The Green Development or the Innovation Bubble: A Study on the Effects of Green Bond Issuance from the Perspective of Managerial Myopia

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Abstract. In the current era of advocating the vigorous development of green finance, the implementation effect of green bonds is of great significance for the environment, the financial system, and the sustainable development of companies. Based on panel data of listed companies in the Chinese A-share market from 2010 to 2022, this paper employs a multi-period difference-in-differences model for empirical research. The results indicate that: ①Issuing green bonds can significantly promote a company's green innovation level. ②Issuing green bonds can enhance the company's green innovation level by mitigating managerial myopia. ③The impact of issuing green bonds on the green innovation level of companies in different industries, with different ownership properties, and at different life cycles varies to some extent. This paper enriches the research on the mechanism of green bonds' effect on a company's green innovation capabilities, and offers suggestions for the government to improve policies related to green bonds and for companies to participate in the green bond market.

Keywords: Green Bonds, Green Innovation, Managerial Myopia

1 Introduction

With the proposal of the "30·60" target in China, traditional financial activities characterized by high carbon emissions and resource waste are increasingly being questioned by society. China continuously emphasizes the necessity and urgency of green development, and establishing a green financial system has emerged as a crucial component in the country's strategic framework.

Companies, as barometers of economic development, can respond actively to the call for green development by improving green innovation technologies in their production and operation activities, achieving a win-win situation for material growth and ecological protection. However, green innovation activities are characterized by long cycles, high difficulty, knowledge spillover, and the "double externality" of environmental protection, making them riskier and requiring more long-term capital investment compared to general innovations[1]. Companies relying solely on internal financing may increase the instability of innovation activities[2], hence, the state has designed the green bond, an important green financial instrument, which can help the issuer obtain funding at a lower interest rate, thereby effectively reducing the capital cost of their green projects. Since the release of the Green

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Credit Guidelines in 2016, green bonds have rapidly developed in China. By the end of 2022, the accumulated stock volume of the green bond market reached 17657.60 billion yuan, making China the world's second-largest green bond market.

The issuance of green bonds was initially intended to offer financial backing and strategic direction for companies' sustainable development. The question of whether this has led to a meaningful advancement in corporate green innovation is a pressing issue. Research into the intersection of green bonds and green innovation is currently scant. Predominantly, academic discourse has been centered on the effects of green bonds on companies' financial and environmental outcomes. Glomsrød and Wei [3]used the GRACE model to study how green finance and divestment from the fossil industry affect the economy, capital flows, energy trends, and carbon dioxide emissions. Additionally, a few articles that focus on the relationship between green bonds and corporate sustainable development have varying views. Wang Xiuhua et al. [4]believe that green bonds can alleviate corporate financing constraints and increase research and development investment in green innovation projects, thereby promoting green technological innovation in enterprises. However, at the same time, Chen Xiao, Zhang Ming, et al. [5]found that China's green bond market faces various practical challenges, including greenwashing and brownwashing phenomena. Weiguo Jiang and Ruan Yuming, et al. [6-7]pointed out that if enterprises issue green bonds blindly, it may lead to over-financialization and a decline in enterprise innovation. Moreover, the effectiveness of policy implementation may also vary due to differences in the quality of internal corporate control. Whether the short-sightedness of managers under the principal-agent problem will affect the effectiveness of green bond issuance is also worth paying attention to. Zhai Guangyu and Wang Yao [8] and Dong Zhu et al.[9] found that short-sightedness to a certain extent intensifies the principal-agent problem in enterprises and further constrains the development of green innovation.

This paper uses a multi-period difference-in-differences model to study whether the issuance of green bonds can promote the development of enterprises' green innovation level as expected. It explores the impact mechanism of short-sighted behavior of enterprise managers on the policy implementation effect and compares the effect of green bond issuance in different industries, ownership properties, and at different life cycle stages.

This scholarly work makes several key contributions to the field: ①It provides an in-depth analysis of the economic impacts of issuing green bonds, focusing on the role of corporate green technological innovation, which enhances the understanding of the economic effects associated with green bond activities. ②The study offers a pioneering examination of how managerial characteristics influence the relationship between green bond issuance and the encouragement of green technological innovation. ③By categorizing enterprises based on their industrial sector, ownership structure, and life cycle stages, the research highlights the varying influence of green bond offerings on the level of green innovation across different business entities. ④The paper delivers policy recommendations for governmental entities aiming to enhance their green bond frameworks and guidance for enterprises looking to engage in the green bond market.

