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THE RELATIONSHIP BETWEEN ESG, FINANCING CONSTRAINTS, AND FINANCIAL PERFORMANCE: EVIDENCE FROM CHINA

ABSTRACT

ESG has become an internationally accepted indicator of an overall level of development within a company. This study empirically examines the impact of ESG on the corporate financial performance of Chinese A-share listed companies in the manufacturing industry from 2019 to 2023. The study considers panel regression techniques in order to test the hypotheses. Moreover, a mediation process is also considered to understand the impact of financial constraints. ESG scores were sourced from the Huazheng ESG Rating framework, while financial and firm-level data were obtained from the CSMAR database. The results of the study find that ESG performance has a statistically significant and positive effect on financial performance (coefficient = 0.014, p<0.01). Moreover, it has also been found that ESG performance alleviates financing constraints (coefficient = –0.550, p < 0.01), which in turn positively influences financial performance (coefficient = –0.015, p < 0.01). This indicates a partial mediating effect in place. Finally, the subgroup analysis reveals that the financial benefits of ESG practices are more pronounced in non-state-owned enterprises (non-SOEs) (coefficient = 0.014, p < 0.01) than in state-owned enterprises (SOEs) (coefficient = 0.013, p < 0.01). This indicates that ownership structure plays a moderating role in the relationship. This study provides empirical evidence that optimizing ESG performance can enhance the market competitiveness of listed manufacturing companies in China, while also offering theoretical support for policy-making. There are also substantial implications for firms, as the study suggests ESG principles should be incorporated by firms to ensure strategic planning, and to reduce financing constraints and improve financial outcomes.

Keywords: ESG, financing constraints, financial performance, corporate governance, empirical analysis, manufacturing sector, sustainability

JEL Classification: G32, M14, Q56

INTRODUCTION

Reform and opening up have brought rapid development to the Chinese economy. However, this has been accompanied by escalating challenges related to environmental degradation and resource depletion. The 19th CPC National Congress identified the primary contradiction in Chinese society as the disparity between the people's increasing demands for an improved quality of life and the current uneven and inadequate development, thereby advocating for a focus on promoting high-quality development as a central priority. This requires that economic development be accompanied by a greater reconciliation of the economy with the environment, society, and people's livelihoods (Xu & Hu, 2020). During the 75th session of the UN General Assembly on September 22, 2020, China declared its goal to reach carbon dioxide emission apex by 2030 and to become carbon neutral by 2060. This goal has been included in China's "14th Five-Year Plan", and the focus is shifting to environmentally sustainable transformation and low-carbon growth, which is expected to become a key priority for China's future economic and social development. Subsequently, several important documents have been issued, such as the "Guidelines on Fully, Accurately, and Comprehensively Applying the New Development Philosophy to Achieve Carbon Peak and Neutrality", along with the "2030 Carbon Peak Implementation Roadmap." A series of key policy documents has been rolled out in succession, establishing the framework for China's "dual carbon" objectives

while presenting a comprehensive roadmap for achieving peak carbon emissions and carbon neutrality nationwide. These measures systematically address the institutional architecture required to meet these ambitious environmental targets at the country level.

Against this policy backdrop, the ESG investment concepts of Western countries have been hotly debated in the Chinese investment arena. ESG indicators are one of the key metrics for measuring a company's sustainability capabilities, including: Environment (E), Social (S), and Governance (G). The concept of ESG first appeared in the United Nations publication "Who Cares Wins" and was officially accepted by the United Nations Global Compact in June 2004 (Dathe et al., 2024). Subsequently, ESG has grown rapidly in Western capital markets and has gradually come into the public eye, leading to more ESG applications. Currently, ESG has become an important indicator of the overall level of corporate development that is generally accepted by the international community (Indriastuti & Chariri, 2021).

In the current era, sustainable development is a key focus for both the international community and China. The biggest dilemma for enterprises to follow the principle of sustainable development is how to balance the maximisation of economic profit with the maximisation of social efficiency (DeSimone, 2000). To promote ESG practices among Chinese listed companies, government agencies, regulators, and industry associations have introduced a range of policies to strengthen ESG disclosure, enhance ESG practices, and encourage investors to adopt ESG investment principles. In 2018, the China Securities Regulatory Commission and the China Securities Investment Fund Industry Association successively released the "Corporate Governance Guidelines for Listed Companies" and the "Research Report on the ESG Evaluation System for Chinese Listed Companies." They laid the foundation for ESG information disclosure and also emphasized the importance of ESG research and advocacy in promoting sustainable economic growth in China, to achieve three main goals. In February 2021, the China Securities Regulatory Commission included ESG considerations into communication guidelines for listed companies and investors for the first time, thereby strengthening the influence of ESG factors in the capital market. These policies provide new impetus for Chinese companies to focus on long-term lasting advantages and sustainable growth. It is worth noting, however, that although these policies and regulations provide norms and guidelines for ESG development to a certain extent, prompting enterprises and other stakeholders to pay attention to and actively fulfil their ESG, institutional compulsion alone is far from enough to make ESG concepts come into practice. Corporate managers, as rational economic actors focused on profit maximization, require incentives to foster intrinsic motivation for achieving higher economic returns and enhanced sustainability through improved ESG performance, thereby encouraging corporations to proactively adopt ESG performance (Chen et al., 2023).

