The Impact of ESG Practice on Firm Value and the Moderating Effect of Financial Constraints: Evidence from China

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The Impact of ESG Practice on Firm Value and the Moderating Effect of Financial Constraints: Evidence from China

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Abstract

This study examines the impact of Environmental, Social, and Governance (ESG) ratings on firm value, using Chinese A-share listed firms from 2018 to 2022. This study finds that ESG scores have a positive impact on firm value during the entire sample period. When examining the impact of the three sub-dimensions on firm value, only social and governance scores have significant positive effects, whereas environmental scores have no significant impact. Additionally, financing constraints moderate the impact of ESG scores on firm value. Compared to financing constrained firms, the ESG rating of non-financing constrained firms has a positive moderating effect on the impact of firm value. The robustness test verifies the validity of the conclusion, suggesting that non-financing constrained firms can actively improve ESG performance to improve firm value.

Key Words: ESG; Firm Value; Financing Constraints

1. Introduction

Environmental, social, and governance (ESG) represents the environmental protection, social responsibility and corporate governance of firms. This emphasizes that firms should protect the environment while developing the economy, take the initiative to assume social responsibility and protect stakeholders' legitimate interests. It has become an important indicator of firms' sustainable development ability in recent years, and an increasing number of investors and investment institutions fully consider the ESG level before making investment decisions. As China is focusing on the impact of climate change, energy conservation, and emissions reduction efforts and actively practicing green sustainable economic development, environmental protection, social responsibility, corporate governance, and other aspects of firms' problems have also shown blowout outbreaks over time. Chinese firms inevitably practice ESG's to maintain long-term performance growth and

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achieve sustainably higher firm value. Chinese regulatory departments have issued several laws and regulations successively in recent years, formulating corresponding standards for firm environmental information disclosure, clarifying the responsibility of environmental information disclosure of key pollutant-discharging units and putting forward the ESG which is highly consistent with the present stage of economic development and the advocated development strategy to assess and practice the concept of sustainable development. Studies on the impact of ESG on firm value can provide a reference for firms to improve their ESG practices and invest in ESG activities. Simultaneously, it is of great significance to promote long-term and stable development and guide firms to actively participate in and practice sustainable development.

With the continuous development of green finance, ESG has become an important concept and practical tool for building green capital markets. Various international organizations and investment institutions continue to promote the development of ESG, successively introducing more relevant evaluation systems and investment products. In the past several years, some Chinese domestic agencies have launched ESG rating data, such as the SynTao Green Finance ESG Ratings (June 2018), China Social Value Investment Alliance ESG Rating (December 2019), Huazheng ESG Rating (April 2020), Wind ESG Rating (June 2021), and Sino-Securities Index ESG Rating (July 2020). Among them, only the Wind ESG rating provides numerical data related to ESG as a whole, as well as numerical scores for the three single pillars (E, S, and G); however, it only covers A-share listed firms after 2018. In other words, we know very little about Chinese companies' ESG performance over the past dozen years.

Simultaneously, capital is a crucial foundation for the sustainable development of enterprises, and fulfilling ESG responsibilities requires a significant amount of funding. Financial constraints refer to the limitations a firm faces in terms of access to financial resources such as capital and credit. These constraints can affect a firm's ability to invest in and implement projects or initiatives, as well as its ability to generate returns on those investments. Some of the more common methodologies include the Kaplan–Zingales (Kaplan and Zingales, 1997) index, the Whited and Wu (2006) index of financial constraint, and the Hadlock and Pierce (2010) index. The measure proposed by Kaplan and Zingales (1997) is a major innovation in corporate finance research. However, as Hadlock and Pierce (2010) show, the predictive power of the SA index, using data from a sample of publicly traded companies, outperforms the KZ and WW indices in predicting the impact of financial constraints on a company's investment decisions. They also find that the SA index is more robust to different sample sizes and time periods, and is less sensitive to changes in the market value of a company's assets. If companies face low financing constraints, readily available and low-cost funds facilitate their conscientious implementation of ESG principles and proactive fulfillment of ESG responsibilities. Improvements in ESG performance can help companies accumulate more social and reputational capital, leading to greater support from stakeholders and positive feedback from the market, thereby enhancing firm

performance. Conversely, severe financing constraints weaken enterprises' enthusiasm to fulfill their ESG responsibilities. Research findings on the relationship between financing constraints and firm performance are still debated. Some scholars argue that financing constraints may inhibit improvement in firm performance, whereas others suggest that financing constraints may benefit firm performance (Lamont et al., 2001). Against the backdrop of China's relatively immature capital market, firms face significant financing constraints. Fulfilling ESG responsibilities requires substantial financial investment. This study examines whether financing constraints moderate the impact of ESG on firm value.

This study is one of the first to evaluate ESG performance based on ESG-related numerical data disclosed by Chinese A-share listed firms rather than using ESG grade ratings. Moreover, analyzing each pillar of ESG provides a more in-depth understanding of the sustainability context. Additionally, this study enriches the research theory on the influence mechanism of the value effect of a firm's ESG performance by introducing financing constraints into the research process. The remainder of this paper is organized as follows: Section 2 presents a literature review and proposes the research hypotheses. Section 3 presents the empirical study design, including sample data collection, variable explanations, and model designs. Section 4 presents the empirical results and analysis, including regression analysis, robustness tests, and a discussion of endogeneity. Finally, Section 5 concludes the paper by summarizing the findings and providing suggestions.

2. Literature Review and Research Hypotheses

2.1 The Effect of ESG on Firm Value

Meta-analyses have been conducted to examine the relationship between ESG factors and firm value and profitability. According to Friede et al. (2015), researchers have searched for a link between ESG and corporate financial success since the 1970s. After examining 2,200 papers, they found that the research supported the case of investing in ESG, with approximately 90% of the studies demonstrating a positive association between ESG and firm financial performance. More recently, Whelan et al. (2021) conducted a meta-analysis of over 1,000 papers published between 2015 and 2020 and found that 58% of the studies showed a positive relationship between ESG and financial performance, 8% found a negative relationship, 13% found no relationship, and 21% found mixed results. The authors concluded that while most studies found a positive relationship, there is no consensus on this issue.

