as small-scale heavily polluting enterprises, designated as Size=0, and are regressed separately, with results shown in column (2) of Table 6. The coefficient of the difference term for large-scale enterprises is -0.051 and is not significant. The coefficient of the difference term for small-scale enterprises is -0.279, passing the 1% significance level test. This suggests that the implementation of the “Green Credit Guidelines” primarily suppressed the performance of small-scale heavily polluting enterprises, thereby confirming Hypothesis H5.

Table 6. Test Results for Scale Heterogeneity

Variables	(1)	(2)
	PERF	PERF
DID	-0.051	-0.279***
	(0.038)	(0.057)
Size	-0.157***	-1.151***
	(0.026)	(0.040)
FA	-0.281**	-0.704***
	(0.112)	(0.168)
Age	-0.048	0.540***
	(0.074)	(0.089)
Fratio	0.002	0.007
	(0.013)	(0.010)
Top10	-0.000	0.008***
	(0.001)	(0.002)
Mshare	0.003	-0.013***
	(0.004)	(0.004)
ATO	0.236***	0.218***
	(0.038)	(0.063)
Growth	-0.002	-0.004
	(0.008)	(0.014)
Board	-0.012	-0.141
	(0.068)	(0.126)
_cons	5.636***	25.618***
	(0.617)	(0.852)
N	4966.000	4954.000
r2	0.165	0.386
firm	Yes	Yes
year	Yes	Yes

6. Conclusion and Policy Recommendations

This study, covering the period from 2007 to 2022, employed the Difference-in-Differences (DID) model to assess the impact of green credit policy on the performance of listed companies in China. The research found that following the implementation of the "Green Credit Guidelines," the performance of heavily polluting enterprises declined more significantly compared to non-heavily polluting enterprises. To further eliminate potential endogenous impacts, a series of robustness tests such as parallel trends analysis, PSM-DID, and placebo tests were conducted, and the main findings remained valid. Additionally, state-owned enterprises experienced a smaller negative impact from the "Green Credit Guidelines" than non-state-owned enterprises, and the guidelines mainly suppressed the performance of small-scale enterprises. Lastly, the mediation effect test indicated that the green credit policy reduced the asset-to-liability ratio of enterprises, thereby intensifying the policy's suppressive effect on corporate performance. Based on these conclusions, the following policy recommendations are proposed:

Firstly, from the government's perspective, there should be an increase in penalties for corporate environmental pollution and the establishment of a robust mechanism for the

disclosure of environmental information by companies, including the development of information service platforms to timely and accurately disclose corporate environmental protection and pollution penalty information to the public. This would utilize public opinion for supervision and share environmental data with banks to assist in their green credit auditing process. Given the significant differences in economic development and marketization levels across regions in China, the government should tailor green finance policy evaluation indicators to avoid banks wasting credit resources in meeting green credit targets. Additionally, as green credit policies have a negative impact on the performance of some heavily polluting enterprises, the government should introduce corresponding incentive measures, providing green transition financial support to these enterprises while suppressing their investments in polluting projects. Lastly, the green credit system should be improved, and the construction of green credit risk management indicators and systems should be strengthened to ensure the stability and continuity of green credit policies.

Secondly, from the perspective of banks, they should broaden the coverage of green credit services and coordinate policy effectiveness disparities. Green credit policy impacts on sustainable development performance of enterprises vary significantly based on the size of the enterprise, ownership attributes, proportion of fixed assets, and degree of marketization development. The long-standing issue of "difficult and expensive financing" has hindered the continuous and healthy development of small and medium-sized enterprises, and private enterprises. Financial institutions should make full use of digital means to rationally allocate credit resources. The application of digital technology significantly reduces the asymmetry of information between the two parties, facilitating financial institutions to accurately assess the environmental and social risks of corporate investment projects; this also expands the coverage of green credit services and enriches green credit service products, favoring the precise allocation of credit resources. Meanwhile, using financial technology to improve the degree of marketization in the financial market, correct capital misallocation in traditional financial markets, and focus on enterprise needs, can enable more small and micro enterprises that meet "green" access restrictions to obtain credit support.

Thirdly, from the perspective of enterprises, for high-polluting enterprises, green credit to some extent suppresses their ability to obtain loans through the banking system, leading to certain restrictions and constraints on their financing. They can improve high-pollution and high-energy production methods to complete enterprise transformation and achieve sustainable and green development. Managers need to improve the level of green management in enterprises. On the one hand, enterprise managers can enhance environmental awareness and improve the disclosure of environmental information of enterprises, linking it to the financing costs such as the level of environmental risk of the project and the difference in loan interest rates so that risk and cost can be matched. On the other hand, it is necessary to reduce the asymmetry of information between banks and enterprises. This will improve the financing ability of enterprises themselves, avoid the long-term financing difficulties and insufficient operating funds that may be caused by the green credit penalty mechanism, and continuously improve their capital structure to resist financial risks. Enterprises should not pay additional pollution fees for huge energy consumption but should actively comply with government energy policies and respond to government energy-saving propaganda. Enterprises must fully recognize that while pursuing development, they need to adapt to the needs of the times and focus on energy saving and emission reduction.