ESG concepts are gradually penetrating all industries and opening up new tracks in the highly competitive global economic market. The widespread adoption of this concept underscores the emphasis companies place on social responsibility and sustainable development, reflecting the elevated standards expected by society today. Despite a complex and volatile global environment and numerous industry challenges, the Made in China initiative continues to progress steadily, advancing China's industrial and technological capabilities. China's manufacturing sector has maintained its position as the world's largest since 2010. Over the years, China's manufacturing industry has sustained steady productivity growth, establishing a distinctive scale advantage in capacity and output. Regarding industry distribution, manufacturing firms face heightened environmental, employee, and safety responsibilities, intense market competition, and stringent regulatory demands (Hu et al., 2021). The industry's scale, combined with the introduction of the Opinions and the 'dual carbon' targets, has driven manufacturing enterprises to adapt, transform their development approaches, mitigate ESG risks, and generate ESG value. Therefore, this study focuses on the manufacturing industry and systematically explores the relationship between ESG, financing constraints, and financial performance.

LITERATURE REVIEW

ESG and Financial Performance

Enterprises should not solely prioritize maximizing shareholder value in daily operations but also consider stakeholders' interests, balancing the value demands of diverse stakeholders (Jensen, 2001). Numerous studies have established that an enterprise's survival and growth hinge significantly on stakeholder support. When companies actively assume social responsibilities and always focus on the interests of stakeholders in their activities, they are often able to gain more support and recognition from these stakeholders, which in turn helps drive long-term sustainable growth (Fallah Shayan, 2022; Javed et al., 2020). As the most recent advancement in the concept of social responsibility, corporate ESG practices stem from companies' strategic decisions to embrace social responsibility and ethical commitments. ESG refers to integrating a company's financial operations into three pivotal domains: Environment, Social, and Governance. This approach conveys

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to stakeholders and investors the organization's commitment to a development strategy that coordinates economic growth with social and environmental factors (Pollman, 2024).

Based on information asymmetry theory and signaling theory, a natural information disparity exists between firms and their stakeholders. To promote sustainable growth, organizations that have more information will strive to convey useful information to those with less information through designated communication channels. This ensures stakeholders are better informed about the enterprise's production and operational realities, thereby reducing inefficiencies such as adverse selection (Cui et al., 2018). Shaikh (2022) suggests that better ESG performance tends to imply better performance in terms of operational compliance and sustainability, which facilitates firms to avoid short-sightedness in development and minimize potential risks in terms of internal and external environmental governance and ethical critique. Yin et al. (2023) also found through empirical research that strong ESG practices can effectively enhance firms' stock returns. According to a study by Bilyay-Erdogan et al. (2024), implementing ESG strategies has the potential to improve investment effectiveness by mitigating investment levels that are too high or too low. Corporate ESG practices mitigate information asymmetry between enterprises and stakeholders while signaling positive attributes to investors, consumers, and governments, including robust corporate social responsibility, effective governance mechanisms, and strong sustainable development capabilities. These positive signals enhance firms' reputational capital (Maaloul et al., 2023), encouraging stakeholders to provide greater support through policy backing, capital financing, and product consumption, ultimately improving financial performance (Zheng et al., 2022). Hypothesis H1 is presented.

H1: *The higher the level of ESG practices, the higher the level of corporate financial performance of listed Chinese manufacturing companies.*

ESG, Financing Constraints, and Financial Performance

With the growth of ESG practice, academic inquiry into corporate ESG evaluation systems is increasing. Currently, the literature on the field of corporate ESG covers several areas, including the disclosure of corporate ESG disclosure level (Darnall et al., 2022), ESG framework system (Sardanelli et al., 2022), the impact of ESG on investment guidance (Park & Jang, 2021), and the correlation of corporate value (Cohen, 2023), among others. Despite this, studies connecting corporate ESG to financial metrics are still limited. The financial performance of a company is typically evaluated through various fundamental financial indicators, which highlight its strengths and weaknesses. As a result, there is still a relatively underdeveloped area on how the fulfilment of corporate ESG responsibilities affects their financial performance. Although a large number of empirical studies conducted in Europe and the United States have shown a favorable correlation between positive corporate ESG initiatives and financial results, there is still no broad consensus on this correlation because different views are still prevalent (Hwang et al., 2021; Kalia & Aggarwal, 2023). Ball's (2021) study suggests that the correlation between corporate ESG responsibility fulfilment and financial performance may be negative, or there may not even be any association. Currently, literature on the relationship between corporate ESG responsibility fulfillment and financial performance is limited, with most studies focusing on the connection between a single ESG dimension and financial outcomes. When assessing business operations and guiding investment choices, a company's financial performance is often considered a key indicator. With the advancement of corporate ESG rating systems, company management is increasingly prioritizing social responsibility fulfillment alongside the pursuit of economic benefits. Thus, balancing social responsibility fulfillment with economic gains and coordinating the relationship between corporate ESG and financial benefits will be critical challenges for enterprises pursuing long-term development.

Meanwhile, most of the existing literature on the mechanisms by which ESG affects firms' financial performance focuses on examining the impact of factors such as corporate innovation (Chouaibi et al., 2022), information disclosure (López-Arceiz et al., 2018), and corporate governance (Saha & Khan, 2024). However, few studies have examined how financing constraints affect corporate financial performance in ESG-driven environments, even though funding is a key determinant. Research indicates that financing constraints significantly influence firms' investment decisions and long-term growth potential (Nicolas, 2022). Therefore, for firms with financing constraints, controlling costs and improving resource efficiency are crucial, and good ESG performance can help alleviate financing pressures, increase investor confidence, and enhance the ability of firms to raise capital, thus bringing long-term value benefits to firms (Bai et al., 2022). Thus, investigating how enhanced ESG performance can mitigate financing constraints to improve corporate financial performance is crucial.

When the operating rights of a firm are separated from its ownership, an agency conflict arises between the firm's managers and shareholders, resulting in a financing constraint when the firm's cost is higher than its internal cost of capital when financing externally (Jensen & Meckling, 2019; Nikolov et al., 2021). Per information asymmetry theory, external investors, lagging behind internal operators in understanding business conditions, often increase risk premiums to safeguard their interests, thereby elevating financing costs (Ahmad et al., 2023). Good ESG performance can effectively break

down this information barrier. ESG practices provide more high-value-added non-financial information to help investors more comprehensively understand a company's current operations and future business development concepts, and it is easier for investors to judge whether a company is in line with their investment philosophy based on its sense of social responsibility (Bai et al., 2022).