The ESG performance supporters, such as Fatemi et al. (2018), investigated US companies from 2006 to 2011 and found that strength in ESG activities and disclosure improved firm value. Dalal and Thaker (2019) examined 65 Indian enterprises between 2015 and 2017 and found that ESG scores had a positive effect on financial success. Velte (2017) found that ESG has a positive effect on firm value

(as measured by Tobin's Q) and profitability (as measured by return on assets [ROA]) for firms in Germany and that governance has a significant effect on financial performance. Yoon et al. (2018) examined the link between ESG ratings and market value in Korea and found that corporate social responsibility (CSR) initiatives have a favorable and considerable effect on a firm's market value, although the effect may vary depending on the firm's characteristics.

However, some empirical studies find that a company's ESG performance may negatively impact its value. According to Barnett (2007), investment in CSR may have a detrimental influence on corporate financial performance because funds are reallocated from shareholders to other stakeholders. Several country-specific studies have found an inverse association between ESG performance and business value. Brammer et al. (2006) used market returns and examined the influence of corporate social performance on enterprises in the United Kingdom and discovered that firms with low social scores outperformed the market. Landi and Sciarelli (2019) studied 54 publicly traded Italian companies from 2007 to 2015 and found a negative association between ESG rankings and financial success. Folger-Laronde et al. (2020) investigated the relationship between ESG ratings and the financial returns of exchange traded funds (ETFs) in Canada during the COVID-19 epidemic and discovered that good ESG performance in ETFs did not guarantee protection during significant market downturns. A few multicountry studies have also discovered a negative association between ESG performance and business value. Duque-Grisales and Aguilera-Caracue (2019) examined 104 multinational corporations in Latin America from 2011 to 2015 and discovered a negative association between ESG scores and financial success. Garcia and Orsato (2020) analyzed emerging and established countries using 2,165 enterprises from 2007 to 2014 and discovered a negative association between ESG scores and financial success in emerging markets.

The relationship between ESG performance and firm value is complex and may vary depending on various factors, including the specific industry in which a company operates and the ESG issues most relevant to that industry. Consequently, the impact of ESG on firm value may be mixed, with some pillars experiencing a positive impact, and others experiencing a negative or no impact (Han et al. 2016; Atan et al. 2019; Saygili et al. 2021). As China attaches great importance to the sustainable development of firms, the literature on ESG and China has increased significantly in recent years, primarily focusing on ESG disclosures, ratings, and investing (Shen et al. 2023). Most empirical results show that better ESG performance improves China's financial performance (Deng and Cheng, 2019; Feng et al. 2022; Chen et al. 2023). However, not all the studies conducted in China have yielded positive results. Zhang et al. (2022) investigated whether and how ESG investing works in China and found a nonlinear relationship between ESG and portfolio excess returns. Owing to limited evidence, whether Chinese listed firms' attempts to improve ESG performance can enhance firm value remains controversial. Therefore, hypothesis 1 is proposed:

H1：ESG score positively affects firm value for China's listed companies.

2.2 The Moderating Effect of Financial Constraints

Financial constraints refer to the limitations a firm faces in terms of access to external financial resources or financing its chosen investments (He and Ren, 2017). These constraints can affect a firm's ability to invest in and implement ESG initiatives, as well as its ability to generate returns on those investments. Therefore, financial constraints play a crucial role in firms' financing and investment decisions (Xiao and Wang, 2020). The role of financing constraints in this relationship mainly includes two aspects.

First, the degree of financing constraint determines the degree of ESG investment. Firms' financing constraints affect their investment behavior and decisions (Junlu et al., 2009), thus affecting the degree of their ESG investment. Firms under less pressure from financing constraints have more liquidity (Chan et al., 2010) and the ability to invest in ESG, thereby increasing their value. Firms with high financing constraint pressure have poor capital liquidity, high capital pressure, high external financing pressure, poor initiative, and poor ability to invest in ESG (Xu and Zhu, 2024). Second, according to the stakeholder theory, the degree of financing constraints affects the investment attitude of stakeholders. The better the information revealed by ESG, the better the operation and development of the company, the more resources and inputs it receives from stakeholders, the lower the pressure of financing constraints and financing costs, and the higher the firm value. However, the economic benefits of a company's investment in ESG lag. Stakeholders cannot see the profitability of a company's ESG through the interference of financing constraints and cannot invest resources in the company in a timely manner. For firms with high financing constraints, the long-term failure to obtain the resource input of stakeholders reduces their income from ESG investment, leading to difficulties in enterprise operations. Therefore, financing constraints restrain the improvement of firm value through ESG investment.

Empirical studies on financing constraints and ESG performance have primarily focused on the mediating role of financing constraints. Improving ESG performance can improve corporate performance by alleviating financial constraints (Hong et al., 2012; Cheng et al.,2014). However, few empirical studies have examined the moderating effects of financing constraints. Alsahlawi et al. (2021) investigated the role of financial constraints in moderating the environmental sustainability disclosure–stock return relationship among listed Saudi firms. Their findings suggest that the impact of environmental disclosures on stock returns is more negative for firms that face greater financial constraints. Financially constrained firms may have limited resources to invest in environmental initiatives, leading investors to demand higher returns to compensate for the perceived risks associated with both environmental performance and financial constraints. Xu and Zhu (2024) examined the correlation between ESG performance and corporate financial performance in A-share listed firms. Their findings suggest that when corporations face financial constraints, the capacity of ESG performance to enhance ROA weakens.

Overall, financial constraints can be a factor that moderates the relationship between a firm's ESG practices and its financial performance and value. The rapid development of the Chinese economy implies abundant investment opportunities for listed Chinese firms. However, lagging capital market development has led to significant financing constraints for several firms. Recently, numerous private and high-tech firms have chosen to go public. Compared to traditional state-owned firms undergoing transformation, these firms tend to have smaller scales and higher proportions of intangible assets, thus facing more severe information asymmetry issues in the capital market (Chan et al. 2012). Based on this analysis, we propose the following research hypotheses:
H2: Compared with financing constrained firms, ESG scores of non-financing constrained firms have a more positive effect on firm value.

