

Full Length Article

ESG performance, institutional investors' preference and financing constraints: Empirical evidence from China

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Abstract

The purpose of this article is to determine whether the ESG (environmental, social, and governance) performance by Chinese listed companies affects their financing constraints. Based on panel data on 3400 listed companies in China from 2013 to 2020, we find that good ESG performance by listed companies not only directly reduces their financing constraints but also encourages institutional investors to increase their shares, thereby conveying positive signals to the market and helping enterprises reduce their financing constraints. However, in primary industry, enterprises' ESG performance in terms of reducing financing constraints at listed companies is not obvious. In addition, this study provides evidence that institutional investors have ESG investment preferences, and this preference is more significant at non-state-owned listed companies and listed companies in secondary and tertiary industries.

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1. Introduction

The cash flow of an enterprise is directly related to its survival and sustainable development. Financing constraints refer to the restrictions imposed when enterprises obtain cash flow through financing. High financing constraints indicate that it is difficult for enterprises to raise funds from the outside world, which increases financing costs and can even drive enterprises into a financial crisis. According to the Questionnaire Tracking Survey Report of Chinese Business Operators issued by the Development Research Center of China's State Council, Chinese enterprises generally regard financing constraints as the

main factor that restricts their stable, long-term development. In particular since the outbreak of COVID-19, Chinese enterprises have faced increasingly serious financing constraints. Effectively solving this problem is currently crucial for Chinese enterprises. Some papers have studied the impact of factors such as financial structure (Luo et al., 2018), financial friction (Nikolov et al., 2021), green innovation (Zhang et al., 2020), and green governance structure (Li et al., 2020) on enterprises' financing constraints. Because of the widespread acceptance of the concept of sustainable development, enterprises' environmental, social, and governance (ESG) performance has gradually become a hot area of research for scholars worldwide and in China. ESG is a way to comprehensively evaluate the risk response and sustainable development in the dimensions of an enterprise's environmental protection, fulfillment of social responsibility, and corporate governance; ESG also describes more advanced, holistic, and comprehensive corporate governance by an enterprise. Although articles have discussed the

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impact of enterprises' ESG practice on its financing constraints (Ge et al., 2022; Liu et al., 2021; Peng & Isa, 2020; Tang, 2022), few have studied the relationship among ESG performance, institutional investors' ESG investment preferences, and financing constraints. Moreover, research on the ESG investment preference of institutional investors simply considers the positive correlation between ESG and the institutional investors' shareholding as ESG investment preference of institutional investors (Jin, 2022; Zhou et al., 2020), and further research is needed to ensure its accuracy.

Expanding on prior research, first, we study the impact of ESG performance by listed companies on their financing constraints and the mediating role of institutional investors' shareholding ratio; second, we identify the investment behavior of institutional investors and study whether the motivation of institutional investors to increase their shareholdings of target companies is due to their ESG investment preferences.

The paper mainly makes the following contribution. We enrich the research on the impact of ESG performance on financing constraints and provide evidence in China. Most importantly, we propose an empirical method to test institutional investors' preferences. By examining changes in institutional investors' behavior, we determine whether there is ESG preference, and illustrate the mediating role of institutional investors' preferences in the process of ESG performance affecting financing constraints. The remainder of this article is structured as follows. Section 2 reviews the existing literature and proposes our hypothesis. Section 3 presents the variable design, model, and data sources used. Section 4 describes our empirical results. Section 5 summarizes the findings and offers our conclusions.