Concurrently, Organizations that demonstrate strong ESG practices can effectively communicate a commitment to sustainable development, stable future cash flows, and sound corporate governance. This approach reduces "double agency costs", which in turn boosts investor confidence, helps obtain funds more easily, and relieves the pressure associated with obtaining financial support. Secondly, policymakers and regulators are more likely to favor more lenient policies for companies with better ESG performance. By developing a robust bond market, streamlining loan approval processes, and enhancing financial institution support for enterprises with strong ESG performance, firms can access external financing more readily and at lower costs, thereby facilitating production expansion, increased investment, and enhanced enterprise value (Zhang et al., 2023).

Relaxing financial restrictions may give companies an advantage over competitors. The essence of the return on corporate performance is the benefit that the enterprise brings to the investor by using the resources that the enterprise can control. The reduction of financing constraints will expand the profitability space, which will make the enterprise favoured by the investor, and lead to the reduction of the financing cost, and the total amount of financing will be improved, which will further expand the source of high-quality funds (Qian, 2024). Reduced financing constraints have encouraged enterprises to allocate greater resources and capital to the real economy, enhancing productivity and innovation. This supports long-term stability, boosts market competitiveness, and contributes to improved financial performance (Heller, 2024). Hypothesis H1 is presented.

H2: *The increased level of ESG practices of listed Chinese manufacturing firms can enhance corporate financial performance by alleviating financing constraints.*

AIMS AND OBJECTIVES

The aim of this particular study is to analyze the impact of Environmental, Social, and Governance (ESG) performance on the financial performance of Chinese A-share listed manufacturing firms. This is furthermore done by focusing on the mediating role that financing constraints have on the performance.

The research also has the objective to evaluate the direct relationship between ESG performance and the financial performance of listed Chinese manufacturing firms. Furthermore, the research also assesses the extent to which ESG performance alleviates financing constraints in these firms. The research also examines whether the reduction in financing constraints mediates the relationship between ESG performance and financial performance. Finally, in order to test the robustness of these relationships using alternative financial performance indicators, bootstrap mediation testing, lagged variables, and heterogeneity analysis were performed.

METHODS

Sample Selection and Data Sources

The study focuses on A-share listed manufacturing companies between 2019 and 2023. Data for the independent variable, ESG performance, is obtained from HuaZheng ESG Rating Agency. Drawing on widely recognized ESG assessment methodology standards globally, HuaZheng ESG Rating combines with Chinese characteristics to make the ESG rating system with localisation, year-round coverage, and high timeliness, which is the longest retrospective and most recognised ESG rating system in the Chinese market. Data for all other variables were sourced from the CSMAR database, a professional organization database. The CSMAR database, comparable to the WRDS database widely utilized by international scholars, provides data that have been employed in studies published in authoritative journals (Lin et al., 2009; Qiu et al., 2024). The sample data went through the following processing steps:

1. Excluding ST and *ST listed companies, which have abnormal financial indicators and are not comparable.
2. The deletion of samples with missing financial data is necessary.
3. The 1% and 99% quantiles of all continuous variables were adjusted by tailoring (Winsorizing).

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After the screening process, a data set was finally determined, containing 1944 samples and a total of 9720 valid observations.

Variable selection

Dependent variable

Financial performance evaluations often rely on accounting measures such as ROA, ROE, and Tobin's Q value. Wang et al. (2020) proposed that although indicators derived from the stock market can be used for analytical purposes, the unique characteristics of China's stock market limit their effectiveness in accurately representing the company's true market valuation. In view of this, this study mainly selected two commonly used accounting indicators, ROA and ROE, to measure the corporate financial performance (Chen et al., 2023). ROA directly reflects the intensity of competition and company growth, and it is not affected by equity dilution on profitability measures; it has objectivity and stability in reflecting the profitability and financial performance of the firm (Olunuga & Akinrodoye, 2022). ROE indicates a company's ability to use the company's equity investment to create value for its shareholders, with higher values indicating greater shareholder returns, making it a preferred metric for assessing corporate financial performance among scholars (Keter et al., 2023).

Independent variable

Hu et al. (2025) used the Huazheng ESG Evaluation Framework to assess the ESG performance of listed manufacturing companies in China, benefiting from the detailed structure of the framework specifically designed for the Chinese market environment. The HuaZheng ESG evaluation system incorporates a comprehensive set of indicators to ensure the thoroughness and professionalism of its data. The assessment framework is built based on measurable information, including publicly available financial statements, sustainability disclosures, and corporate social responsibility reports. The HuaZheng ESG evaluation system categorizes ESG performance into nine levels, from best to worst, AAA-C, assigning scores from 1 to 9, with C as 1 and AAA as 9, in ascending order. This hierarchy not only provides companies with a clear objective but also provides investors with quantitative measurement tools to help them make more informed investment decisions. To ensure timeliness and effective risk management while addressing the investment decision-making needs of institutional investors, the HuaZheng ESG rating system is updated quarterly. The study uses the average of companies 'cumulative ESG scores for each quarter to represent their overall ESG performance throughout the year.

Mediating variable

Based on the methodology adopted by Xu et al. (2020), this study employs the KZ index as the primary metric for evaluating financial constraints. The KZ index, introduced by Kaplan and Zingales (1997), evaluates financing constraints faced by enterprises across five dimensions—operating net cash flow (CF), growth (Tobin's Q), leverage (LEV), cash holdings (CASH), and cash dividends (DIV)—and is widely adopted by scholars. A higher KZ index indicates greater financing constraints for firms, while a lower KZ index suggests relatively milder financing constraints. This approach enables precise measurement of a firm's financing constraints at various time points and facilitates analysis of their potential impact on financial performance.