3. Design on Empirical Research

3.1 Data and Sample

We focused on Chinese A-listed firms and extracted financial data from China Stock Market & Accounting Research Database (CSMAR) and ESG data from the WIND database. However, as WIND ESG only started publishing its data from 2021, we could only access the ESG rating data from 2018 to 2022. Therefore, the study was conducted over the entire study period. Additionally, we performed a series of data processing steps during the data collection process, which involved: 1. Excluding listed firms with special treatment and those undergoing particular transfers. 2. Excluding listed financial firms. 3. Excluding listed firms with missing data. 4. Winsor variables other than ESG and logarithmically treated variables to the 1st and 99th percentiles of their distributions. After these steps, we obtained 4024 listed firms with 11698 firm-year observations.

3.2 Variables Design

3.2.1 The Dependent Variables

Several researchers prefer Tobin's Q to measure firm value (Atan et al., 2018; Saygili et al., 2021; Giannopoulos et al., 2022). Tobin's Q is a financial metric developed by Nobel Laureate James Tobin. It is widely regarded as the most authoritative measure of a company's market value, as it considers not only the current market value of a company's assets but also the company's expected future profitability. Tobin's Q reflects the market's expectations of a company's future performance and profitability and is often used as a proxy for the market's assessment of a company's overall value, including its ESG performance. Therefore, Tobin's Q is often used as a dependent variable in studies examining the relationship between a company's ESG practices and its financial performance and value. Tobin's Q in this study was calculated as follows:
Tobin's Q = (Market value of shares outstanding at year-end + Market value of non-marketable shares

at year-end + Market value of net debt at year-end)/Total assets at year-end

Price-to-book (P/B) ratio is a financial metric that compares the market value of a company's shares to its book value, which is the value of the company's assets as reported in its balance sheet. The P/B ratio is often used as a measure of a company's value and can be used to compare the valuations of different firms within the same industry. The P/B ratio is calculated as follows:

Price to book ratio = Market Price per share / Book Value per share

This study uses the P/B ratio as a robustness test to prove the relationship between ESG and Tobin's Q because it is less sensitive to changes in a company's earnings or other factors that may affect Tobin's Q. This makes it a useful tool for examining the stability of the relationship between ESG and values over time. By including both measures, a study can provide a more comprehensive assessment of the relationship between a company's ESG practices and value.

3.2.2 The Explanatory Variables

The ESG, as the core explanatory variable of this study, represents a company's attitude regarding human rights, integration of sustainability into core operations, emission reduction, and environmental protection among others. In this study, data were selected from the WIND ESG, which was first obtained in 2021. The Wind ESG composite score corresponds to different ESG ratings and the ESG composite score is composed of the management practice score (total score of 7) and controversial event score (total score of 3). The ESG management practice score is reflected in firms' E/S/G performance, which is calculated as

*The ESG management practice score = 70% * Σ (E/S/G dimension score x E/S/G dimension weight)*

The ESG controversial event score is defined as all the negative news and penalties among others related to sustainability that one firm has faced recently and is calculated as:

The ESG controversial event score= 3 - Σ (Regulatory penalty event demerit points + Lawsuit event demerit points + negative news demerit points)

Therefore, the composite ESG score used as the explanatory variable in this study is as follows:

The composite ESG score = The ESG management practice score + The ESG controversial event score

WIND ESG not only provides overall scores but also individual ratings for each component(E/S/G), which allows for a thorough examination of the impact of each component on firm value.

In addition, to measure the ESG performance of Chinese-listed firms, we followed Lin et al. (2021) by applying the ESG rating developed by Sino-Securities Index Information Service (Shanghai) Co. Ltd. Wind ESG database also provides the ratings divided into nine levels – "C," "CC," "CCC," "B," "BB," "BBB," "A," "AA," and "AAA." Previous studies often assign a score of nine to an "AAA" ESG rating, eight to an "AA" rating, and so on, until one is assigned to a "C" rating. In this study, we generate dummy variables for ratings to examine the effect of different ratings on firm value, which we use in the robustness test.

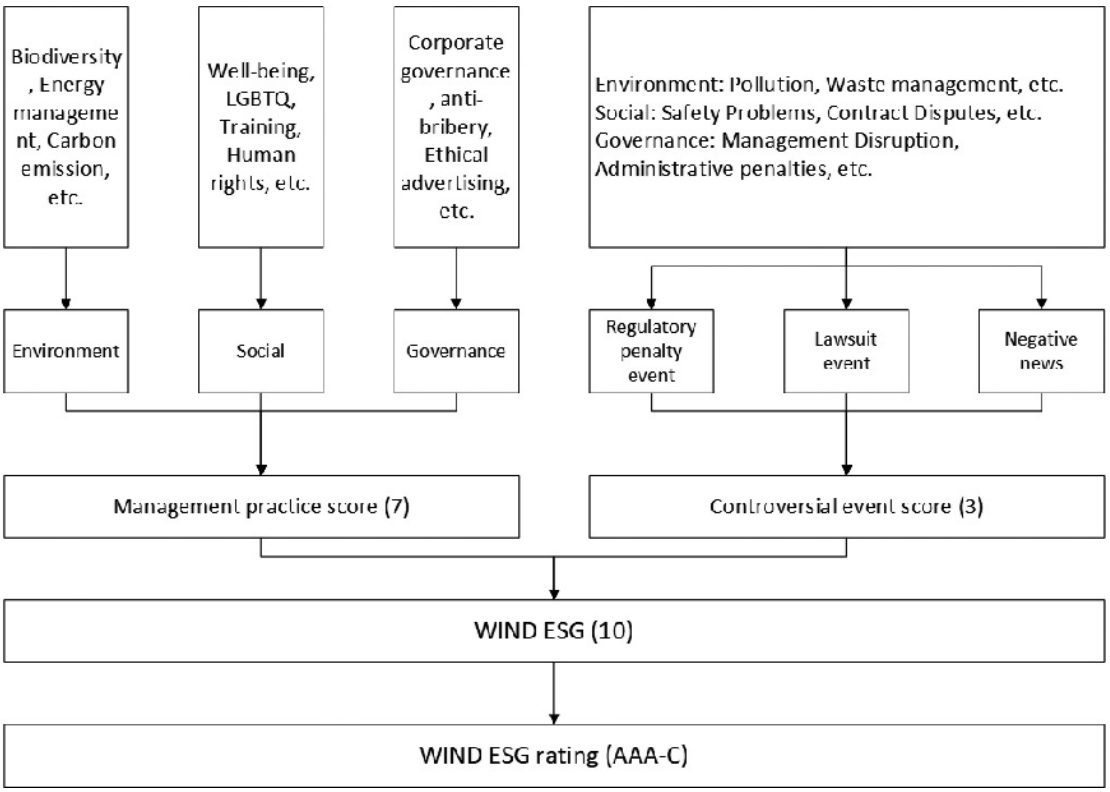

Figure 1　Wind ESG Explanation

3.2.3　The Moderating Variables

We employed the SA index (Hadlock and Pierce, 2010) as a proxy for the degree of a firm's financial constraints. The SA index is calculated as follows:

