Can Green Funds Improve Corporate Environmental and Financial Performance? Evidence from Chinese Listed Companies

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ABSTRACT

Facing increasing global environmental pressures and China's carbon emission targets, China is making the transition to a green economy. A key component of this transition lies in promoting corporate green transformation and sustainable development. Green funds are regarded as an important force in driving corporate sustainability. At the firm level, sustainability not only involves the fulfillment of environmental responsibilities, but also requires firms to maintain sound financial returns in the process. However, it remains unclear whether improvements in environmental performance driven by green funds are accompanied by better financial performance. This study aims to investigate how green fund shareholding, in terms of both shareholding ratio and volatility, affects corporate environmental and financial performance in China. Drawing upon a data sample of 2,277 non-financial listed companies from 2012 to 2021, the system Generalized Method of Moments (GMM) approach is employed to address potential endogeneity issues and provide robust estimates. Findings indicate that green fund shareholding ratio has no significant impact on corporate environmental performance, yet contributes to financial performance, suggesting that firms can receive financial returns through green funds, but such shareholdings are insufficient to drive environmental improvements. In contrast, green fund shareholding volatility positively affects both environmental and financial performance, indicating that active management or adjustments in green fund shareholdings can drive better overall corporate sustainability outcomes. These results highlight the comprehensive governance role of green funds and emphasize the importance of active fund oversight in promoting both environmental and financial sustainability in Chinese firms.

Keywords: Green funds; Environmental performance; Financial performance; Sustainable development

INTRODUCTION

Due to the global movement towards environmental pressure and sustainable development goals, companies are being compelled to incorporate environmental protection into their corporate strategy and decisions (Khater et al., 2025). Companies that demonstrate active involvement and engagement with sustainable issues increase their capabilities for countering environmental and government pressures, and their marketability, which attracts sustainable investment from socially responsible investors (Li et al., 2024). Thus, what began as a voluntary process has become an involuntary action, driven largely by government policy and market pressures. This trend has especially become manifest within emerging nations. Being the second-largest country in terms of the world's Gross Domestic Product (GDP), and also being one of the world's largest polluters, China faces the problem of meeting the requirements for conserving the planet while, at the same time, having to meet its demands for economic growth (Liu et al., 2025). Companies represent the key units for economic activity and play an important part in the transition to the green economy. Thus, the transition to the green economy in China especially targets promoting firms towards sustainable development.

The increasing pressure of the environment and the need for a green economic transition have led the Chinese government to take the initiative. The idea of sustainable development has contributed to the promotion of green

finance. Green finance is mainly promoted through the state's policies and focuses on raising capital for green and environmentally sustainable projects. This helps the green transition of the economy (Chen et al., 2025). Backed by the Chinese government, green finance has experienced a rapid increase. It mainly operates through financial instruments such as green bonds, green credit, green funds, and green insurance (Zhang et al., 2024).

Green funds invest in companies and hold shares, which gives them the ability to influence the company as shareholders. Green bonds and green credit, which are financial instruments, do not have shareholding rights in the enterprise. Green bonds and green credit mainly relate to the financing needs of the company and help in the reduction of the cost of financing, but they have a limited influence on the behavior and decisions of the company (Muhammad et al., 2025; Jiang & Yuan, 2025). Green funds have become a major catalyst in the green transition for the company.

Although green funds have attracted growing scholarly attention, prior research has several limits in assessing their effects. Most studies focus on their impact on firms' environmental performance, environmental disclosure, or environmental governance (Cheng et al., 2025; Ge et al., 2025), while their role in firms' financial performance has received far less attention. Yet green transition is inherently a long-term process that involves both environmental goals and economic benefits (Cai et al., 2025). If green funds cannot support firms' financial sustainability while improving environmental performance, their governance role is unlikely to persist. Focusing only on environmental outcomes may therefore overlook or understate the role of green funds in firms' sustainable development.

Furthermore, the existing literature often considers green funds as a homogeneous group of investors. The common method of research uses the existence of green fund shareholders as a variable to classify companies into groups based on the presence of green fund shareholders, and then uses this as a dummy variable to compare the performance of companies with and without green fund shareholders to determine the impact of green funds on the performance of companies (Feng & Yuan, 2024; Wang et al., 2024). Although this method shows that green funds positively impact the performance of companies, it does not fully capture the actual governance effects of green funds.

Differences in the shareholding ratio of green funds may influence their ability to monitor and influence corporate governance. Shareholding volatility, on the other hand, reflects the changes in the strategies of green funds and may influence the company through continuous monitoring, market forces, and the threat of exit, resulting in different levels of influence and incentive effects (Chung & Zhang, 2011).

By merely concentrating on the static difference of whether a firm has green fund investors, it may lead to overlooking the differential effects of varied patterns of shareholding on firms' environmental and financial performance. Therefore, the effects of varied green fund shareholding patterns on firms' environmental and financial outcomes have yet to be explored.

With the growing popularity of green funds in China, it has become important to investigate their actual role in green and sustainable development. Green funds are still an emerging field of study, and there has been little research that has investigated whether different shareholding behaviors can shape companies' performance in terms of their financial and environmental aspects. This study aims to investigate the following questions to explain the importance of green funds in sustainable development:

(1) Do the shareholding ratio and shareholding volatility of green funds affect firms' environmental performance?