Control variables

Including control variables helps minimize the impact of confounding factors, thereby improving the accuracy of study results. This study incorporated relevant control variables and aimed to improve analytical accuracy when studying how ESG performance and financing constraints affect the company's financial performance, taking into account the role of various influencing factors. This study refers to relevant research in the field and selects corporate age, corporate size, shareholding concentration, corporate growth, board size, and the proportion of independent directors as control variables (Awaysheh et al.,2020; Wang & Chen, 2024).

Corporate Age (ListAge): As a company remains publicly traded for longer, it tends to accumulate more resources and strengthen its governance framework, which in turn reduces the likelihood of opportunistic behavior by the company's leadership.

Corporate Size (Size): Large companies often make a significant contribution to a country's economic growth and encounter fewer obstacles in accessing capital (Luo et al., 2018). A company's scale often serves as a barometer of its overall capabilities—larger corporations typically possess greater resources and operational capacity to implement robust ESG initiatives. Moreover, these sizable enterprises tend to place heightened emphasis on managing financial risks, as their expanded operations demand more sophisticated oversight.

Shareholding Concentration (Top1): Shareholding concentration indicates the firm's internal governance structure, reflecting the influence and authority of major shareholders, which impacts the company's ESG investment decisions (Truong et al., 2025).

Corporate Growth (Growth): Corporate growth reflects an enterprise's development potential and investment value, higher growth attracting investors and lowering financing costs.

Board size (Board): Board size is a critical component of corporate governance, directly influencing oversight efficiency, strategic decision quality, and resource accessibility. Larger, more diverse boards are likely to have more members who are focused on social and environmental issues or are better able to represent the voices of different stakeholders, thus promoting more proactive ESG strategies (Treepongkaruna et al., 2024).

Proportion of independent directors (Indep): The directors' board administers and regulates the company, mitigating agency issues within management and ensuring operational efficiency. For management, ESG practices do not deliver performance gains in a timely manner, so there is a tendency to invest in other high-yield projects. Greater board independence encourages management to adopt ESG strategies, fostering the company's sustainable development (Popov & Makeeva, 2022).

Table 1. Summary Table of Variable Selections.

Variable type	Variable name	Notation	Description of indicators
Independent variable	Environment, Social, and Governance	ESG	Huazheng ESG Rating Index
Dependent variable	Financial performance	ROA	Net Income/Total Assets
Mediating variable	Financing Constraints	KZ	KZ index
Control variable	Corporate Size	Size	Ln (Total Assets at End of Period)
	Corporate Age	ListAge	Ln(Current year year - year of listing + 1)
	Corporate Growth	Growth	Growth rate of operating income
	Shareholding Concentration	Top1	Shareholding ratio of the largest shareholder
	Board size	Board	Ln (Number of Board of Directors)
	Proportion of independent directors	Indep	Number of independent directors on the board/ Number of Board of Directors

Model construction

Model (1) is developed based on hypothesis H1 to assess the direct effect of ESG on its financial performance.

$$Perfor_{i,t} = \alpha 0 + \alpha 1\ ESG_{i,t} + \sum \alpha 2\ Controls_{i,t} + \varepsilon_{i,t} \quad (1)$$

This study used sequential regression analysis to explore how financial constraints affect the link between ESG and financial performance (Baron & Kenny, 1986). Models (2) and (3) incorporate financing constraints (KZ) as a mediating variable to assess Hypothesis H2.

$$KZ_{i,t} = \beta 0 + \beta 1\ ESG_{i,t} + \sum \beta 2\ Controls_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$Perfor_{i,t} = \eta 0 + \eta 1\ ESG_{i,t} + \eta 2\ KZ_{i,t} + \sum \eta 3\ Controls_{i,t} + \varepsilon_{i,t} \quad (3)$$

In the model, Perfor represents the sample company's ROA, reflecting corporate financial performance; ESG represents corporate ESG performance; KZ indicates corporate financing constraints; Controls encompass control variables; ε represents the stochastic error; and i and t signify individual firms and years.

This study employs four robustness tests to validate the results:

1. Variable Substitution Tests. In this study, ROE is adopted in place of ROA as the measure of financial performance for the dependent variable.

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2. Mediated Effects Test. The more robust bootstrap sampling method was employed to examine the mediating effect of financing constraints.
3. Lagged independent variables. The independent variables are lagged by one to three periods to substitute for the dependent variable ESG, mitigating endogeneity issues arising from potential bidirectional causality between ESG and the financial performance of the sample firms.
4. Other Robustness Testing Methods. Robust standard errors for firm-level clustering are added to the baseline regression analysis to avoid the effects of heteroskedasticity and within-group autocorrelation.

In addition, the nature of equity, as an important feature of corporate governance, influences management's investment decision-making behavior, which in turn affects corporate ESG practices. This study explores the diversity among sample companies by classifying sample companies according to their ownership structure and distinguishes state-owned enterprises and non-state-owned enterprises, thereby enhancing empirical surveys and broadening the breadth and depth of research.