$$SA_{i,t} = -0.737 \times Size_{i,t} + 0.043 \times Size_{i,t}^{2} + -0.04 \times Age_{i,t}$$

According to the localization improvements made by Chinese scholar Ju (Ju et al., 2013) to the SA index, the CSMAR database calculates the SA values for Chinese listed firms using a modified method. The index values are all negative, the smaller the value, the more severe the financing constraints. This study generates interaction terms between the ESG score, the three sub-dimension scores and the SA index to test the moderating effect of financing constraints. In addition, we use grouping regression and alternative indices to test the robustness of the results. Following the approach of most scholars, this study divides SA values into two groups: 1) non-financial constrained firms (NFC) for firms below the median of the SA index absolute value and 2) financial constrained firms (FC) for firms above the median of the SA index absolute value. The group with financing constraints is assigned a value of 0, whereas the group with non-financing constraints is assigned a value of 1. Moreover, we apply WW-index to test their stability.

3.2.4 The Control Variables

In this study, we use Firm size (Lnta), Leverage (Lev), and Return on assets (Roa). Firm growth (Growth), Operating cash flow (Ocf), Ownership ratio (Owner), Listing age (Lnage), and Dividend payout ratio (Divd) as control variables. Table 1 presents definitions of the variables.

3.3 Model Design

A panel data regression is used to investigate the research objectives of this study. This technique allows the extraction of data from datasets containing data on many participants and time periods. Together with additional variables in an equivalent period, the panel data set enables an important examination of how information evolves over time. To test our hypotheses, the following regressions are used:

$$TobinQ_{i,t}=\beta_0+\beta_1 esg_{i,t}+\beta_2 control_{i,t}+\gamma_i+\delta_t+\epsilon_{i,t} \quad (1)$$

Include interaction terms to test for moderation effects:

Table 1 Variables Definitions

Variable	Symbol	Variable Definition
Firm value	Tobin's Q	(Market value of shares outstanding at year-end + Market value of non-marketable shares at year-end + Market value of net debt at year-end)/Total assets at year-end
ESG score	ESG	ESG scores range from 0-10
E score	E	E scores range from 0-10
S score	S	S scores range from 0-10
G score	G	G scores range from 0-10
Financial constraints	SA	An index to measure financial constraints (FC). The smaller the value, the more serious the degree of financing constraint
Firm size	Lnta	Natural logarithm of total corporate assets
Leverage	Lev	Total liabilities/Total assets
Return on assets	Roa	Net profit/ Total assets
Firm growth	Growth	(Current year's operating revenue-Previous year's operating revenue)/Previous year's operating revenue
Operating cash flow	Ocf	Cash flow generated from operating activities/Total assets
Ownership ratio	Owner	Number of shares held by the largest shareholder/Total number of shares
Listing age	Lnage	Natural logarithm of years of being listed as a public company
Dividend payout ratio	Divd	Cash dividend payout/ Retained earnings
Market to book value	Pb	Market value/Book value
SA dummy	SA_d	For Non-FC: $SA_d=1$; FC: $SA_d=0$
WW dummy	WW_d	For Non-FC: $WW_d=0$; FC: $WW_d=1$

$$TobinQ_{i,t}=\beta_0+\beta_1 esg_{i,t}+\beta_2 moderating_{i,t}+\beta_3 interaction_{i,t}+\beta_4 control_{i,t}+\gamma_i+\delta_t+\epsilon_{i,t} \quad (2)$$

Where $TobinQ_{i,t}$ represents the dependent variable firm value observed for firm i at time t, $esg_{i,t}$ denotes the explanatory variable ESG score observed for firm i at time t. $control_{i,t}$ represents the control variables. γ_i and δ_t control the industry and time fixed effect. $\epsilon_{i,t}$is the error term, representing unexplained stochastic variation in the model.

4. Empirical Results and Discussion

4.1 Descriptive Statistics

The descriptive statistics of the relevant variables are presented in Table 2. For the dependent variable, the minimum value of Tobin's Q is only 0.815 and the maximum value is 8.476, with a standard deviation of 1.219. The large difference between the maximum and minimum values indicates significant variation in the valuation of firms by the market. For the independent variable, ESG has a minimum value of 4.36 and a maximum value of 8.24; the difference between the maximum and minimum values is not large. The average ESG score is 6.015 points, with a standard deviation of 0.797, indicating that Chinese listed firms' ESG scores are relatively moderate and that there is room for improvement. From the subdimension scores for environment (E), social (S), and governance (G), the minimum for E is 0, the maximum is 8.78, and the average is only 1.74. For S, the minimum is 0.42, the maximum is 8.58, and the average is 3.985. For G, the minimum is 3.48, the maximum is 8.83, and the average is 6.505. The descriptive results of these sub-dimension scores indicate significant disparities in E and S. Particularly in E, with the lowest average, suggesting that many firms have not made significant environmental improvements. The higher average for G indicates relatively strong performance in corporate governance among Chinese listed firms, which is also consistent with our hypothesis. For the moderating variable, SA equals 1, implying that the firm belongs to the non-financial constraints group, and SA equals 0 for the financial constraints group. The distributions of the other related control variables are also within reasonable ranges.