2 Theoretical Analysis and Research Hypotheses

The prerequisite for green innovation to empower enterprises is to have high-quality innovation. If there is insufficient investment, the quality of green innovation may be difficult to ensure. Green bonds may alleviate the aforementioned issues from the perspectives of policy supervision and financing constraints, thereby enhancing the quality of corporate green innovation. From the perspective of policy supervision, green bonds have high requirements for information disclosure and numerous restrictions on the use of funds, with stringent review of the greenness of projects. This is beneficial for strengthening the supervision and promotion role of shareholders and management on corporate green innovation, helping enterprises overcome internal organizational inertia, alleviate agency conflicts, and motivate enterprises to actively seek technological innovation to meet the bond issuance standards and have the capacity to implement green projects. At the same time, as one of the green financial instruments, the green financing obtained from green bonds has significant disciplinary effects on financing and investment suppression[10]. If green bonds are issued for the purpose of "greenwashing", enterprises will not only lose social trust but will also bear higher financing costs. Therefore, the guarantee of priority funding for green projects by green bonds helps enterprises improve their green innovation level. From the perspective of financing constraints, firstly, the debt repayment period of bond financing matches the long cycle of innovation activities[11], and the financing channels expanded by green bonds can alleviate the funding pressure for green innovation; secondly, the "environmental signaling" released by enterprises through the issuance of green bonds may lead to a spillover effect on bank loans[12], attracting creditors with a preference for greenness, which reduces the financing costs of enterprises and allows more funds to flow towards green innovation.

However, due to the complexity and variety of participating subjects, green bonds may have the opposite effect in practice. Firstly, the policy supervision role of green bonds is limited, with only a portion of the green bonds requiring all funds to be invested in green projects, while another portion requires only 50% of the funds raised to be used for green projects. Therefore, it cannot be ruled out that enterprises will use the funds intended for green projects for financial investment and other speculative activities, and green projects do not necessarily include green innovation. In practice, the green funds raised by enterprises are often prioritized for replacing clean equipment rather than green innovation[13], facing resource crowding-out. After the implementation of green bonds, there may also be a distortion of policy incentives, with enterprises going to great lengths to obtain the qualification to issue bonds, potentially engaging in "greenwashing". Secondly, existing research has confirmed the existence of a "green premium" in China's bond market, and the issuance of green bonds by enterprises does not reduce their financing costs[14]. Additionally, enterprises face a "cost of compliance" stage in green innovation, leading to a decline in financial performance in the short term. Faced with funding pressure and performance appraisal pressure, managers may embezzle the necessary funds for green innovation quality improvement to avoid the risk of innovation failure[15].

Therefore, a pair of competitive hypotheses is proposed:

H1: Green bond financing can promote corporate green innovation and help enterprises achieve "green development".

H2: Green bond financing may inhibit corporate green innovation and stimulate the formation of "innovation bubbles" in enterprises.

3 Research Design and Statistical Analysis

3.1 Sample Selection and Data Source

The initial sample of this study covers Chinese A-share listed companies from 2010 to 2022, and is filtered according to the following criteria: ①Exclude companies listed as ST or *ST during the sample period; ②Exclude financial sector companies; ③Exclude companies with return on assets less than zero. The final dataset consists of 30,862 company-year observations, including 42 companies that have issued green bonds. The data on green patents utilized in this research were obtained from the website of the National Intellectual Property Administration, CSR score data from Hexun.com, green bond issuance information from WIND, and financial data and other information of listed companies from CSMAR.

3.2 Model Design and Variable Selection

Due to the varying timelines of when companies first issue green bonds, following the approach of Beck et al.[16], a progressive difference-in-differences model is employed, specified as follows:

$$gpa_{i,t} = a_0 + \beta_1 treat_i \cdot time_{i,t} + X_{i,t}\gamma_1 + \delta_t + \mu_i + \varepsilon_{i,t}. \quad (1)$$

In formula (1), $gpa_{i,t}$ represents the extent of a company's green innovation, which is quantified through the count of green patent applications by the firm annually.