References

- [1] VAN MARREWIK M. Concepts and definitions of CSR and corporate sustainability: between agency and communion[M]//Citation classics from the Journal of Business Ethics. Dordrecht: Springer Netherlands, 2012: 641-655.

- [2] Liu Qiang, Wang Weinan, Chen Hengyu. The Impact of the Implementation of "Green Credit Guidelines" on the Innovation Performance of Heavily Polluting Enterprises [J]. *Scientific Research Management*, Vol. 41 (2020) No.11, p.100-112.
- [3] Lian Lili. Does Green Credit Affect the Cost of Corporate Debt Financing? - A Comparative Study of Green Enterprises and "High Pollution, High Energy Consumption" Enterprises [J]. *Research in Financial Economics*, 2015, No.05, p.85-95.
- [4] Su Dongwei, Lian Lili. Does Green Credit Affect the Investment and Financing Behavior of Heavily Polluting Enterprises? [J]. *Journal of Financial Research*, 2018, No.12, p.127-141.
- [5] Wang Yanli, Lei Xiaodong, Long Ruyin. Does Green Credit Policy Improve Corporate Investment Efficiency? - From the Perspective of Financial Resource Allocation in Heavily Polluting Enterprises [J]. *China Population, Resources and Environment*, 2021, No.01, p.123-133.
- [6] Ning Jinhui, Yuan Zeming, Wang Xiaoqi. Green Credit Policy and Corporate Overinvestment [J]. *Financial Forum*, 2021, No.06, p.7-16.
- [7] HOJNIK J, RUZZIER M. The driving forces of process eco-innovation and its impact on performance: insights from Slovenia[J]. *Journal of cleaner production*, 2016, 133: 812-825.
- [8] ABU SEMAN N, GOVINDAN K, MARDANI A, et al. The mediating effect of green innovation on the relationship between green supply chain management and environmental performance[J]. *Journal of cleaner production*, 2019, 229: 115-127.
- [9] XIE X M, HUO J G, QI G Y, et al. Green process innovation and financial performance in emerging economies: moderating effects of absorptive capacity and green subsidies[J]. *IEEE transactions on engineering management*, 2016, 63(1): 101-112.
- [10] PORTER M E, VAN DER LINDE C. Toward a new conception of the environment-competitiveness relationship[J]. *Journal of economic perspectives*, 1995, 9(4): 97-118.
- [11] LANOIE P, LAURENT-LUCCHETTI J, JOHNSTONE N, et al. Environmental policy, innovation and performance: new insights on the Porter Hypothesis[J]. *Journal of economics & management strategy*, 2011, 20(3): 803-842.
- [12] EIADAT Y, KELLY A, ROCHE F, et al. Green and competitive: an empirical test of the mediating role of environmental innovation strategy[J]. *Journal of world business*, 2008, 43(2): 131-145.
- [13] CORBETT L M, CLARIDGE G S. Key manufacturing capability elements and business performance[J]. *International journal of production research*, 2002, 40(1): 109-131.
- [14] Chen Liming, Guo Lihua, Zhang Weiwei. The Operational Mechanism and Implementation Path of Green Credit Policy in China [J]. *Contemporary Economic Research*, 2016, No.1, p.91-96.
- [15] Hu G., Wang X., Wang Y. (2021). Can the Green Credit Policy Stimulate Green Innovation in Heavily Polluting Enterprises? Evidence from a Quasi-Natural Experiment in China. *Energy Economics*, Vol. 98, 105134.
- [16] Cuevas-Vargas Héctor, Cortés-Palacios Héctor A., Lozano-García Jeffrey J. (2022). Impact of Capital Structure and Innovation on Firm Performance: Direct and Indirect Effects of Capital Structure. *Procedia Computer Science*, Vol. 199, p.1082-1089.
- [17] Yao S., Pan Y., Sensoy A., Uddin G., Cheng F. (2021). Green Credit Policy and Firm Performance: What We Learn from China. *Energy Economics*, Vol. 101, 105415.
- [18] He, L., L. Zhang, Z. Zhong, D. Wang, and F. Wang. (2019). Green credit, renewable energy investment and green economy development: Empirical analysis based on 150 listed companies of China. *Journal of Cleaner Production* 208:363-372.
- [19] Chen Lingfang, Yu Hainan. ESG Performance, Financing Constraints, and Corporate Performance [J]. *Friends of Accounting*, 2022, No.22, p.24-30.