4.2 Regression Results

Table 3 shows the regression results for Model (1). Regression (1) shows that ESG has a positive relationship with Tobin's Q and is significant at the 1% level. The coefficient is 0.101, indicating that an ESG score of one higher increases Tobin's Q by 0.101. This finding suggests that ESG performance positively affects firm value. Among the three sub-dimension scores, the coefficient of the E score is very low and not significant, suggesting that improving environmental scores may not increase firm value. A possible reason is that, at the current stage, the market believes that paying attention to environmental protection requires more costs, which may not bring about an increase in firm value in the short term. Both S and G scores are positive and significant at the 1% level, with

Table 2 Descriptive Statistics

Variable	N	Mean	SD	Min	Max
TobinQ	11698	1.854	1.219	0.815	8.476
ESG	11698	6.015	0.797	4.360	8.240
E	11698	1.740	2.034	0	8.780
S	11698	3.985	1.862	0.420	8.580
G	11698	6.505	0.922	3.480	8.830
SA	11698	-3.914	0.253	-4.496	-2.843
Lnta	11698	22.65	1.334	20.08	27.54
Lev	11698	0.460	0.187	0.064	0.896
Roa	11698	0.029	0.075	-0.348	0.212
Growth	11698	0.156	0.352	-0.608	1.915
Ocf	11698	0.052	0.065	-0.144	0.251
Owner	11698	0.349	0.164	0.038	0.760
Lnage	11698	2.144	0.943	0	3.332
Divd	11698	0.235	0.282	0	1.735
Pb	11698	3.779	2.725	1.175	19.21
SA_d	11698	0.500	0.500	0	1
WW_d	11698	0.500	0.500	0	1

Note: N is the number of samples. Mean is the mean of variables. SD is the standard deviation. Min is the minimum value. Max is the maximum value. The variable definitions are shown in Table 1.

coefficients of 0.040 and 0.039, respectively. The results show that improving social responsibility and governance can lead to higher firm value. Therefore, H1 is supported.

Table 4 shows the moderating effects of financial constraints. Column (1) shows that the SA index has a positive and significant effect on firm value; the lighter the degree of financing constraints faced by firms, the higher the value. Columns (2)-(5) show the moderating effect of SA; the coefficient of the interaction between ESG and SA is positive and significant at the 5% level. For the three sub-dimension scores, the interaction of E and SA is positive and significant at the 10% level, S and SA are positive at the 5% level, and the interaction of G and SA is not significant. This result indicates that the impact of the ESG score on firm value is moderated by financing constraints, particularly for the ESG overall score and S score. This suggests that non-financially constrained firms can improve their Tobin's Q by investing in ESG rather than financially constrained firms by investing in ESGs. This is because investments in ESG require considerable investment capital, and firms that find it much easier to acquire capital have more room to invest in renewable products without harming their main business, therefore, increasing their firm value. Thus, verifying the H2, indicating that non-

Table 3　Regression of Firm Value (TobinQ) and ESG Ratings

	(1) TobinQ	(2) TobinQ	(3) TobinQ	(4) TobinQ
ESG	0.101***			
	(0.019)			
E		0.011		
		(0.007)		
S			0.040***	
			(0.008)	
G				0.039***
				(0.014)
Lnta	−0.263***	−0.249***	−0.255***	−0.250***
	(0.017)	(0.017)	(0.017)	(0.017)
Lev	−0.424***	−0.471***	−0.450***	−0.467***
	(0.106)	(0.106)	(0.106)	(0.106)
Roa	1.957***	1.991***	1.971***	1.971***
	(0.255)	(0.256)	(0.255)	(0.256)
Growth	0.309***	0.306***	0.307***	0.304***
	(0.038)	(0.038)	(0.037)	(0.038)
Ocf	2.039***	2.044***	2.070***	2.047***
	(0.252)	(0.254)	(0.253)	(0.253)
Owner	−0.344***	−0.338***	−0.333***	−0.342***
	(0.100)	(0.100)	(0.100)	(0.100)
Lnage	0.039**	0.026	0.041**	0.029
	(0.020)	(0.020)	(0.020)	(0.020)
Divd	−0.286***	−0.280***	−0.287***	−0.280***
	(0.040)	(0.041)	(0.041)	(0.041)
Constant	6.922***	7.200***	7.185***	6.965***
	(0.339)	(0.350)	(0.334)	(0.338)
Observations	11698.000	11698.000	11698.000	11698.000
Adjusted R^2	0.251	0.248	0.250	0.248
Industry	YES	YES	YES	YES
Year	YES	YES	YES	YES

Note: This table reports the regression results based on Model (1). Column (1) uses the comprehensive ESG score as the independent variable, while the column (2), (3) and (4) use the E/S/G score as independent variables. The industry and year fixed effects are controlled. The variable definitions are shown in Table 1. Standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

financially constrained firms have an increasing effect on the positive relationship between ESG and firm value.

4.3 Robustness Tests

In addition to the standard regressions, a robustness check is performed. In the robustness check analysis, slight changes are made to the model, and the results are compared with the results of the baseline regressions.

4.3.1 Changing Dependent Variables

In this section, we use the market-to-book ratio (Pb) instead of Tobin's Q. Table 5 shows that the coefficient of ESG is 0.151, which is significant at the 1% level, indicating that ESG scores and the price-to-book ratio are positively related. Only the S score is significant at the 1% level; it is not significant for the E score. The coefficients of the ESG and S-scores are slightly higher than those of the baseline regression. This may be because the increase in the value of ESG for the company comes from an increase in the value of the stock market. Replacing the dependent variable showed that our conclusions are robust.

4.3.2 Changing Independent Variables

As WIND ESG database also provides a rating system with the levels – "C," "CC," "CCC," "B," "BB," "BBB," "A," "AA," and "AAA," dummy variables are created in this study for regression. There is no firm's rating filling in "C" and "CC," therefore, there are seven categories. In this study, we classify the rating into three groups, and the group with a rating of "BB" or below is classified as the group with poor ESG performance. Ratings of "BBB" and "A" are classified as moderate ESG performance groups. The "AA" and "AAA" ratings are placed in the excellent ESG performance group. The poor ESG performance group is used as the benchmark for comparison. Table 6 shows that when the score changes from poor to moderate, the coefficient is 0.116 and significant at the 1% level; when the score is excellent, the coefficient is 0.404 and significant at the 1% level. When the dependent variable is changed to Pb, the results remain the same, which further verifies that an improvement in the ESG score enhances firm value.