RESULTS

Descriptive Statistics

Descriptive statistics, as the first step in data research, are listed in Table 3. ROA as a dependent variable varied significantly within the data set, ranging from as low as -0.232 to as high as 0.197, indicating considerable fluctuations in the financial performance of the companies examined. The mean ROA is 0.038, and the standard deviation is 0.065, indicating a relatively stable average profitability. The median ROA of 0.039, closely aligned with the mean, suggests a concentrated data distribution. Regarding the independent variable ESG, the average value is 4.215, and the standard deviation is 0.896. This suggests that significant variations exist in the ESG profiles of the sample. The median ESG score of 4.000 indicates that most firms' ESG performance is at a moderate level. The financing constraints variable, KZ, averaged 0.810 (SD = 2.361) and ranged from -5.996 to 6.611, underscoring prevalent and highly variable financing constraints among the sample firms. The descriptive statistics for the remaining variables align with prior literature and fall within expected ranges (Awaysheh et al., 2020; Wang & Chen, 2024).

Table 2. Descriptive Statistical Table.

VarName	Obs	Mean	SD	Min	Max	Median
ROA	9720	0.038	0.065	-0.232	0.197	0.039
ESG	9720	4.215	0.896	1.250	6.000	4.000
KZ	9720	0.810	2.361	-5.996	6.611	1.077
Size	9720	22.331	1.170	19.743	25.556	22.175
ListAge	9720	2.248	0.686	0.000	3.332	2.303
Growth	9720	0.174	0.463	-0.652	3.532	0.083
Board	9720	2.087	0.188	1.609	2.565	2.197
Indep	9720	0.380	0.055	0.333	0.571	0.364
Top1	9720	0.314	0.137	0.089	0.717	0.294

Correlation Analysis

Table 4 indicates a correlation of 0.242 between ROA and ESG metrics, demonstrating a notable positive association with a p-value at the 1% threshold. This suggests that firms actively implementing ESG practices achieve notable financial performance gains, providing preliminary support for hypothesis H1. The coefficient of association between ESG and financing constraints (KZ) reveals a -0.203 value, suggesting a highly statistically negative relationship at the 1% confidence interval. This implies that stronger ESG performance is associated with reduced financing constraints, highlighting the role of robust ESG practices in alleviating financing barriers. Additionally, ROA and KZ show a strong inverse relationship, with a coefficient of -0.589 (significant at 1%), suggesting that financing constraints may hinder corporate financial performance.

Table 3. Pearson Correlation Analysis Results. Note: ***p<0.01, **p<0.05, *p<0.1.

	ROA	ESG	kz	Size	ListAge	Growth	Board	Indep	Top1
ROA	1								
ESG	0.242***	1							
kz	-0.589***	-0.203***	1						
Size	0.104***	0.243***	0.074***	1					
ListAge	-0.139***	-0.055***	0.185***	0.455***	1				
Growth	-0.023**	-0.025**	0.034***	-0.069***	-0.051***	1			
Board	0.043***	0.044***	-0.014	0.241***	0.173***	-0.007	1		
Indep	-0.032***	0.056***	0.042***	-0.019*	-0.028***	0.004	-0.595***	1	
Top1	0.175***	0.095***	-0.166***	0.091***	-0.089***	0.005	-0.024**	0.039***	1

The variance inflation factor (VIF) test is shown in Table 5. All variables had variance inflation factor (VIF) scores between 1 and 2, significantly below the cut-off of 10, while their tolerance levels (calculated by dividing 1 by the VIF) were greater than 0.1. This shows that there is no multicollinearity, meets the necessary conditions for panel data regression, and ensures the reliability of the analysis.

Table 4. Collinearity Diagnostics Table.

Variable	VIF	1/VIF
ESG	1.16	0.863171
KZ	1.11	0.898741
Board	1.70	0.587851
Indep	1.60	0.625289
Size	1.50	0.668362
ListAge	1.37	0.727823
Top1	1.06	0.945454
Growth	1.01	0.992131

Regression Analyses

Model (1) investigates the effect of ESG performance on the financial performance of listed Chinese manufacturing firms. The ESG regression coefficient was 0.014 and statistically significant ($p < 0.01$). Holding other variables constant, a single-point rise in ESG score improves financials by roughly 0.014, meaning a one-point rise in ESG ratings for these firms increases their return on total assets by 0.014%. This demonstrates that proactive ESG practices by listed Chinese manufacturing firms yield substantial financial benefits, thereby confirming hypothesis H1.

Model (1) confirms the direct positive effect of ESG performance on financial performance. The study investigates the impact of financing constraints through stepwise regression analysis. Initially, Equation (2) analyzes ESG's influence on financing constraints, showing a coefficient of -0.550 for ESG, $p < 0.01$. This indicates that stronger ESG performance significantly reduces financing constraints, supporting the notion that ESG performance indirectly enhances corporate financial performance by easing financing barriers. Next, Model (3) incorporates financing constraints into Model (1) to test their mediating effect. In Model (3), the direct coefficient of ESG performance on financial performance is 0.005, lower than the 0.014 in Model (1) but still significant at the 1% level, demonstrating that ESG performance maintains a positive effect on financial performance even when accounting for financing constraints. This supports the direct effect hypothesis. In Model (3), financing constraints display a pronounced adverse impact on ROA, registering a regression coefficient of -0.015, indicating that increased constraints diminish performance gains. Thus, ESG performance in listed Chinese manufacturing firms not only directly enhances financial performance but also indirectly improves it by mitigating financing constraints, thereby supporting Hypothesis H2.

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Table 5. Results of Model Regression Analysis. Note: ***p<0.01, **p<0.05, *p<0.1.