The core explanatory variable $treat_i \cdot time_{i,t}$ is a dummy variable, with companies that have issued green bonds during the sample period serving as the treatment group, while other companies serve as the control group. For companies in the treatment group, the value $treat_i$ is set to 1; otherwise, it is set to 0. If a company is in the treatment group and has already issued records by year t, $time_{i,t}$ is set to 1; otherwise, it is set to 0. The control variables are represented by $X_{i,t}$. Referring to existing research, this study selects return on total assets, asset size, corporate growth, cash flow, corporate age, fixed asset ratio, debt ratio, equity concentration, proportion of independent directors, debt repayment ability, and CSR score as control variables. The time fixed effect, ithe individual effect and the random error term are respectively represented by δ_t, μ_i and $\varepsilon_{i,t}$. The subscript i distinguishes companies, and the subscript t distinguishes years. The variables' definitions and calculation methods are shown in Table 1 .

Table 1. Variable Definitions

Variable type	Symbol	Variable	Meaning
Explained variable	gpa	Green patents	log(1+ The number of green patent applications of enterprises）
Explanatory variable	treat*time	Interaction terms	If enterprise i has issued green bonds at time t, the value is 1 otherwise 0
Control variable	roa	ROA	Net profit/average total assets
	size	Asset size	log(Total assets at the end)

gro	Growth	log(Operating income growth rate)
cash	Cash	Net cash flow from operating activities/total assets
lage	Age	log(Years of business establishment+1)
cap	Fixed asset ratio	Net fixed assets/total assets
lev	Debt-to-asset ratio	Total liabilities/total assets
top	Equity concentration	Percentage of shareholding of the largest shareholder
indep	Proportion of independent directors	Number of independent directors/number of board of directors
lbankg	Debt paying ability	Long-term debts/total assets
lcsr	CSR score	log(CSR Score)

3.3 Statistical Analysis

Descriptive analysis results indicate that the median gpa is 0.6931, slightly below the mean, suggesting that there are relatively fewer companies in the sample with a higher level of green innovation. The medians of ROA, gro, and lbankg are also below the mean, indicating that there are fewer companies in the sample with high asset profitability, high growth, and high debt repayment capabilities. The standard deviation of size is 1.3378, which is relatively large, indicating significant variations in company size among the samples. The medians of other variables are closer to the mean, and the standard deviations are smaller, suggesting that the data are relatively concentrated around the middle value.

4 Empirical Results and Analysis

4.1 Benchmark Regression Results

Table 2. Baseline Regression Results

	(1)	(2)
Variables	gpa(All)	gpa(All)
treat*time	0.312***	0.260***
	(0.038)	(0.041)
Control	NO	YES
Observations	30849	25387
R-squared	0.732	0.758
Firm fixed effects	YES	YES
Year fixed effects	YES	YES

Standard errors are in parentheses，*p < 0.1, ** p < 0.05, *** p < 0.01, the same below

According to Table 2, when no control variables are considered in Column (1), the coefficient is 0.312, demonstrating asignificantly positive correlation at the 1% confidence interval. In Column (2), after incorporating control variables, the results remainsignificantly positive at the 1% confidence level, reinforcing the notion that the issuance of green bonds by companies fosters an increase in their green innovation capacity, thereby aiding them in pursuing a trajectory of “green development.” This supports Hypothesis H1.

4.2 Robustness Check

Parallel Trend Test. The difference-in-differences (DID) model relies on the assumption of parallel trends, suggesting that businesses within both the treatment and control groups follow comparable patterns in the number of green patent applications before the green bonds are issued. The test outcomes revealed in Figure 1 illustrate that there is no substantial discrepancy between the two groups prior to the policy's enactment, fulfilling the requirement for parallel trends. Conversely, distinct discrepancies become apparent post-policy implementation.