(2) Do the shareholding ratio and shareholding volatility of green funds affect firms' financial performance?

This study attempts to explore whether green fund shareholding features affect environmental and financial performance of firms. To achieve this, we conduct an analysis of non-financial listed firms in the Shanghai and Shenzhen Stock Exchanges from 2012 to 2021 using the System GMM method. The results show that green fund shareholding ratio and shareholding volatility have different effects on environmental and financial performance of firms. Specifically, the shareholding ratio of green funds has no significant impact on the environmental performance of firms, but shareholding volatility has a positively significant impact. In terms of financial performance, there is a statistically significant positive correlation between the shareholding ratio and

shareholding volatility with corporate financial performance. These findings remain stable across robustness checks.

The study makes some contributions. First, unlike existing research that focuses on whether green funds exist in the firm, this study examines the role of two aspects of green fund shareholding, namely the shareholding ratio and volatility. By doing this, it adds more depth to the involvement of green funds at the firm level and advances the existing body of literature on green funds. Second, this paper examines the influence of green funds on environmental and financial performance. This allows for an overall assessment of the role of green funds in promoting corporate sustainability from both environmental and financial perspectives, unlike existing research that has focused on environmental performance. Third, this paper uses the system GMM method, which allows for the mitigation of potential endogeneity issues and improves the robustness of results.

The rest of the study is organized as follows: Section 2 describes the literature review and the research hypotheses. Section 3 describes the research design and the research methods employed in this study. Section 4 presents the empirical results, robustness tests, and discussion. Section 5 concludes the study, provides practical implications, limitations, and future direction.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

As research on the link between green funds and corporate performance remains limited, and green funds are an important part of institutional investors, this study mainly draws on the literature on institutional investor shareholding and firm performance in the literature review. Studies on institutional investors provide both theoretical reference and empirical evidence for examining the effects of green funds on firms' environmental and financial performance. This section reviews the related literature from the perspectives of environmental performance and financial performance and, based on this review, develops the research hypotheses.

Green Funds and Corporate Environmental Performance

Previous research shows that institutional investors can help improve firms' environmental performance. Using data from 5,575 European firms, Kordsachia et al. (2022) measure environmental performance with a composite environmental score and find that institutional investor shareholding is associated with higher environmental performance, especially in carbon reduction and product innovation. Based on institutional theory and stakeholder theory, Wahba (2010) studies 418 firms in Egypt and uses ISO 14001 certification as a measure of environmental performance. The results from a logistic regression show a positive relationship between institutional investor shareholding and firms' environmental performance.

Similar evidence is found by Alda (2019), who examines 197 UK pension funds and 1,253 invested firms from 2002 to 2018 and finds that the shareholding ratio of socially responsible pension funds is positively related to firms' environmental performance and ESG practices. Using Indian listed firms involved in mergers and acquisitions from 2013 to 2022, Kapil and Kumar (2023) also find that institutional investor shareholding and foreign investor shareholding are associated with higher corporate sustainability performance.

In the Chinese context, related studies also provide supporting evidence. Feng and Yuan (2024) use data from Chinese A-share listed firms from 2009 to 2022 to examine the effect of green investors on corporate ESG performance. They find that green investors improve ESG performance by easing internal financing constraints and responding to public environmental concerns. In addition, Chen et al. (2024) and Yu and Zhang (2025) find that green investors significantly enhance firms' environmental performance in Chinese A-share listed companies.

However, not all studies reach the same conclusion. Some studies find that the institutional investor shareholding does not always improve firms' environmental performance. Lee et al. (2025) study Korea's largest national pension fund and use a fixed-effects panel model to examine the effect of its two-period lagged shareholdings on the greenhouse gas intensity of 147 investee firms from 2018 to 2023. They find that the pension fund's shareholding ratio has no clear effect on firms' greenhouse gas intensity. In short, the relationship between institutional investor shareholding and firms' environmental performance is not yet consistent. Differences may come from the country studied, sample characteristics, or research methods used.

From the perspective of stakeholder theory, institutional investors can strengthen the link between firms and their stakeholders through capital allocation and governance participation. Their investment decisions send a clear signal to stakeholders such as customers, employees, suppliers, and communities that the firm is committed to environmental responsibility, which can improve social recognition and market competitiveness (Wahba, 2010). Stakeholder theory also emphasizes that firms should consider the interests of different stakeholders in their business decisions to achieve long-term sustainable development (Blair & Stout, 2017). Based on this logic, sustainability-oriented institutional investors are more inclined to invest in firms that actively fulfill environmental responsibilities and participate in energy saving, emission reduction, clean energy, and low-carbon transition activities (Aguirre & Ibikunle, 2014).

Green funds focus on environmental goals, they not only provide firms with capital through shareholding but also strengthen the attention of firms to environmental issues. They help coordinate the interests of multiple stakeholders, which may improve firms' environmental performance. Based on the above theoretical analysis and existing studies, this paper proposes the following hypothesis:

H1a: Green fund shareholding ratio has a positive effect on corporate environmental performance.