4.3.3 Grouped Regression of SA Index

To test the moderating effect of the grouped regression, Table 7 presents the results for two groups: Financial constraints (FC) and Non-Financial constraints (NFC). SA equals 1, implying that the firm belongs to the non-financial constraints group, and SA equals 0 for the financial constraints group. For the financing constraint group, the ESG score and each sub-dimension score have no significant influence on Tobin's Q. For the non-financing constrained group, all scores have a positive

Table 4　Regression of Interaction of Financial Constraints (SA)

	(1) TobinQ	(2) TobinQ	(3) TobinQ	(4) TobinQ	(5) TobinQ
SA	0.642***	0.605***	0.620***	0.613***	0.627***
	(0.080)	(0.080)	(0.082)	(0.080)	(0.082)
ESG		0.091***			
		(0.019)			
E			0.010		
			(0.007)		
S				0.034***	
				(0.008)	
G					0.038***
					(0.014)
ESG×SA		0.120**			
		(0.057)			
E×SA			0.038*		
			(0.021)		
S×SA				0.036**	
				(0.015)	
G×SA					0.048
					(0.048)
Lnta	−0.302***	−0.321***	−0.311***	−0.310***	−0.310***
	(0.019)	(0.019)	(0.020)	(0.019)	(0.019)
Lev	−0.433***	−0.374***	−0.418***	−0.397***	−0.416***
	(0.105)	(0.105)	(0.105)	(0.105)	(0.105)
Roa	2.200***	2.182***	2.214***	2.184***	2.191***
	(0.253)	(0.253)	(0.253)	(0.252)	(0.253)
Growth	0.295***	0.299***	0.297***	0.297***	0.294***
	(0.037)	(0.037)	(0.037)	(0.037)	(0.037)
Ocf	2.055***	2.037***	2.043***	2.067***	2.043***
	(0.251)	(0.250)	(0.251)	(0.251)	(0.251)
Owner	−0.336***	−0.341***	−0.338***	−0.334***	−0.341***
	(0.100)	(0.099)	(0.100)	(0.099)	(0.099)
Lnage	0.121***	0.129***	0.120***	0.128***	0.124***
	(0.025)	(0.024)	(0.025)	(0.024)	(0.025)
Divd	−0.275***	−0.278***	−0.273***	−0.279***	−0.274***
	(0.041)	(0.040)	(0.040)	(0.041)	(0.040)
Constant	10.643***	10.388***	10.749***	10.574***	10.522***
	(0.609)	(0.615)	(0.615)	(0.609)	(0.611)
Observations	11698	11698	11698	11698	11698
Adjusted R^2	0.259	0.263	0.260	0.262	0.260
Industry	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES

Note: This table reports the regression results based on Model (2). Column (1) uses the SA index as the independent variable to examine whether financial constraints affect firm value. Column (2) adds the ESG score as well as the interaction term between the ESG score and the SA index. Columns (3), (4), and (5) examine the interaction terms between the scores of each sub-dimension (E/S/G) and the SA index separately. The industry and year fixed effects are controlled. The variable definitions are shown in Table 1. Standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5 Regression of Firm Value (Pb) and ESG Ratings

	(1) Pb	(2) Pb	(3) Pb	(4) Pb
ESG	0.151***			
	(0.042)			
E		0.018		
		(0.016)		
S			0.064***	
			(0.018)	
G				0.052
				(0.033)
Lnta	−0.637***	−0.618***	−0.626***	−0.616***
	(0.042)	(0.043)	(0.041)	(0.041)
Lev	8.147***	8.079***	8.111***	8.081***
	(0.319)	(0.318)	(0.318)	(0.317)
Roa	1.901***	1.954***	1.921***	1.925***
	(0.624)	(0.625)	(0.624)	(0.625)
Growth	0.432***	0.428***	0.429***	0.424***
	(0.086)	(0.087)	(0.086)	(0.087)
Ocf	4.610***	4.615***	4.658***	4.624***
	(0.581)	(0.582)	(0.582)	(0.581)
Owner	−0.496**	−0.488**	−0.481**	−0.494**
	(0.217)	(0.218)	(0.218)	(0.217)
Lnage	0.089**	0.069*	0.094**	0.074*
	(0.042)	(0.041)	(0.041)	(0.041)
Divd	−0.558***	−0.548***	−0.559***	−0.548***
	(0.080)	(0.080)	(0.080)	(0.080)
Constant	12.862***	13.305***	13.264***	12.943***
	(0.871)	(0.897)	(0.865)	(0.880)
Observations	11698.000	11698.000	11698.000	11698.000
Adjusted R^2	0.273	0.272	0.273	0.272
Industry	YES	YES	YES	YES
Year	YES	YES	YES	YES

Note: This table reports the regression results based on Model (1), while replace the dependent variable with the price-to-book ratio. Column (1) uses the comprehensive ESG score as the independent variable, while the column (2), (3) and (4) use the E/S/G score as independent variables. The industry and year fixed effects are controlled. The variable definitions are shown in Table 1. Standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

and significant impact on Tobin's Q. The S and G scores continue to have the greatest impact, and the E score is also significant at the 5% level.