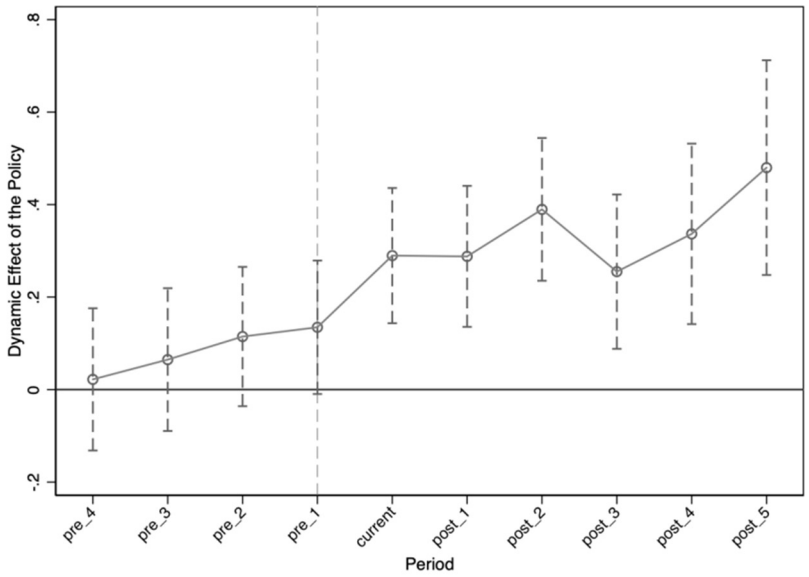

Fig. 1. Results of Dynamic Heterogeneity Analysis

Placebo Test. Figure 2 depicts the kernel density profiles of the coefficient estimates for the quintet of randomly configured treatment groups. The graphic evidence suggests that the arithmetic mean of the regression coefficients aligns closely with 0, approximating a normal distribution. The absence of any sample coefficients to the right of the delineated dashed line for the actual coefficients indicates that the latter exhibit substantial deviation from the mean in the placebo test, emerging as marked outliers. Furthermore, the estimation outcomes do not manifest evidence of critical bias stemming from the exclusion of relevant variables.

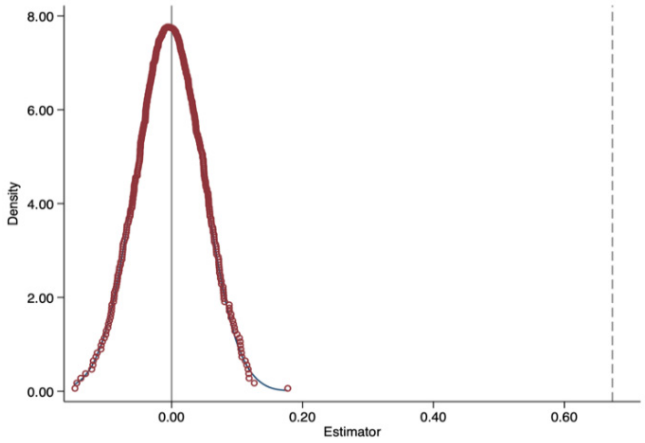

Fig. 2. Results of Placebo Test

Substitute Variable. In this paper, the number of granted green patents of enterprises (gppa) is used as a substitute for the number of green patent applications for robustness testing. The logarithm of the sum of the granted green patents plus 1 is included in the model. Table 3 shows the regression results after replacing the variable, and the direction and significance of the coefficient remain consistent with the original regression results, proving that the benchmark regression results are robust and reliable.

Table 3. Regression Results (replacement of explanatory variables)

	(1)	(2)
Variables	gppa	gppa
treat*time	0.814***	0.723***
	(0.045)	(0.047)
Control	NO	YES
Observations	30849	25387
R-squared	0.752	0.786
Firm fixed effects	YES	YES
Year fixed effects	YES	YES

PSM-DID. Given that companies issuing green bonds often possess robust green innovation skills, neglecting this selection bias could result in skewed estimation outcomes. Hence, this study employs a methodological approach that combines propensity score matching with difference-in-differences (PSM-DID) techniques to tackle this problem. An appropriate control group of "non-issuing green bond enterprises," which share comparable traits with the treatment group, is carefully chosen to reduce the impact of sample selection bias.

The results of the propensity score matching balance test show that the mean values of the treatment and control groups are very close after matching, and the standardized biases of most variables are reduced by approximately less than 10% after matching. Additionally, the P values for most observable variables are greater than 0.1 after matching, indicating a good matching effect. Figure 3 presents the kernel density plots of the propensity scores before and after matching. After matching, the distribution center of the control group clearly shifts to the

left and moves closer to the control group, with the distance between the centers shortened. This indicates that PSM has significantly corrected the sample selection bias issue, and the matching effect is quite ideal, fulfilling the common support assumption.