Besides the level of shareholding, changes in shareholdings may also affect firms' environmental performance. Previous studies mainly focus on shareholding stability. Using data on 8,402 U.S. firms from 1981 to 2008, Attig et al. (2012) find that long-term and stable institutional shareholding is positively related to firm performance, while short-term and unstable shareholding may harm performance. Elyasiani and Jia (2010), based on 8,370 observations from 1,532 U.S. firms, show that shareholding stability improves firm performance for both pressure-sensitive and pressure-insensitive institutional investors. In the environmental context, Arco-Castro et al. (2023) study 406 firms included in the Dow Jones Sustainability Europe Index from 2015 to 2019 and find that stable socially responsible investment shareholding encourages firms to adopt more active environmental practices.

However, the studies above mainly emphasize the governance benefits of shareholding stability and may overlook the governance signals and monitoring effects carried by ownership changes. Compared with investors that keep stable shareholding over time, institutional investors with more volatile ownership often play a more active role in corporate governance (Elyasiani & Jia, 2008). On the one hand, long-term stable shareholding may weaken external monitoring and reduce managers' incentives to pursue environmental innovation and strategic adjustment (Yan & Zhang, 2009). On the other hand, institutional investors with higher shareholding volatility are more likely to express their views through trading and to take a more active, and sometimes more forceful, role in board governance and strategic oversight (Aggarwal et al., 2011).

Therefore, there is no clear agreement on how fluctuations in institutional shareholding affect firms' environmental performance. The effect may vary by investor type, governance motives, and the institutional setting.

From a stakeholder perspective, changes in institutional shareholding not only reflect investors' views on firm behavior but also send signals to the market about a firm's environmental responsibility. When institutional investors adjust their holdings to show dissatisfaction with, or expectations for, a firm's environmental performance, managers may face pressure from capital market, which can lead them to revise strategies and improve environmental performance.

In the Chinese context, green funds have grown quickly, but they are still at an early stage. Their investment strategies are mainly passive. In this setting, even small changes in green fund shareholding may be read by the market as a sign that green funds are taking a more active monitoring role. Such shareholding changes can send clear pressure to managers on environmental governance and encourage more environmentally friendly business practices, which in turn improve firms' environmental performance. Based on this reasoning, this research proposes the following hypothesis:

H1b: Green fund shareholding volatility has a positive effect on corporate environmental performance.

Green Funds and Corporate Financial Performance

Previous research has widely examined the effect of institutional shareholding on firms' financial performance.

Overall, it suggests that institutional investors can improve firm financial performance through monitoring, information sharing, and incentive mechanisms.

Using 72,193 observations from the U.S. market, Chung et al. (2015) apply Fama–MacBeth regressions and two-stage least squares (2SLS) and find that long-term institutional shareholding help improve firms' financial performance. In an emerging market setting, Mukhopadhyay and Chakraborty (2017) use data from 1,781 listed firms in India and show that foreign institutional shareholding significantly improves financial performance. Similarly, using a sample of 146 manufacturing firms in Pakistan, Din et al. (2022) apply a GMM approach and confirm that institutional shareholding enhances financial performance by reducing agency conflicts and strengthening monitoring. Evidence from other emerging economies points to similar results. Rahman et al. (2022) and Abedin et al. (2022) find that both domestic and foreign institutional shareholding has a positive effect on firms' financial performance in Indonesia and Bangladesh.

However, some studies hold a different view. For example, passive institutional investors, such as index funds, may lack strong governance incentives. This can weaken corporate governance and even disrupt financial performance (Fichtner et al., 2017). Besides, some studies find that the link between institutional shareholding and financial performance is non-linear or not significant (e.g., Rose, 2007; Katan & Nor, 2015; Satt et al., 2025). For example, Rose (2007), using data from 434 listed firms in Denmark, shows that low levels of institutional shareholding have a negative effect on corporate governance, while higher shareholding does not lead to a clear governance effect. Katan and Nor (2015) also find no significant effect of overall institutional shareholding on financial performance in the Malaysian market. Using data from Morocco, Satt et al. (2025) even report a negative effect of institutional shareholding on firms' financial performance.

These mixed findings suggest that the effect of institutional shareholding on firms' financial performance is not uniform. Its governance impact may depends on investor type, investment goals, and the level of active involvement in governance. In this context, value-oriented and responsibility-oriented investors may show different effects from traditional institutional investors.

Research shows that investors focused on environmental and social responsibility tend to aim for long-term value. Their decisions consider not only short-term financial returns but also the firm's ability to operate sustainably (Muñoz et al., 2014). Green funds prefer firms with strong environmental responsibility and innovation. This investment focus can help firms improve long-term competitiveness and financial stability (Chi et al., 2023).

Based on stakeholder theory, a firm's financial performance depends not only on maximizing shareholder returns but also on coordinating with and gaining the trust of multiple stakeholders. Green funds send positive signals to the market through their shareholding, showing that firms take environmental and social responsibility seriously. This can improve reputation, lower financing costs, and increase the confidence of other stakeholders, which may help improve financial performance. Compared with traditional institutional investors, green funds have clearer values and long-term goals. Higher shareholding by green funds can provide firms with more resources and support.

In the Chinese context, green funds provide capital support and environmental oversight. An increase in their shareholding can not only ease firms' financing constraints but also boost stakeholders' trust, which may improve financial performance. Based on this reasoning, this study proposes the following hypothesis:

H2a: Green fund shareholding has a positive effect on corporate financial performance.