2. Literature review and hypotheses

According to stakeholder theory, the survival and development of an enterprise depends on the effective response of the enterprise to the interests of its stakeholders and not only on the shareholders (Donaldson & Preston, 1995). Because of rising attention to sustainability issues, financial disclosure no longer meets the information needs of stakeholders (Vitolla et al., 2019). ESG disclosure, as a supplement to nonfinancial information disclosure, reflects the true development status of enterprises more comprehensively, and market players, such as governments, regulators, financial institutions, investors, and the public, are increasingly concerned about it. ESG has gradually become an important window for interaction and communication between enterprises and stakeholders, and its influence on the business performance and sustainable development ability of enterprises has been continuously highlighted, which also makes it possible to reduce financing constraints through ESG practices (Zhu, 2014). On the one hand, good ESG performance by firms implies better information disclosure, which reduces the information asymmetry and investment risk for investors, thus reducing the required necessary rate of return and easing financing constraints on firms. On the other hand, companies that actively engage in

ESG practices can create a social reputation for them. Based on the strong public demand for corporate ESG-related information, media that pursue greater circulation and click-through rates tend to track and cover companies that fulfill their social responsibilities (Dyck & Zingales, 2004; Tang et al., 2018). Positive media coverage is the key for companies to enhance their market influence and corporate image, which helps them create and accumulate a good social reputation. Having a good social reputation is one of a fundamental resource for a company in creating business value (Branco & Rodrigues, 2006; Wong & Zhang, 2022), which helps it to form a brand effect (McWilliams et al., 2006), gain value recognition from the capital market and the public, enhance its potential and lasting competitive advantage (Hart & Dowell, 2011), and thus reduce its financing constraints. Existing studies have found that good ESG performance by firms can improve their financial performance (Chan et al., 2017; Friede et al., 2015; Kumar & Firoz, 2022; Saygili et al., 2022; Velte, 2017) and financing efficiency (Chang et al., 2021; Ho et al., 2022; Wei & Zhang, 2021), as well as reduce their financing costs (Qiu & Yin, 2019; Raimo et al., 2021). Accordingly, we propose our first hypothesis.

Hypothesis 1. A listed company with good ESG performance can reduce its financing constraints.

Institutional investors who invest with their own funds and funds raised from the public, have a greater ability to gather and analyze information and focus more on the safety of their assets. After entering the market, institutional investors can significantly reduce volatility in the capital market (Shi & Wang, 2014), because institutional investors with a price prediction advantage act as an investment vane in the capital market, which can reduce noise in the market. The capital market has severe information asymmetry between creditors and debtors. Greenwald (1984) and Myers et al. (1984) first introduced the notion of information asymmetry in the capital market and established the pecking order theory in an imperfect market, arguing that the financing constraints faced by enterprises are positively related to information asymmetry. In *Market Signaling*, Michael Spence (1974, p. 1) states, "Market signals are activities or attributes of individuals in a market that, by design or accident, change the beliefs of, or send messages to, other individuals in the market." Therefore, good ESG performance is also a positive signal by a company in the face of information asymmetry in the capital market, which not only enhances creditors' confidence in a company's development prospects but also attracts potential investors. On the one hand, good ESG performance conveys to the market a company's willingness to operate steadily and pursue long-term development and gain the trust and recognition of the market (Sacconi & Degli Antoni, 2011); on the other hand, good ESG performance can attract institutional investors who pay attention to asset safety and stable operating capital (Wang & Chen, 2017). It increases the shareholding ratio of institutional investors and, through the influence of the role of institutional

investors as a weathervane, builds a reputation for the company (Song et al., 2022) and enhances public trust in the company. Therefore, good ESG performance by enterprises can encourage institutional investors to increase their shares, convey positive signals to the market, enhance the confidence of the capital market in enterprises, and thus reduce their financing constraints. Accordingly, we propose our second hypothesis:

Hypothesis 2. Good ESG performance attracts more institutional investment, which signals the high credibility of companies and then reduces their capital constraint.

Institutional investors tend to hold stocks of listed companies with higher information transparency, higher corporate governance, and relatively low risk (Bushee et al., 2014; Mccahery et al., 2016). Companies with good ESG performance tend to disclose more comprehensive information and more transparent information. Such companies are willing to fulfill social responsibilities and their potential for long-term development, which not only avoids environmental and other kinds of government policy risks (Liu, 2016) but also reduces their inefficient investment (Hai et al., 2022), which is in line with the investment preferences of institutional investors. Cao et al. (2020) study the US stock market, finding that when the ESG factor is added, although the excess stock returns are negative, it is still favored by institutional investors, indicating that institutional investors who focus on the intrinsic value and sustainable returns of a company with a higher tolerance for lower ESG short-term returns. Accordingly, we propose our third hypothesis:

Hypothesis 3. Institutional investors have ESG investment preferences and can tolerate short-term downturns in the operating performance of listed companies with good ESG performance.