	(1)	(2)	(3)
	ROA	KZ	ROA
ESG	0.014***	-0.550***	0.005***
	(18.971)	(-20.189)	(8.064)
KZ			-0.015***
			(-66.018)
Size	0.007***	0.175***	0.009***
	(10.335)	(7.296)	(16.766)
ListAge	-0.017***	0.479***	-0.009***
	(-15.856)	(11.675)	(-9.600)
Growth	-0.003**	0.210***	0.001
	(-1.990)	(4.202)	(0.535)
Board	0.005	-0.278*	0.003
	(1.144)	(-1.738)	(0.719)
Indep	-0.050***	2.297***	-0.012
	(-3.515)	(4.304)	(-0.975)
Top1	0.062***	-2.525***	0.022***
	(13.540)	(-14.796)	(5.784)
_cons	-0.141***	-1.401**	-0.158***
	(-8.787)	(-2.344)	(-11.886)
N	9720	9720	9720
R2	0.109	0.101	0.384
Adj. R2	0.108	0.101	0.384

Robustness Tests

Variable Substitution Tests

To validate findings and assess the robustness of benchmark regressions against chance occurrences or sample bias, this study uses ROE as a proxy indicator of financial performance to verify the robustness of the results (Chen et al., 2023). ROE, calculated as net profit over average shareholder equity, reflects a firm's efficiency in generating owner value through capital utilization. Regression models (1) and (3) yielded ESG coefficients of 0.025 and 0.010, respectively; both proved significant ($p < 0.01$). These results are consistent with those obtained using ROA as a financial performance indicator, further supporting the view that good ESG performance has a positive impact on a company's financial performance. Furthermore, for Model 3, financing constraints (KZ) display a highly statistically negative association at the 1% confidence level, with a -0.025 coefficient. These results further confirm that ESG performance in listed Chinese manufacturing firms enhances financial performance by mitigating financing constraints.

Table 6. Regression Analysis with Replacement Variables. Note: ***p<0.01, **p<0.05, *p<0.1.

	(1)	(2)	(3)
	ROE	KZ	ROE
ESG	0.025***	-0.550***	0.010***
	(16.181)	(-20.189)	(6.909)
KZ			-0.025***
			(-49.636)
Size	0.021***	0.175***	0.025***
	(15.449)	(7.296)	(20.732)
ListAge	-0.030***	0.479***	-0.018***
	(-13.792)	(11.675)	(-8.671)
Growth	0.002	0.210***	0.007***
	(0.879)	(4.202)	(2.867)
Board	0.003	-0.278*	0.001
	(0.371)	(-1.738)	(0.125)
Indep	-0.092***	2.297***	-0.023
	(-3.061)	(4.304)	(-0.845)
Top1	0.115***	-2.525***	0.048***
	(11.938)	(-14.796)	(5.573)
_cons	-0.457***	-1.401**	-0.490***
	(-13.545)	(-2.344)	(-16.388)
N	9720	9720	9720
R2	0.100	0.101	0.283
Adj. R2	0.100	0.101	0.282

Mediated Effects Test

Leveraging Wen & Ye's (2014) framework, this research utilizes the Bootstrap sampling method to rigorously evaluate the mediating variable's resilience. The Bootstrap method constructs empirical sampling distributions without requiring predefined distributional shapes through repeated sampling. By generating numerous pseudo-samples via simulation, it maximizes the use of original data, enhances test sensitivity, and yields more robust results compared to the stepwise regression approach.

This study conducted 5,000 iterations for the Bootstrap analysis. The results indicate that the bias-corrected 95% confidence intervals for the direct effect [0.0036804, 0.0063098] and indirect effect [0.0074815, 0.0091881] exclude 0. Similarly, the percentile 95% confidence intervals for the direct effect [0.0036958, 0.0063351] and indirect effect [0.0074604, 0.0091579] also exclude 0. Results from Bootstrap sampling verify the existence and importance of financing constraints (KZ) as an intermediary factor. These research results support the H2 hypothesis and strengthen the stability and reliability of the proposed intermediary relationship. The findings are presented in Table 7.

Table 7. Bootstrap Sampling Method Test Results.

	OC	BootSE	Bootstrapping			
			Bias-corrected 95% CI		Percentile 95%	
			Lower	Upper	Lower	Upper
Ind_Eff	0.0083	0.0004	0.0074815	0.0091881	0.0074604	0.0091579
Dir_Eff	0.0049	0.0006	0.0036804	0.0063098	0.0036958	0.0063351

Lagged independent variables

To alleviate potential endogenous issues caused by the two-way causal relationship between a company's financial performance and ESG initiatives, where strong financial performance may have a positive impact on ESG work, this study introduced a lagging version of the ESG variable. Specifically, ESG was moved forward by one, two, and three cycles, respectively, resulting in new variables L.ESG, L2.ESG and L3.ESG, which was used to replace ESG in the regression analysis (Gao et al., 2023). As shown in Table 8. These lagging variables consistently show a statistically significant positive regression coefficient at the 1% level, providing strong evidence for the H1 hypothesis.

Table 8. Lagged Independent Variable Test Results. Note: ***p<0.01, **p<0.05, *p<0.1.

	(1)	(2)	(3)
	ROA	ROA	ROA
L.ESG	0.013***		
	(16.211)		
L2.ESG		0.011***	
		(13.376)	
L3.ESG			0.009***
			(9.683)
Size	0.008***	0.009***	0.010***
	(11.316)	(11.491)	(10.424)
ListAge	-0.017***	-0.015***	-0.015***
	(-12.916)	(-9.595)	(-7.299)
Growth	-0.002	-0.001	0.001
	(-1.584)	(-0.711)	(0.255)
Board	0.005	0.005	0.001
	(1.123)	(0.924)	(0.180)
Indep	-0.053***	-0.053***	-0.063***
	(-3.329)	(-2.891)	(-2.805)
Top1	0.065***	0.063***	0.066***
	(12.567)	(10.487)	(8.977)
_cons	-0.169***	-0.195***	-0.200***
	(-9.463)	(-9.518)	(-8.003)
N	7776	5832	3888
R2	0.108	0.106	0.104
Adj. R2	0.107	0.105	0.102

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Other Robustness Testing Methods

To address the problems caused by heteroscedasticity and autocorrelation, primary regression analysis was enhanced by applying robust standard errors, and clustering was performed at the company level (Younas, 2023). Per the information displayed in Table 10, the regression coefficients and significance ratings for the independent, mediating, and control factors align rather closely with those noted in the baseline regression assessment, providing strong evidence for hypotheses H1 and H2.