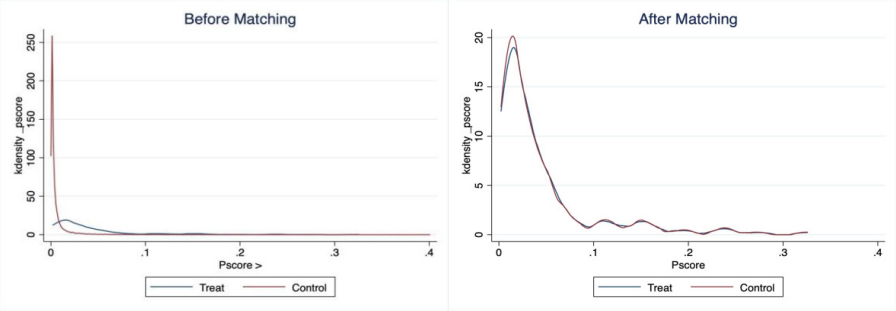

Fig. 3. PSM Kernel Density

Following propensity score matching, the new sample is subjected to DID modle. The results of the PSM-DID model are displayed in Table 4: In Column (1), which excludes control variables, the regression coefficient for treat*time is 0.273, demonstrating statistical significance at the 1% confidence interval. In Column (2), which includes control variables, the treat*time coefficient remains significantly positive at the 1% confidence interval. The PSM-DID regression outcomes align with those from the original DID model, confirming that the foundational regression results are sturdy and dependable.

Table 4. PSM-DID Regression Results

	(1)	(2)
Variables	gpa(PSM)	gpa(PSM)
treat*time	0.273***	0.242***
	(0.049)	(0.049)
Control	NO	YES
Observations	11396	11396
R-squared	0.810	0.811
Firm fixed effects	YES	YES
Year fixed effects	YES	YES

5 Mechanism Analysis and Heterogeneity Analysis

5.1 Test of Mediation Effect of Managerial Short-sightedness

The Upper Echelons theory posits that managers' cognitive levels and values influence the formulation of strategic goals, which in turn affect corporate decisions and future development[17]. Research indicates that short-sightedness among management is widespread among public companies and has a detrimental effect on technological innovation [18]. This is manifested specifically as short-sighted management leading to companies engaging in high-interest entrusted loans, reducing the opportunities for future innovation[19]; managers

avoiding the short-sightedness caused by the threat of hostile takeovers by investors investing more time, effort, and capital in short-term, high-yield projects, resulting in insufficient investment in innovation[20]; and short-sighted management also expanding the adverse impact of market manipulation on corporate innovation[21]. As a special form of innovation activity, green innovation is likely directly affected by managerial short-sightedness. However, the green orientation brought about by green bonds may encourage businesses to take measures to achieve simultaneous environmental and corporate sustainability, intentionally enhancing the importance of managers in recognizing the company's long-term development and social responsibility. This can mitigate their short-sightedness and lead them to allocate more funds to support green innovation. The policy's oversight effect may also cause managers to invest more effort in following up on the implementation of green innovation projects, thereby effectively improving the level of green innovation.

In the current era that advocates innovative economic development, a higher research and development (R&D) expenditure often indicates that managers value the company's long-term development and have a longer-term investment perspective. Conversely, it suggests that managers may have a propensity for short-sightedness. Therefore, drawing on the measurement method of Rao Yulei et al.[22], this paper uses the proportion of corporate R&D investment to operating revenue to reflect the degree of managerial short-sightedness, which is used as a mediator variable in the model. To eliminate the effects of heteroscedasticity and dimensionality, it is logged. According to the method proposed by Baron and Kenny[23] for causal stepwise regression, the following model is set up:

$$gpa_{i,t} = a_1 + \beta_1 treat_i \cdot time_{i,t} + X_{i,t}\gamma_1 + \delta_t + \mu_i + \varepsilon_{i,t} \quad . \tag{2}$$

$$lrdi_{i,t} = a_2 + \beta_2 treat_i \cdot time_{i,t} + X_{i,t}\gamma_2 + \delta_t + \mu_i + \varepsilon_{i,t} \quad . \tag{3}$$

$$gpa_{i,t} = a_3 + \theta lrdi_{it} + \beta_3 treat_i \cdot time_{i,t} + X_{i,t}\gamma_3 + \delta_t + \mu_i + \varepsilon_{i,t} \quad . \tag{4}$$

$lrdi_{i,t}$ is the R&D investment intensity, a higher value indicates a lighter degree of managerial short-sightedness, and a lower value suggests a more severe degree of managerial short-sightedness. $X_{i,t}$represents control variables, which are selected consistent with the benchmark regression. δ_t represents time fixed effects; μ_i represents individual fixed effects; $\varepsilon_{i,t}$ is the random error term.