Previous research has mostly found that stable institutional shareholding improves firms' financial performance. Bushee (1998) uses data from 13,944 U.S. firms between 1983 and 1994 to classify institutional investors as long-term, short-term trading, and quasi-index investors. He finds that long-term stable investors are more

active in governance, which supports long-term financial performance, while short-term trading investors mainly improve short-term profits. Similarly, Hsu and Wang (2014) show that for 647 listed firms in Taiwan, higher stability of institutional shareholding is associated with better financial performance. Studies by Jafarinejad et al. (2015) and Wang and Sun (2022) in the U.S. also support a positive link between institutional shareholding stability and corporate financial performance.

However, Elyasiani and Jia (2008) suggest that stable institutional shareholding may not always improve financial performance. They examined Bank of America Corporation as a case study and found that in a highly regulated environment, the link between shareholding stability and financial performance is weak, and in some cases even negative.

Moreover, institutional investors with more volatile shareholding often provide stronger market pressure and governance incentives. Compared with long-term stable investors, high-volatility investors adjust their shareholding more frequently, sending signals to the market, strengthening performance pressure on managers, and amplifying market feedback on business decisions (Ben-David et al., 2021). This "voting with feet" mechanism can encourage managers to pay more attention to efficiency and financial performance.

Based on stakeholder theory, institutional investors are important external stakeholders of firms. Their investment decisions not only affect market expectations and reputation but also indirectly influence business decisions. When institutional investors adjust their shareholding frequently, managers may see it as feedback on strategy or performance and may change their business plans to protect firm value and maintain market trust.

In the context of China's capital market, the above mechanism may be more pronounced. On one hand, green funds are still at an early stage, they often show herd behavior, so changes in shareholding carry more information and signaling effects. On the other hand, their investment behavior attracts more market attention. Even small changes in shareholding may be seen as a signal that green funds are actively monitoring or reassessing firm value, which may put pressure on managers to improve financial performance. Based on this analysis, this study proposes the following hypothesis:

H2b: Green fund shareholding volatility has a positive effect on corporate financial performance.

RESEARCH METHODOLOGY

Data Collection

Data on green funds, firm financial performance, and control variables were obtained from the China Stock Market & Accounting Research (CSMAR) database, while data on corporate environmental performance came from Bloomberg. The analysis covers listed firms held by green funds on the Shanghai and Shenzhen Stock Exchanges from 2012 to 2021, a period of 10 years. The study starts in 2012 because the Chinese government first included green development in its national strategy that year, and ends in 2021 to ensure data completeness.

Following Feng and Yuan (2024), this study selects samples of green funds and their invested firms as follows:

(1) Identification of Green Funds. We use content analysis to screen funds based on keywords in fund names, investment objectives, and investment scope. Keywords include but are not limited to "environmental protection," "low carbon," "green," "ecological," and "new energy." We then manually check the fund prospectuses and investment strategy descriptions to ensure that the identified funds have a clear green focus in practice.

(2) Identification of Invested Companies. We collect fund profiles and stock investment details of green funds and match them with quarterly and annual data of Chinese A-share listed firms. This allows us to identify the firms that received green fund investment in each year. (3) Measurement of Green Fund Shareholding Characteristics. Based on the matched data, we use Excel to organize and calculate the annual shareholding ratio and shareholding volatility of green funds for each listed firm.

In constructing the sample, we first excluded financial firms, companies with special treatment by the China Securities Regulatory Commission, and firms with less than five years of continuous data to improve reliability. This resulted in a final sample of 2,277 listed firms. Missing values for the corporate environmental performance variable were replaced with the industry–year median to reduce sample loss. In addition, all continuous variables were winsorized at the 1% and 99% levels to reduce the potential impact of outliers and ensure robust results (Barnett & Lewis, 1994). All data processing and empirical analysis were conducted using Stata.

Model Specification

To examine the impact of green funds on corporate environmental and financial performance, we first compared static models to determine the suitability of fixed effects, random effects, and Pooled Ordinary Least Squares (POLS) models. The results in Table 1 show that the fixed effects model performs better than POLS and the random effects model. Further, the Durbin–Wu–Hausman test rejects the null hypothesis, indicating the presence of endogeneity (Hausman, 1978), while the Modified Wald test shows significant heteroskedasticity (Greene, 2000). In addition, firm performance is dynamic, because past performance may affect current performance (Maury, 2018), and static fixed effects models cannot handle dynamic effects and potential endogeneity.

Table 1: Results of the Static Model Screening Test

Model Comparison	Test Type	Null Hypothesis	P-value	Result Selection
POLS vs FE	F-test	No significant difference in variance	Prob>F=0.000	FE
POLS vs RE	BP-LM test	POLS is more efficient than RE	Prob > chibar2 = 0.000	RE
FE vs RE	Hausman test	RE is more efficient than FE	Prob>Chi2=0.000	FE

Based on model comparison tests, endogeneity checks, and data characteristics, this study uses the GMM method to account for the effect of lagged dependent variables on current firm performance and potential endogeneity. GMM includes difference GMM and system GMM, and system GMM is more efficient and robust when instruments are weak (Roodman, 2009). Therefore, we choose system GMM as the main estimation method.

In the system GMM model, we focus on the Arellano–Bond test for autocorrelation (AR test) and the Hansen test to check the model specification and the validity of instruments (Saygın & İskenderoğlu, 2022). The AR test examines whether the errors in the first-order differenced model are serially correlated. If AR(2) is not significant, there is no second-order serial correlation, which means the dynamic model is acceptable. The Hansen test evaluates the overall validity of the instruments. A p-value above 0.10 indicates that the null hypothesis of instrument exogeneity cannot be rejected, supporting that the chosen instruments are suitable.