3. Study design

3.1. Variable design

3.1.1. Explained variable

This paper uses the Kaplan and Zingales (KZ; 1997) index to measure the financing constraints of listed companies. Following KZ (1997) and Wei et al. (2014), we construct a KZ index through the following steps.

1. Subdivide the full sample based on the operating net cash flow/total assets at the beginning of the year ($\frac{CF_{it}}{ASSET_{it-1}}$), cash dividends/total assets at the beginning of the year ($\frac{DIV_{it}}{ASSET_{it-1}}$), cash holdings/total assets at the beginning of the year ($\frac{CASH_{it}}{ASSET_{it-1}}$), asset-liability ratio (LEV_{it}), and Tobin's Q (Q_{it}). If $\frac{CF_{it}}{ASSET_{it-1}}$ is less than the median, $KZ1_{i,t}$ is 1; otherwise, 0; if $\frac{DIV_{it}}{ASSET_{it-1}}$ is less than the median, $KZ2_{i,t}$ is 1; otherwise, 0; if $\frac{CASH_{it}}{ASSET_{it-1}}$ is less than the median, $KZ3_{i,t}$ is 1; otherwise, 0;

- if LEV_{it} is higher than the median, $KZ4_{i,t}$ is 1; otherwise, 0; if Q_{it} is higher than the median, $KZ5_{i,t}$ is 1; otherwise, 0.
2. Calculate the KZ* index: $KZ^* = KZ1_{i,t} + KZ2_{i,t} + KZ3_{i,t} + KZ4_{i,t} + KZ5_{i,t}$.
3. Use ordered logistic regression in Equation (1). Use the KZ* index as the dependent variable and estimate the regression coefficient of each variable:

$$KZ_{it}^* = \kappa_1 * \frac{CF_{it}}{ASSET_{it-1}} + \kappa_2 * LEV_{it} + \kappa_3 * \frac{DIV_{it}}{ASSET_{it-1}} + \kappa_4 * \frac{CASH_{it}}{ASSET_{it-1}} + \kappa_5 * Q_{it} \tag{1}$$

4. Use the estimated coefficients $\kappa_1, \kappa_2, \kappa_3, \kappa_4, \kappa_5$ obtained in the previous step to construct Equation (2). The data on listed companies for each year are added in order to calculate the degree of financing constraints - KZ index. The higher the value of this index is, the higher the degree of financing constraints faced by the listed company:

$$KZ_{it} = \kappa_1 * \frac{CF_{it}}{ASSET_{it-1}} + \kappa_2 * LEV_{it} + \kappa_3 * \frac{DIV_{it}}{ASSET_{it-1}} + \kappa_4 * \frac{CASH_{it}}{ASSET_{it-1}} + \kappa_5 * Q_{it} \tag{2}$$

3.1.2. Explanatory variable

We use the Social Responsibility Score by the Chinese ESG scoring agency Hexun.com (<http://stockdata.stock.hexun.com/zrbg/>) as the explanatory variable (lnESG). The score is a comprehensive evaluation of the environmental, social, and governance aspects of companies listed on the Shanghai and Shenzhen Stock Exchanges.¹

3.1.3. Mediating variable

The mediating variable used in this paper is the sharehold ratio of institutional investors (Hold), and institutional investors include fund management companies, securities brokerages, insurance companies, social security funds,² trusts, and financial companies and banks; the shareholders include qualified foreign investors.

3.1.4. Control variables

Among the firm characteristics considered are firm age (lnAge), firm size (lnSize), and the number of directors, supervisors, and senior managers (lnEx) to control for differences in firm establishment, firm size, and management characteristics. It is generally believed that firms that are older and larger have accumulated more experience about survival, hold a larger market share, and have greater financing ability than newer and smaller firms. The size of management determines

¹ See the weight ratio in Hexun's professional evaluation system in social responsibility reports of listed companies at <http://stock.hexun.com/2013/gsshzr/index.html>.