Table 5. Mediation Effect Test Results

	(1)	(2)	(3)
Variables	Model_1(gpa)	Model_2(lrdi)	Model_3(gpa)
lrdi			0.014***
			(0.004)
treat*time	0.260***	0.193**	0.257***
	(0.041)	(0.076)	(0.041)
Control	YES	YES	YES
Observations	25387	25362	25362
R-squared	0.758	0.801	0.758
Firm fixed effects	YES	YES	YES
Year fixed effects	YES	YES	YES

Table 5 presents the mediation effect test results, with columns (1), (2), and (3) showing the regression results of models (2), (3), and (4), respectively: The coefficient β_1 is significantly positive at the 1% confidence level, indicating that issuing green bonds promotes the level of corporate green innovation. The coefficient β_2 is significantly positive at the 5% confidence level, suggesting that issuing green bonds helps to alleviate managerial short-sightedness, making managers more willing to support corporate innovation and R&D. Both θ and β_3 are significantly positive at the 1% confidence level, and the value of β_3 is 0.257, which is less than β_1, indicating that there is a partial mediation effect. This means that enterprises can improve their level of green innovation by issuing green bonds, which lowers the degree of managerial short-sightedness and thereby enhances corporate green innovation.

The Sobel test Z statistic is 2.135, and the p-value is 0.033, which is less than 0.05. This further indicates that managerial short-sightedness plays a significant mediating role in the process by which a company's issuance of green bonds promotes the level of green innovation.

5.2 Heterogeneity Analysis

Industry-based Heterogeneity Analysis. This paper adopts the methodologies proposed by Liu Yun Guo and Liu Meng Ning[24]. It identifies 15 industries (e.g. categorizing coal mining, natural gas extraction and black metal mining) as heavily polluted industries. Utilizing this categorization, the research distinguishes between enterprises operating in heavily polluting industries and others to investigate the diversity in the influence of companies issuing green bonds on their green technological innovation capabilities, varying across different industry sectors.

Table 6. Industry-based Heterogeneity Test Results

	(1)	(2)
Variables	Heavily polluted industries	Non-heavily polluting industries
treat*time	0.355***	0.209***
	(0.059)	(0.056)
Control	YES	YES
Observations	7587	17727
R-squared	0.729	0.768
Firm fixed effects	YES	YES
Year fixed effects	YES	YES

The results of the industry-based heterogeneity analysis shown in Table 6 indicate that although there is no significant difference in the impact of corporate bond issuance on green technological innovation capabilities across industries, enterprises in heavily polluted industries experience a more significant enhancement in green technological innovation capabilities when they issue green bonds.

Ownership-based Heterogeneity Analysis. The research document classifies publicly traded companies into two groups: state-owned and privately-owned, according to their ownership structure. It then investigates the differences in the promotional impacts of issuing green bonds on green technological innovation capabilities among these companies with varying ownership traits.

Table 7. Ownership-based Heterogeneity Test Results

Variables	(1) SOEs	(2) NSOEs
treat*time	0.318***	-0.067
	(0.056)	(0.070)
Control	YES	YES
Observations	9075	16091
R-squared	0.797	0.724
Firm fixed effects	YES	YES
Year fixed effects	YES	YES

Table 7 showcases the outcomes of the analysis of ownership-based heterogeneity, revealing that the issuance of green bonds markedly enhances the green technological innovation capabilities of state-owned enterprises (SOEs), while the influence on non-state-owned enterprises (NSOEs) is less pronounced.

Life Cycle-based Heterogeneity Analysis. Corporate life cycle typically includes several stages: startup, growth, maturity, and decline. This paper divides the life cycle of enterprises by referring to the methods of Cao et al.[25], employing a cash flow hybridization technique to bifurcate the life cycle into three periods and to examine the diversity in the facilitation of green technological innovation capabilities by green bond issuance across enterprises at different life cycle stages. The distribution of cash flows specific to each phase is detailed in Table 8.