4.3.4 Grouped Regression of WW Index

Table 8 shows that the sample is divided into the financing constraint group and non-financing constraint group based on WW index. Different from SA index, a larger WW index implies a larger

Table 6　Regression of ESG ratings as Dummy Variables

	(1) TobinQ	(2) Pb
BBB/A	0.116***	0.175***
	(0.026)	(0.055)
AA/AAA	0.404***	0.733***
	(0.088)	(0.180)
Lnta	−0.259***	−0.635***
	(0.017)	(0.041)
Lev	−0.436***	8.133***
	(0.106)	(0.318)
Roa	1.976***	1.931***
	(0.255)	(0.624)
Growth	0.308***	0.432***
	(0.038)	(0.086)
Ocf	2.042***	4.612***
	(0.253)	(0.580)
Owner	−0.334***	−0.480**
	(0.100)	(0.217)
Lnage	0.037*	0.087**
	(0.020)	(0.041)
Divd	−0.284***	−0.555***
	(0.040)	(0.080)
Constant	7.377***	13.612***
	(0.338)	(0.876)
Observations	11698.000	11698.000
Adjusted R^2	0.251	0.273
Industry	YES	YES
Year	YES	YES

Note: This table reports the regression results based on Model (1), while replace the independent variable with the ESG rating dummies. "AA/AAA" represents the excellent ESG performance group, "BBB/A" represents the moderate ESG performance group, "BB" or below represents the poor ESG performance group and set it as the reference level. Column (1) uses the Tobin's Q as the independent variable, while the column (2) uses the price-to-book ratio as the independent variable. The industry and year fixed effects are controlled. The variable definitions are shown in Table 1. Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

financing constraint, therefore, WW = 0 indicates a non-financing constraint group, and WW = 1 indicates a financing constraint group.　The results show that the ESG score and S score of the non-financing constraint group are significantly positive, which is basically consistent with our baseline regression.

Table 7 Regression of Firm value and ESG Ratings Group by Financial Constraints (SA)

	(1) TobinQ (FC)	(2) TobinQ (NFC)	(3) TobinQ (FC)	(4) TobinQ (NFC)	(5) TobinQ (FC)	(6) TobinQ (NFC)	(7) TobinQ (FC)	(8) TobinQ (NFC)
ESG	0.033	0.152***						
	(0.027)	(0.025)						
E			−0.002	0.022**				
			(0.010)	(0.010)				
S					0.016	0.057***		
					(0.012)	(0.011)		
G							0.022	0.053***
							(0.019)	(0.019)
Lnta	−0.357***	−0.256***	−0.351***	−0.238***	−0.356***	−0.238***	−0.355***	−0.234***
	(0.029)	(0.021)	(0.030)	(0.023)	(0.029)	(0.021)	(0.030)	(0.022)
Lev	−0.288**	−0.538***	−0.301**	−0.638***	−0.295**	−0.587***	−0.296**	−0.633***
	(0.138)	(0.155)	(0.138)	(0.156)	(0.137)	(0.155)	(0.138)	(0.155)
Roa	2.399***	1.759***	2.411***	1.810***	2.400***	1.781***	2.402***	1.785***
	(0.367)	(0.337)	(0.365)	(0.341)	(0.366)	(0.338)	(0.366)	(0.340)
Growth	0.221***	0.377***	0.219***	0.376***	0.221***	0.373***	0.220***	0.368***
	(0.050)	(0.054)	(0.050)	(0.054)	(0.050)	(0.054)	(0.050)	(0.055)
Ocf	2.290***	1.797***	2.300***	1.789***	2.304***	1.837***	2.289***	1.808***
	(0.334)	(0.371)	(0.334)	(0.375)	(0.334)	(0.373)	(0.333)	(0.374)
Owner	−0.043	−0.576***	−0.039	−0.572***	−0.036	−0.575***	−0.042	−0.578***
	(0.127)	(0.146)	(0.127)	(0.147)	(0.127)	(0.146)	(0.127)	(0.147)
Lnage	0.096***	0.087***	0.092***	0.070**	0.098***	0.081***	0.093***	0.075***
	(0.032)	(0.028)	(0.032)	(0.028)	(0.032)	(0.028)	(0.032)	(0.028)
Divd	−0.249***	−0.289***	−0.245***	−0.286***	−0.250***	−0.290***	−0.246***	−0.288***
	(0.051)	(0.059)	(0.051)	(0.060)	(0.051)	(0.060)	(0.051)	(0.060)
Constant	9.089***	6.473***	9.140***	6.970***	9.196***	6.782***	9.086***	6.565***
	(0.608)	(0.426)	(0.602)	(0.450)	(0.592)	(0.420)	(0.596)	(0.426)
Observations	5849.000	5849.000	5849.000	5849.000	5849.000	5849.000	5849.000	5849.000
Adjusted R^2	0.239	0.281	0.239	0.274	0.239	0.279	0.239	0.274
Industry	YES	YES	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES	YES	YES

Note: This table reports the regression results based on Model (1) while divide the sample into two groups by the SA index. Column (1), (3), (5) and (7) are the financial constraints group, and Column (2), (4), (6) and (8) are the non-financial constraints group. Column (1) and (2) uses the comprehensive ESG score as the independent variable, while the column (3)(4), (5)(6) and (7)(8) use the E/S/G score as independent variables. The industry and year fixed effects are controlled. The variable definitions are shown in Table 1. Standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4.4 Endogeneity Problem

4.4.1 Instrumental Variable Method

We controlled for the endogeneity of the missing variables that may affect both ESG performance and firm value. This study used the annual industry mean value of ESG performance as an instrumental variable, as reported in Table 9. The results show that the instrumental variable (ESG_Mean) is significantly correlated with ESG. Using the instrumental variable method, the second

Table 8　Regression of Firm Value and ESG Ratings Group by Financial Constraints (WW)