After deciding to use the system GMM, we construct Model 1 and Model 2. Model 1 tests Hypotheses 1a and 1b, while Model 2 tests Hypotheses 2a and 2b.

Model 1: Corporate environmental performance

$$CEP_{it} = +\square\ \square_{01}CEP_{it-1} + \square_2 GF_{it} + \square_3 Control_{it} + \square\ \square_i + {}_t + \square_{it}$$

Model 2: Corporate financial performance

$$CFP_{it} = +\square\ \square_{01}CFP_{it-1} + \square_2 GF_{it} + \square_3 Control_{it} + \square\ \square_i + {}_t + \square_{it}$$

CEP represents corporate environmental performance, and CEP_{it-1} is the performance in the previous period. *CFP* represents corporate financial performance, and CFP_{it-1} is the performance in the previous period. *GF*

stands for green funds, measured by green fund shareholding ratio (GSR) and green fund shareholding volatility (GSV). The subscript *i* refers to the firm, and *t* refers to the year. *Control* represents control variables, γ_i is the firm fixed effect, λ_t is the year fixed effect, and ε_{it} is the error term. The main focus of this study is on the coefficients α_2 and β_2, which measure the impact of green funds on corporate environmental and financial performance.

Variables and Measurements

Dependent Variables

The dependent variables in this study are corporate environmental performance and corporate financial performance. Corporate environmental performance is measured using the environmental score provided by Bloomberg. This score is widely used in research and has been shown to be reliable (Bellamy et al., 2020). As one of the largest and most authoritative financial information providers, Bloomberg systematically reports ESG-related data for listed companies. The environmental score is based on publicly disclosed information and reflects a company's overall performance in environmental management, pollution control, resource efficiency, and sustainable development. Therefore, we use the Bloomberg environmental score as a proxy for corporate environmental performance.

Corporate financial performance is measured using Tobin's Q. As important external stakeholders, green funds focus on a firm's long-term value, future growth potential, and market expectations. Tobin's Q captures the ratio of a firm's market value to the replacement cost of its assets, reflecting the market's overall assessment of growth and investment opportunities. Therefore, it is widely used as a proxy for firm value and financial performance (Wu et al., 2022; Aibar-Guzmán et al., 2024). Based on this, we use Tobin's Q to measure corporate financial performance.

Independent Variables

Green funds are an important part of the green finance system and are seen as a key force in promoting firms' green transition and sustainable development. They mainly invest in green and environmentally friendly projects, aiming to guide the upgrading of industries through capital allocation while seeking both environmental benefits and economic returns (Tang et al., 2024).

In this research, green funds are measured by two indicators: the green fund shareholding ratio (GSR) and green fund shareholding volatility (GSV). GSR refers to the proportion of a firm's freely tradable shares held by green funds. If multiple green funds hold shares in the same firm, the GSR is calculated as the sum of their shareholding ratios (Ma et al., 2023). GSV captures the degree of change in green fund shareholding, measured as the standard deviation of the quarterly shareholding ratios within a year (Sakaki & Jory, 2019).

Control Variables

Firm characteristics are related to environmental and financial performance. Following prior research (Ni et al., 2019; Saif et al., 2022), we control for firm size (Size), leverage (Lev), free cash flow ratio (Fcf), firm age (Age), and the proportion of independent directors (Indep). Table 2 reports the measurements and data sources of all variables used in this study.

Table 2: Measurement and sources of variables

Variable types	Variables	Symbol	Description and operation of variables	Citation
Dependent variables	Corporate Environmental performance	*CEP*	Bloomberg's environmental score	Bellamy et al. (2020)
	Corporate financial performance	*CFP*	Tobin's Q= (Book value of total assets + Market value of equity-Book value of equity)/Book value of total assets	Lin and Fu (2017)
Independent	Green fund	*GSR*	Number of shares held by green funds /	Ma et al. (2023)

variables	shareholding Ratio		total number of shares in the company	
	Green fund shareholding volatility	*GSV*	GSV is measured as the standard deviation of the fund's returns over the past four quarters, calculated by the square root of the average squared deviations from the mean return	Sakaki and Jory (2019)
Control variables	Firm size	*Size*	Ln (Total assets of the company)	Dang et al. (2018)
	Corporate leverage	*Lev*	Total liabilities at the end of the period/Total assets at the	Lestari (2021)
			end of the period	
	Free cash flow	*Fcf*	Ratio of net cash flow from operations to total assets	Ni et al. (2019)
	Firm age	*Age*	Ln (length of existence of the company)	Akben-Selcuk (2016)
	Independent directors	*Indep*	Independent Board Members/Total Number of Board Members	Samara and Berbegal (2018)

DATA ANALYSIS AND FINDINGS

Descriptive Statistics

Table 3 reports the descriptive statistics of green fund investment in Chinese listed firms. The table summarizes the data and presents the mean, standard deviation, minimum, and maximum for each variable. The minimum value of the green fund shareholding ratio is zero, indicating that green funds do not always hold shares in firms. The mean shareholding ratio is 0.159, and the maximum is 19.390, suggesting that overall green fund shareholding ratio is relatively low. The mean value of green fund shareholding volatility is 0.047, indicating limited changes in holdings and mainly passive investment behavior. Corporate environmental performance (CEP) ranges from 0.332 to 73.815, showing large differences across firms. The mean value of corporate financial performance (CFP) is 1.088, indicating that the capital market places a relatively favorable valuation on firms' growth prospects.