Table 8. Cash Flow Characteristics over the Different Life Cycles of a Business

Net Cash Flow	Growth		Maturity		Decline			
	Startup	Growth	Maturity	Decline	Decline	Decline	Phase-out	Phase-out
Operating	-	+	+	-	+	+	-	-
Investment	-	-	-	-	+	+	+	+
Financing	+	+	-	-	+	-	+	-

Table 9. Life Cycle-based Heterogeneity Test Results

	(1)	(2)	(3)
Variables	Growth	Maturity	Decline
treat*time	0.194***	0.476***	0.185
	(0.056)	(0.089)	(0.203)
Control	YES	YES	YES
Observations	10379	9456	3452
R-squared	0.778	0.800	0.844
Firm fixed effects	YES	YES	YES
Year fixed effects	YES	YES	YES

The results of the heterogeneity test are shown in Table 9. The coefficients of treat*time for the sample regression of enterprises in the growth and maturity stages are 0.194 and 0.476, respectively, both showing a significant positive impact at the 1% confidence level. This indicates that the issuance of green bonds by enterprises promotes their green technological innovation capabilities during both the growth and maturity stages, with the effect being better in the maturity stage. However, the coefficient of treat*time for the sample of enterprises in the decline stage is statistically insignificant. It is speculated that this is due to the potential

decline in market share and profits, technological obsolescence, and management difficulties that enterprises may face during the decline stage. These factors may result in enterprises, even if they obtain financing through green bonds, being unable to develop green technological innovation.

6 Conclusion and Recommendations

Based on the main conclusions of the research, this paper proposes the following policy recommendations for the development of green finance: The study analyzes annual panel data from non-financial companies listed on the Chinese A-share market between 2010 and 2022 to assess the influence of issuing green bonds on a company's ability to innovate environmentally. Key findings include: ① Issuing green bonds can substantially enhance a company's environmental innovation capacity. ②Green bond issuance aids in reducing managerial myopia, fostering the growth of green innovation skills. ③In terms of industry impact, green bonds are more beneficial for polluting companies than for those with lower pollution levels. ④From an ownership standpoint, green bonds have a notable positive effect on state-owned enterprises' green innovation capabilities, while the impact on privately-owned enterprises is less significant. ⑤Regarding the business lifecycle, green bond issuance positively affects green innovation capabilities in growth and maturity phases, although its impact on decline-phase companies is lesser.

Building on these findings, the paper offers the following policy suggestions for advancing green finance:①Encourage market participants to strengthen the innovation of green bond products, enrich the existing green bond product system, establish and improve risk compensation mechanisms, and optimize the investor structure. For example, select some standard green bond varieties as financial tools for the central bank's open market operations to attract investor attention to the green bond market and help high-quality enterprises obtain more sufficient capital support. ②To ensure the healthy development of the green bond market, it is necessary to build a complete and transparent green bond information disclosure system, promote the standardization and digitalization of green bond information disclosure, and alleviate information asymmetry issues. ③According to the development direction of China's high-quality economy, develop clearer "green project" definition standards to guide enterprises in developing more technologically innovative green projects. At the same time, strictly review the qualifications of bond-issuing enterprises and the use of funds to prevent the occurrence of "greenwashing" behaviors. ④Longitudinally track the development of green innovation activities of bond-issuing enterprises, and use the level of green innovation as one of the criteria for continuously qualifying to issue bonds, to incentivize enterprises to continuously improve their green innovation level. ⑤For heavily polluting enterprises, state-owned enterprises, and enterprises in the growth and maturity stages, provide stronger support for bond issuance, such as appropriately lowering the threshold for these enterprises to obtain green project financing, enabling them to have more active performance in green bond issuance, and continuously enhance their green innovation capabilities. ⑥ For non-state-owned enterprises and enterprises in the decline stage, continue to encourage them to pursue green development and adopt appropriate guiding measures, providing them with fiscal subsidies and tax incentives related to green technological innovation.

For enterprises, this paper suggests that they should recognize that issuing green bonds is beneficial for their long-term development, actively participate in the green bond market, and help develop stronger green innovation capabilities, which can enhance their own competitiveness while fulfilling social responsibilities. To achieve better outcomes from the issuance of green bonds, enterprises need to optimize their internal management, integrating the concept of green innovation into their management processes. This can be achieved by improving management and incentives for senior executives, encouraging the management team to advance green innovation projects, strengthening their motivation to focus on the long-term development of the enterprise and society, inspiring their sense of responsibility for environmental protection, reducing their short-termism behavior, and ensuring high-quality development of the enterprise's green innovation capabilities.

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