	(1) TobinQ (NFC)	(2) TobinQ (FC)	(3) TobinQ (NFC)	(4) TobinQ (FC)	(5) TobinQ (NFC)	(6) TobinQ (FC)	(7) TobinQ (NFC)	(8) TobinQ (FC)
ESG	0.109***	0.041						
	(0.022)	(0.028)						
E			0.004	−0.003				
			(0.009)	(0.010)				
S					0.048***	0.017		
					(0.010)	(0.012)		
G							0.025	0.024
							(0.018)	(0.018)
Lnta	−0.115***	−0.671***	−0.089***	−0.667***	−0.106***	−0.669***	−0.091***	−0.670***
	(0.018)	(0.037)	(0.018)	(0.037)	(0.018)	(0.037)	(0.018)	(0.037)
Lev	−0.470***	0.000	−0.536***	−0.019	−0.486***	−0.011	−0.533***	−0.010
	(0.156)	(0.123)	(0.158)	(0.123)	(0.156)	(0.122)	(0.157)	(0.123)
Roa	8.357***	0.894***	8.374***	0.915***	8.367***	0.902***	8.357***	0.904***
	(0.823)	(0.231)	(0.826)	(0.231)	(0.822)	(0.230)	(0.827)	(0.231)
Growth	0.170***	0.349***	0.167***	0.348***	0.169***	0.348***	0.166***	0.347***
	(0.044)	(0.063)	(0.044)	(0.063)	(0.044)	(0.063)	(0.044)	(0.063)
Ocf	0.472	1.524***	0.489	1.535***	0.512	1.534***	0.488	1.526***
	(0.331)	(0.328)	(0.333)	(0.328)	(0.332)	(0.329)	(0.333)	(0.328)
Owner	−0.226*	−0.514***	−0.237*	−0.507***	−0.223*	−0.506***	−0.236*	−0.515***
	(0.126)	(0.130)	(0.126)	(0.130)	(0.126)	(0.130)	(0.126)	(0.130)
Lnage	−0.116***	0.170***	−0.131***	0.166***	−0.114***	0.172***	−0.128***	0.167***
	(0.027)	(0.025)	(0.027)	(0.025)	(0.027)	(0.025)	(0.027)	(0.025)
Divd	−0.244***	−0.261***	−0.233***	−0.260***	−0.242***	−0.263***	−0.235***	−0.259***
	(0.049)	(0.063)	(0.049)	(0.063)	(0.049)	(0.063)	(0.049)	(0.063)
Constant	3.565***	15.617***	3.607***	15.765***	3.836***	15.758***	3.509***	15.680***
	(0.409)	(0.794)	(0.423)	(0.754)	(0.413)	(0.765)	(0.408)	(0.767)
Observations	5849.000	5849.000	5849.000	5849.000	5849.000	5849.000	5849.000	5849.000
Adjusted R^2	0.343	0.262	0.339	0.262	0.344	0.262	0.339	0.262
Industry	YES	YES	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES	YES	YES

Note: This table reports the regression results based on Model (1) while divide the sample into two groups by the WW index. Column (1), (3), (5) and (7) are the non-financial constraints group, and Column (2), (4), (6) and (8) are the financial constraints group. Column (1) and (2) uses the comprehensive ESG score as the independent variable, while the column (3)(4), (5)(6) and (7)(8) use the E/S/G score as independent variables. The industry and year fixed effects are controlled. The variable definitions are shown in Table 1. Standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

stage estimation results show that ESG performance has a significant positive effect on firm value.

4.4.2 Reverse Causality

We used the lag of the independent variable to mitigate potential reverse causality. The regression results in Table 9 show the one-year- and two-year lags of ESG. The estimated coefficient of the ESG performance variable is at % significantly positive for a one-year lag and significantly

Table 9 Regression of Two-stage Least Squares and Reverse Causality

	(1) First stage ESG	(2) Second stage TobinQ	(3) TobinQ	(4) TobinQ
ESG_Mean	1.040***			
	(0.036)			
ESG		0.528***		
		(0.053)		
L1.ESG			0.066***	
			(0.022)	
L2.ESG				0.051**
				(0.026)
Lnta	0.195***	−0.355***	−0.239***	−0.229***
	(0.007)	(0.013)	(0.018)	(0.020)
Lev	−0.615***	−0.302***	−0.625***	−0.837***
	(0.046)	(0.083)	(0.119)	(0.135)
Roa	0.390***	1.719***	2.262***	2.618***
	(0.114)	(0.177)	(0.320)	(0.413)
Growth	−0.035*	0.389***	0.276***	0.311***
	(0.021)	(0.032)	(0.043)	(0.053)
Ocf	0.066	1.835***	2.243***	2.370***
	(0.115)	(0.177)	(0.302)	(0.360)
Owner	0.014	−0.458***	−0.221*	−0.128
	(0.045)	(0.069)	(0.114)	(0.128)
Lnage	−0.134***	0.086***	−0.052*	−0.173***
	(0.008)	(0.015)	(0.028)	(0.037)
Divd	0.057**	−0.327***	−0.304***	−0.360***
	(0.025)	(0.039)	(0.048)	(0.052)
Constant	−4.088***	6.697***	7.086***	7.605***
	(0.271)	(0.250)	(0.372)	(0.422)
Observations	11,697	11,697	8817.000	6336.000
R-squared	0.157	0.145	0.245	0.252
Industry	NO	NO	YES	YES
Year	NO	NO	YES	YES

Note: This table reports the results of the test of endogeneity. Column (1) and (2) reports the two-stage regression of annual industry mean value of ESG performance as an instrumental variable. Column (1) shows the results of the first-stage regression of the instrumental variable (ESG_Mean) on the explanatory variable (ESG), and column (2) shows the results of the second-stage regression on the dependent variable (TobinQ). The industry and year fixed effects are not controlled. Column (3) and (4) reports the results of ESG lagged by one period and ESG lagged by two periods, respectively. The industry and year fixed effects are controlled. The variable definitions are shown in Table 1. Standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

positive for a two-year lag at the 5% level. Therefore, it is verified based on considering the problem of reverse causality research conclusion that ESG performance has a significant positive effect on firm value. It also indicates that ESG levels to some extent have a long-term impact on firm value.

5. Conclusion

This study analyzed the financial and ESG data of A-share listed firms, and the results suggest that a company's ESG performance positively affects its firm value. When assessing how the three sub-dimensions influence firm value, only the social and governance scores exhibited significant positive effects, whereas the environmental scores showed no significant impact. Non-financially constrained firms have an increasingly positive effect on the relationship between ESG and firm value. The lower the degree of financing constraints faced by firms, the more favorable the ESG level is to improving firm value. In the context of sustainable development, firms can actively upgrade their production technology, adhere to environmental regulations, fulfill social responsibilities, and establish effective internal governance systems. These actions cultivate a positive image of long-term development, bolster competitive advantage, attract investor attention, and lay the groundwork for sustained growth in firm value. Moreover, firms with strong ESG credentials foster stakeholder confidence, employee cohesion, and consumer loyalty, which further augment firm value. Financial constraints directly influence ESG-related decisions, potentially hindering firms' access to funds or forcing them to accept high financing costs. This scenario may prompt firms to curtail their investments, affecting their value. Such constraints may also impede environmental investment, social responsibility commitments, and governance improvements, thereby limiting resource utilization efficiency and varying degrees of firm value growth.

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