Table 3: Descriptive Statistics of Variables

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
VARIABLES	**N**	**Mean**	**Std.Dev.**	**Min**	**Max**
CFP	20,074	1.088	1.365	0.611	4.865
CEP	20,074	4.056	9.508	0.332	73.815
GSR	20,074	0.159	0.628	0	19.390
GSV	20,074	0.047	0.215	0	6.509
Size	20,074	22.410	1.403	14.942	28.697
Lev	20,074	0.450	1.301	0.059	0.891

Fcf	20,074	0.051	0.068	-0.152	0.242
Age	20,074	19.048	5.693	5	43
Indep	20,074	0.377	0.058	0.143	0.800

Correlation Analysis

This study uses a Pearson correlation matrix to examine the relationships among variables. When the absolute value of a correlation coefficient is below 0.80, multicollinearity is not considered a serious problem (Winship & Western, 2016). Table 4 reports the correlation results. All correlation coefficients are below 0.80 in absolute value, suggesting no serious multicollinearity in the sample. Green fund shareholding ratio and shareholding volatility are both positively related to corporate environmental performance and corporate financial performance. In addition, the control variables show correlations with the dependent variables, providing a sound basis for the subsequent empirical analysis.

Table 4: Analysis of Pearson Correlation Between Variables

Variables	CEP	CFP	GSR	GSV	Size	Lev	Age	Cash	Indep
CEP	1								
CFP	-0.047***	1							
GSR	0.092***	0.130***	1						
GSV	0.093***	0.123***	0.628***	1					
Size	0.167***	-0.365***	0.004	0.014**	1				
Lev	0.009	-0.272***	-0.008	-0.010	0.502***	1			
Age	0.081***	-0.028***	-0.007	-0.018**	0.224***	0.179***	1		
Fcf	0.096***	0.117***	0.020***	0.034***	0.054***	-0.190***	0.013*	1	
Indep	-0.014**	0.039***	-0.012*	-0.001	0.010	0.007	-0.021***	-0.007	1

Note: At 10%, 5%, and 1%, respectively, statistical significance is indicated by the symbols *, **, and ***.

Green Funds and Corporate Environmental Performance

Table 5 reports the results of Model 1, which tests whether green fund shareholding ratio and shareholding volatility improve corporate environmental performance under the system GMM. The coefficient of GSR is 0.346, with a p-value above 0.10. Although the coefficient is positive, it is not statistically significant, indicating

that the data do not provide enough evidence that green fund shareholding ratio affects corporate environmental performance. Therefore, Hypothesis 1a is not supported. In contrast, the coefficient of GSV is 0.139 and significant at the 5% level, suggesting that green fund shareholding volatility has a positive effect on corporate environmental performance. Thus, Hypothesis 1b is supported.

Regarding the control variables, firm size is positively related to corporate environmental performance and is significant at the 1% level. This suggests that larger firms tend to have better environmental performance. This result is consistent with the findings of Ren et al. (2023), which argues that large firms have more resources, emphasize reputation, and show stronger awareness of environmental responsibility. In contrast, leverage is significantly negatively related to corporate environmental performance (coefficient = −0.286, $p < 0.05$), indicating that firms with higher leverage perform worse in environmental terms. This finding is in line with Liu et al. (2024). Higher leverage increases operating costs and financial pressure, which may limit firms' ability to invest in environmental activities.

In addition, the coefficients of free cash flow and the proportion of independent directors are positive, but their p-values are above 0.10, suggesting that there is no strong evidence that they have a significant effect on corporate environmental performance. One possible reason is that firms' environmental investment decisions do not rely mainly on cash flow or board structure, but are more influenced by regulations and external policies. Firm age has a negative effect on corporate environmental performance (coefficient = −0.113, $p < 0.05$), indicating that older firms tend to have lower environmental performance. Older firms may be less flexible in technology upgrades and green innovation, which can weaken their environmental performance. This result is consistent with the findings of Alqahtani et al. (2025).

From the model diagnostics, the p-value of AR (2) is above 0.10, indicating no second-order serial correlation. The p-value of the Hansen test is also above 0.10, meaning that the null hypothesis of valid instruments cannot be rejected. These results suggest that the model and the instruments are acceptable.

Table 5: Regression Results of Green Fund shareholding ratio and volatility on Corporate Environmental Performance under System GMM

Variables	**CEP**
CEP_{t-1}	0.760***
	(.055)
GSR	0.346
	(0.351)
GSV	0.139**
	(0.070)
Size	0.264***
	(0.098)
Lev	-0.286**
	(0.137)
Fcf	0.036
	(8.758)

Age	-0.113**
	(0.049)
Indep	0.338
	(2.497)
Constant	-0.487
	(0.347)
Observations	17797
Firm	Yes
Year	Yes
Number of instruments	26
AR (1)	0.000
AR (2)	0.102
Hansen Test (p-value)	0.317

Note: the table presents standard errors in parentheses; the asterisk symbols ***, **, and * are used to mark significance at the 1%, 5%, and 10% levels.