Table 9. Other Robustness Test Results. Note: ***p<0.01, **p<0.05, *p<0.1.

	(1)	(2)	(3)
	ROA	kz	ROA
ESG	0.014***	-0.550***	0.005***
	(17.922)	(-20.339)	(7.498)
KZ			-0.015***
			(-58.386)
Size	0.007***	0.175***	0.009***
	(10.333)	(7.312)	(16.568)
ListAge	-0.017***	0.479***	-0.009***
	(-17.069)	(11.148)	(-10.065)
Growth	-0.003*	0.210***	0.001
	(-1.785)	(4.022)	(0.467)
Board	0.005	-0.278*	0.003
	(1.068)	(-1.733)	(0.674)
Indep	-0.050***	2.297***	-0.012
	(-3.250)	(4.267)	(-0.915)
Top1	0.062***	-2.525***	0.022***
	(14.026)	(-14.671)	(6.075)
_cons	-0.141***	-1.401**	-0.158***
	(-8.234)	(-2.343)	(-11.423)
N	9720	9720	9720
R2	0.109	0.101	0.384
Adj. R2	0.108	0.101	0.384

Heterogeneity Analysis

State-owned enterprises (SOEs) maintain a close political connection with the government, serving as key pillars of the national economy. They hold a dominant role in economic development, benefiting from favorable government policies, financial subsidies, and resource support. In contrast, non-state-owned firms actively enhance their ESG performance to secure external resources and improve financial outcomes. Consequently, differences in ESG practices exist between SOEs and non-SOEs, potentially leading to varying impacts on their financial performance. In this study, sample firms are categorized by ownership type, with SOE=0 for non-state-owned firms and SOE=1 for state-owned firms. The empirical results, presented in Table 11, show the regression outcomes for these subgroups. Columns (1) and (2) indicate that the relationship between ESG practices and financial performance is significantly positive at the 1% level for both the non-SOE (SOE=0) and SOE (SOE=1) groups, with coefficients of 0.014 and 0.013, respectively. Thus, among listed manufacturing firms, the ESG performance of non-state-owned firms has a slightly greater positive impact on financial performance compared to state-owned firms.

Table 10. Heterogeneity Analysis. Note: ***p<0.01, **p<0.05, *p<0.1.

	(1)	(2)
	SOE=0	SOE=1
	ROA	ROA
ESG	0.014***	0.013***
	(16.565)	(9.065)
Size	0.009***	0.003**
	(10.780)	(2.460)
ListAge	-0.016***	-0.005**
	(-12.089)	(-2.131)
Growth	0.000	-0.005***
	(0.155)	(-2.615)
Board	0.007	0.022***
	(1.225)	(2.657)
Indep	-0.055***	0.015
	(-2.931)	(0.651)
Top1	0.074***	0.049***
	(13.244)	(5.527)
_cons	-0.191***	-0.142***
	(-8.738)	(-5.278)
N	7187	2533
R2	0.120	0.082
Adj. R2	0.119	0.079

Finding

The research reveals a considerable enhancement in the financial performance of manufacturing companies due to their ESG scores. Empirical findings indicate that higher corporate ESG performance markedly enhances financial outcomes, with the effect intensifying as ESG scores increase. A robust ESG track record does more than just showcase a company's dedication to environmental stewardship, social accountability, and sound governance—it builds credibility with stakeholders and paves the way for easier, more affordable resource acquisition. This virtuous cycle stems from the goodwill generated when businesses walk the talk on their societal commitments. Moreover, ESG performance partially complements financial information, reducing information asymmetry and increasing transparency, thereby attracting greater attention from investors and consumers. Additionally, the study reveals that the ESG performance of non-state-owned firms in the manufacturing sector contributes more substantially to financial performance compared to state-owned firms.

Financing constraints play a significant mediating role in the relationship between corporate ESG performance and financial performance. Manufacturing firms that actively promote ESG practices align with national policies, securing specialized policy support, subsidies, and financing facilities. These enable multi-channel financing, enhance financing opportunities, and lower financing costs, which are critical for long-term sustainable development and improved financial performance. Additionally, by fulfilling ESG responsibilities and transparently disclosing ESG information, firms cultivate a positive reputation among stakeholders, strengthening their capacity to mitigate and manage major financial risks.

DISCUSSION

The findings from this particular research indicate that ESG performance has a significant positive impact on the financial performance of Chinese manufacturing firms. This relation is found both directly and indirectly via reduced financing constraints. The empirical findings of this research have indicated that ROA and ROE have a significant positive impact on the ESG parameters. The results are consistent with previous literature conducted in both developed and emerging markets. For instance, the research by Chen et al. (2023) and Shaikh (2022) concluded that ESG-oriented firms achieve

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stronger financial outcomes. This is due to enhanced stakeholder trust, lower reputational risk, and long-term value creation. Furthermore, Shaikh (2022) also suggests that having a higher ESG performance also improves operational compliance and sustainability. This helps firms to minimize potential risks in terms of internal and external environmental governance. As a result, their operational performance improves. Another study by Zheng et al. (2022) argues that ESG performance can increase firm value by improving relationships with customers, investors, and regulators. The study posits that stakeholders provide greater support to the firm by backing policies and capital financing. As a result, business operations remain stable, which ultimately improves financial performance.