Green Funds and Corporate Financial Performance

Table 6 reports the results of Model 2. Under the system GMM, both green fund shareholding ratio and shareholding volatility have a significant positive effect on corporate financial performance. Specifically, the coefficient of green fund shareholding ratio is 0.103 and is significant at the 1% level, indicating that a higher green fund shareholding ratio is linked to better corporate financial performance, supporting Hypothesis 2a. Besides, the coefficient of green fund shareholding volatility is 0.148, with a p-value below 0.01, suggesting that more active changes in green fund shareholdings are associated with higher corporate financial performance. Thus, Hypothesis 2b is also supported.

As for the control variables, firm size has a coefficient of −0.039 and is significant at the 5% level, suggesting that larger firms may face higher operating and decision-making costs, which can weaken financial performance. This result is in line with Olawale et al. (2017). Leverage has a significant negative effect on corporate financial performance (coefficient = −0.747, $p < 0.01$), indicating that higher debt levels increase financial pressure and hurt performance. In contrast, free cash flow and the proportion of independent directors both have significant positive effects on financial performance, suggesting that more internal cash and better governance help improve firm financial performance, consistent with Alias et al. (2016). Firm age, however, shows no significant effect on financial performance.

Finally, AR(2) and Hansen test p-values are above 0.1, indicating no second-order serial correlation and valid instruments, which suggests that the model and instrument choices are appropriate.

Table 6: Regression Results of Green Fund shareholding ratio and volatility on Corporate Financial Performance under System GMM

Variables	**CFP**
CFP_{t-1}	0.285**
	(0.113)
GSR	0.103***
	(0.007)
GSV	0.148***
	(0.021)
Size	-0.039**
	(0.016)
Lev	-0.747***
	(0.241)
Fcf	0.347**
	(0.155)
Age	0.043
	(0.099)
Indep	0.161***
	(0.058)
Constant	0.804
	(0.612)
Observations	17797
Firm	Yes
Year	Yes
Number of instruments	21
AR (1)	0.000
AR (2)	0.497
Hansen Test (p-value)	0.571

Note: the table presents standard errors in parentheses; the asterisk symbols ***, **, and * are used to mark significance at the 1%, 5%, and 10% levels.

Robustness Tests

The Replacement of Dependent Variables

To check the robustness of the main regression results, this study replaces the dependent variables. Specifically, in the environmental performance model, green innovation (GI) is used instead of the environmental score; in the financial performance model, return on assets (ROA) is used instead of Tobin's Q.

Column (1) of Table 7 reports the regression results with GI as the dependent variable. The results show that the coefficient of green fund shareholding ratio (GSR) is positive but not significant, while the coefficient of green fund shareholding volatility (GSV) is positive and significant at the 5% level. This is consistent with the baseline results in Table 5.

Column (2) of Table 7 reports the results using ROA as the measure of financial performance. Both shareholding ratio and shareholding volatility have positive coefficients and are significant at the 1% level, consistent with the baseline results in Table 6. Overall, the results using alternative dependent variables are consistent with the baseline regressions, further confirming the robustness of the main findings.

Table 7: Regression Results of Green Funds on Corporate Environmental and financial Performance under System GMM

	(1)	**(2)**
Variables	**CEP**	**CFP**
CEP_{t-1}	0.267**	
	(0.028)	
CFP_{t-1}		0.370***
		(0.065)
GSR	0.589	0.399***
	(0.550)	(0.086)
GSV	0.341**	0.553***
	(0.169)	(0.111)
Controls	yes	yes
Observations	17797	17797
Firm	Yes	Yes
Year	Yes	Yes
Number of instruments	22	27
AR (1)	0.000	0.000
AR (2)	0.738	0.356
Hansen Test (p-value)	0.373	0.194

Note: the table presents standard errors in parentheses; the asterisk symbols ***, **, and * are used to mark significance at the 1%, 5%, and 10% levels.

The Replacement of Models

To check the robustness of the baseline results, we further estimated the model using a fixed effects approach. The results in table 8 show that under the fixed effects model, the green fund shareholding ratio (GSR) has a significant positive effect on corporate environmental performance, which differs from the system GMM results where the effect of GSR was not significant. In contrast, the results for green fund shareholding volatility (GSV) on both corporate environmental performance and financial performance are consistent with the baseline System GMM results in terms of direction and significance.

It should be noted that the fixed effects model and system GMM handle endogeneity differently (Khatib, 2025), which may explain why the significance of the green fund shareholding ratio (GSR) differs across models. However, the estimated effects are consistent in direction, and the overall robustness checks support the baseline regression results.

Table 8: Regression Results of Green Funds on Corporate Environmental and financial Performance Based on a Fixed Effects Model

	(1)	**(2)**
Variables	**CEP**	**CFP**
GSR	0.454***	0.240***
	(0.172)	(0.027)
GSV	0.777*	0.536***
	(0.430)	(0.077)
Controls	yes	yes
Observations	20074	20074
Firm	Yes	Yes
Year	Yes	Yes
Adjusted R-squared	0.178	0.220

Note: the table presents standard errors in parentheses; the asterisk symbols ***, **, and * are used to mark significance at the 1%, 5%, and 10% levels.

DISCUSSION

The results show that green fund shareholding ratio and shareholding volatility do not have the same effects on corporate environmental and financial performance. Shareholding volatility has a clear positive effect on both types of performance, while the effect of the shareholding ratio is more selective. In particular, the higher the shareholding ratio, the better the financial performance, but it does not have a statistically significant influence on environmental performance. These results shed light on the function of green funds in promoting companies' sustainability practices in China.

From a practical perspective, the development of green funds in China is in an early stage. The level of shareholding is generally low, and most green funds follow a passive investment approach. Therefore, a mere increase in shareholding does not create much pressure on firms' environmental behavior, which helps explain the lack of a significant effect on environmental performance. This is in line with Lee et al. (2025).

In terms of financial performance, an increased level of green fund shareholding provides firms with more capital and also serves as a positive signal for their future performance. This can enhance firm reputation, increase stakeholder confidence, and expand market opportunities, which may result in improved financial performance. This result is consistent with the literature showing that firm financial performance can be positively influenced by institutional shareholding (Rahman et al., 2022; Abedin et al., 2022; Szewc-Rogalska, 2024).

This result could be explained based on stakeholder theory. Green funds are important stakeholders who consider both financial performance and green accountability. They can affect the companies through their shareholdings. However, green funds in China hold relatively small stakes and follow a passive investment approach. Therefore, the environmental pressure they exert on the companies through their stakes is minimal. Additionally, enhanced environmental performance may take some time to occur. This explains why the direct impact of green fund shareholding on environmental performance is insignificant. However, the increase in green fund shareholding may immediately increase the company's capital and reduce its cost of finance. The management may also take the capital injection and supportive market sentiment of green funds as a green signal to make important strategic changes, thereby improving financial performance.

Moreover, green fund shareholding volatility positively affects both environmental and financial performance. In terms of environmental performance, green funds are regarded as passive investors in the Chinese market. Even the slightest change of their shareholdings would imply monitoring for firms, which would produce a warning effect. In order to maintain recognition and continuous support from green funds, firms are more likely to take appropriate and specific actions concerning environmental issues, which would improve their environmental performance. This is consistent with existing literature that found a positive relationship between shareholding volatility of institutional investors and environmental performance (Elyasiani & Jia, 2008). Turning to financial performance, green fund shareholding volatility represents continuous attention and active adjustment of the portfolio by green funds. Frequent transactions would imply a monitoring signal to firm managers, which would induce them to be more prudent with their operating actions, leading to an improvement in their financial performance. This is consistent with evidence from Ben-David et al. (2021) that found changes in institutional shareholding would improve managerial discipline and market feedback on firms' actions, which would positively affect financial performance.

Stakeholder theory explains the connection between volatility in green fund shareholding and corporate environmental and financial performance. Green funds, being external stakeholders, seek not only returns but also take into consideration environmental responsibility and sustainable development. Changes in their shareholdings act as signals to management that there are pressures for monitoring and governance, which in turn cause more cautious management decisions on environmental investment and corporate strategies. By such pressure and incentives, volatility in shareholding contributes to improvements in environmental and financial performance.

Finally, the findings show that green funds make a positive contribution to the promotion of sustainable development among Chinese companies. To support the role of green funds, the government should adopt more practical policies to encourage and facilitate the development of green funds. In addition, the government should encourage green funds to make more active shareholding decisions and make adjustments to their holdings based on the behavior of companies. In this way, companies' environmental responsibility and economic returns could be improved, and green transformation could be facilitated.

CONCLUSION

The paper examines the data of 2,277 non-financial Chinese A-share listed companies between 2012 and 2021 to test the impact of green funds on the environmental and financial performance of companies using the system GMM. The main findings are: (1) a higher green fund shareholding ratio is linked to better financial performance, and it is not statistically significant to environmental performance; (2) green fund shareholding volatility can improve both environmental and financial performance. Based on the findings, the implications are as follows:

First, the government should improve green finance policies to provide a stable environment for the development of green funds. This can include tax incentives, investment guidelines, and disclosure rules to attract more funds into green investments. At the same time, policies should not focus only on increasing shareholding ratios. They should also encourage green funds to use flexible and dynamic shareholding strategy to engage in corporate governance, strengthen oversight of firms' environmental actions, and better promote green transformation.

Second, companies should understand the role of green funds as important external monitors. Green funds, even with their small shareholding, can trigger signals through their adjustments, and companies should be able to respond to these signals and manage their resources in line with proper governance to satisfy the expectations of green investors. Building a strong relationship with green funds can help to gain more support and provide a stronger base for the green transition.

Finally, green funds should concentrate on the impact they make regarding their shareholding strategy. They should make effective governance signals to companies through their holdings. They should balance the short-term profits and long-term value, not only focusing on the financial performance but also on the environmental goals, so as to maximize both environmental and financial goals.

Although this study presents some helpful findings, it is faced with some limitations. Firstly, this study is focused on China. This could be a limitation to the generalizability of the findings. Secondly, this study does not consider the heterogeneity of the effects. For instance, the green funds could have different effects on different industries or on state and private companies. Finally, this study does not consider small and medium-sized enterprises.

These limitations also point to directions for future research. Future research could take a cross-country approach to examine how green funds shape companies' environmental and financial performances in different institutional environments. They could also look more closely at differences across high- and low-pollution industries, as well as between state-owned and private firms, to explore the heterogeneity of green fund effects. In addition, future research could include small and medium enterprises to provide a more complete analysis of the green fund effect on green transformation.

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