The results of the empirical analysis indicate that financing constraints play a significant mediating role. As a result, improved ESG performance reduces financing constraints (KZ index). Hence, this means that firms provide better financial outcomes. This result aligns with findings from Bai et al. (2022) and Qian (2024), who posit that firms with strong ESG records are more attractive to creditors and investors. This is due to their lower information asymmetry and improved risk profiles. The same is also highlighted by Cui et al. (2018), who support the theoretical foundation by showing that ESG initiatives help reduce information asymmetry, facilitating more efficient capital allocation.

Finally, the results of the study also reveal that the financial impact of ESG is more pronounced for non-state-owned enterprises (non-SOEs) than SOEs. This is understood from the results of the heterogeneity test. As per Zhang et al. (2023), non-SOEs lack preferential government access to resources. Hence, they rely more on ESG to gain external financing. Hence, the same result is validated through this research.

CONCLUSIONS

This study examines the correlation between ESG, financial constraints, and financial performance, using Chinese A-share manufacturing companies from 2019 to 2023 as the research object. The empirical test results indicate that:

1. Good ESG performance can lead to good performance gains, and the performance of non-state-owned firms is even more prominent.
2. The results of the mediating effect test indicate that positive ESG practices among listed manufacturing companies in China help alleviate corporate financing constraints, thereby improving corporate financial performance. In addition, financing constraints played a partial mediating role between ESG rating performance and corporate financial performance.

Recommendations

Organizations need to integrate ESG considerations into their basic strategic frameworks and implement targeted initiatives to promote environmental sustainability, social responsibility, and strong corporate governance. Doing so can improve their financial situation and help maintain a competitive advantage in sustainable practices. Specifically, firms should optimize resource use, improve labor conditions, and strengthen governance frameworks to minimize information asymmetry between management and shareholders. Furthermore, companies should consistently monitor and disclose their ESG performance, ensuring high transparency and ongoing improvement. By recognizing and harnessing the potential of ESG performance, firms can alleviate financing constraints, lower financing costs, boost investor confidence, and ultimately improve corporate performance and returns.

Policymakers should introduce more measures to encourage companies to improve their environmental, social, and governance (ESG) standards, including providing tax incentives and financial support, while tightening rules around ESG-related disclosure. A stronger oversight system is crucial to verifying that the information provided is accurate and comprehensive. These measures will support the long-term development of the industry and help investors make smarter investment choices. From an investor's perspective, greater weight should be given to a company's ESG performance during capital allocation, with its financing activities and disclosures serving as key indicators of long-term value. Strong ESG performance typically reflects superior management quality and reduced operational risks, allowing investors to optimize portfolios by prioritizing these traits, thereby balancing social responsibility with economic returns.

Limitations and Future Research

This study empirically investigates the interplay among ESG, financing constraints, and financial performance, focusing on listed Chinese manufacturing firms, but it faces certain limitations due to objective constraints. First, the investigation into the impact of ESG on financial performance focuses solely on the mediating effects of financing constraints, possibly neglecting alternative pathways of influence. Second, while several control variables affecting financial performance are

included, limitations in scope and academic capacity prevent the inclusion of all relevant factors, which may result in omitted variables and less precise empirical outcomes. In addition, the study focused exclusively on publicly traded manufacturing firms, leaving out smaller, privately held businesses. This narrow focus might mean the findings don't necessarily apply across the board to all manufacturing companies, particularly those that aren't publicly listed.

Future research should expand its scope to comprehensively investigate various other factors that affect the link between ESG efforts and financial performance. Additionally, expanding the sample to include publicly listed and private manufacturing companies, as well as companies in other industries, will improve the robustness and applicability of the research results.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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ВЗАЄМОЗВ'ЯЗОК МІЖ ESG, ФІНАНСОВИМИ ОБМЕЖЕННЯМИ ТА ФІНАНСОВИМИ ПОКАЗНИКАМИ: ДОСВІД КИТАЮ

ESG став міжнародно визнаним показником загального рівня розвитку всередині компанії. У цьому дослідженні емпірично вивчається вплив ESG на корпоративні фінансові показники китайських компаній, що котируються на біржі А, у виробничій галузі за 2019-2023 роки. У дослідженні розглянуто методи панельної регресії з метою перевірки гіпотез. Крім того, процес медіації також розглянуто для розуміння впливу фінансових обмежень. Оцінки ESG були отримані з рамкової системи рейтингу Huazheng ESG, а фінансові дані та дані фірм були отримані з бази даних CSMAR. За результатами дослідження встановлено, що показники ESG мають статистично значущий і позитивний вплив на фінансові показники (коефіцієнт = 0,014, p<0,01). Крім того, було виявлено, що показники ESG пом'якшують фінансові обмеження (коефіцієнт = –0,550, p < 0,01), що в свою чергу позитивно впливає на фінансові результати (коефіцієнт = –0,015, p < 0,01). Це вказує на наявність часткового опосередкованого ефекту. Нарешті, аналіз підгруп показує, що фінансові вигоди від практик ESG більш виражені в недержавних підприємствах (коефіцієнт = 0,014, p < 0,01), ніж у державних підприємствах (ДП) (коефіцієнт = 0,013, p < 0,01). Це свідчить про те, що структура власності відіграє пом'якшувальну роль у відносинах. Це дослідження надає емпіричні докази того, що оптимізація ефективності ESG може підвищити ринкову конкурентоспроможність зареєстрованих на біржі виробничих компаній у Китаї, а також пропонує теоретичне підґрунтя для вироблення внутрішньої економічної політики компаній. Це також має суттєві наслідки для компаній, оскільки дослідження показує, що принципи ESG повинні бути впроваджені компаніями для забезпечення стратегічного планування, а також для зменшення фінансових обмежень і покращення фінансових результатів.

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Ключові слова: ESG, фінансові обмеження, фінансові показники, корпоративне управління, емпіричний аналіз, виробничий сектор, сталий розвиток

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