² Social security funds include basic pension fund, work-related injury insurance fund, unemployment insurance fund, maternity insurance fund and medical insurance fund.

Table 1
Variable definition.

Variables	Name	Definition
Explained variable	KZ	Financing constraints, constructed by referring to the method of Kaplan and Zingales (1997)
Explanatory variable	lnESG	ESG performance, the natural logarithm of Hexun.com's comprehensive evaluation of listed companies' environmental, social, and corporate governance.
Mediating variable	Hold	The shareholding ratio of institutional investors
Control variables	lnAge	Firm age, the natural logarithm of the difference between the year studied and the year the firm was founded.
	lnSize	Firm size, the natural logarithm of the firm's total assets at the end of the year.
	LEV	Asset-liability ratio, total liabilities/total assets
	ROA	Return on assets, net profit/average total assets
	EM	Equity multiplier, total assets/total owner's equity
	lnEx	Number of managers, natural logarithm of the number of directors, supervisors, and senior managers.
	Growth	Sustainable growth rate, return on net asset earnings retention rate/(1-return on net asset earnings retention rate)
Other variables	CH_ROA	Operating performance, the increase in the return on assets since year t-1 to year t
	CH_Hold	Change in institutional investors' shareholding, the increase in institutional investors' shareholding from year t-1 to year t.
	H	The behavior of institutional investors to increase their shareholdings, in a binary logical value; if CH_Hold>0, it takes a value of 1; otherwise, 0
	I	Abnormal investment behavior, in binary logical value; if CH_ROACH_Hold<0, it takes a value of 1; otherwise, 0
	OS	Firm ownership; if state owned and controlled, it takes a value of 1; otherwise, 0

the efficiency of corporate decision making and has an important impact on financing constraints (Liu & Yang, 2016). In terms of financial information, this paper uses the asset-liability ratio (LEV), equity multiplier (EM), and return on assets (ROA) as control variables because the level of debt, financial leverage, and operating performance of a firm have a significant impact on its financing needs and financing constraints (Murthy, 2015; Poursoleiman et al., 2020). In addition,

the long-term growth capacity of the company is an important aspect of investor attention and has an important impact on its financing constraints, so this paper uses sustainable growth rate (Growth) as one of the control variables.³ The variables are defined in Table 1.

3.2. Empirical model construction

3.2.1. Model for testing the mediating effect

This paper uses the causal-steps approach proposed by Baron and Kenny (1986) to test the mediating effect of institutional investors' shareholding ratio.

First, we construct a model for the impact of listed companies' ESG performance on their financing constraints:

$$KZ_{i,t} = \alpha_1 + \beta_1 \ln ESG_{i,t} + \delta_1 C_{i,t} + \eta_{1i} + \sigma_{1t} + \varepsilon_{1i,t} \quad (3)$$

where $C_{i,t}$ is the set of control variables, η_{1i} is the individual fixed effect, σ_{1t} is the year fixed effect, and $\varepsilon_{1i,t}$ denotes the robust standard error, clustered at the individual firm level.

Second, we construct a model for the impact of listed companies' ESG performance on institutional investors' shareholding ratio:

$$Hold_{i,t} = \alpha_2 + \beta_2 \ln ESG_{i,t} + \delta_2 C_{i,t} + \eta_{2i} + \sigma_{2t} + \varepsilon_{2i,t} \quad (4)$$

where $Hold_{i,t}$ is the shareholding ratio of institutional investors, and $C_{i,t}$ is the set of control variables, which is consistent with the previous settings.

Finally, we construct a model to test the mediating effect of the institutional investor shareholding ratio:

$$KZ_{i,t} = \alpha_3 + \beta_3 \ln ESG_{i,t} + \gamma_3 Hold_{i,t} + \delta_3 C_{i,t} + \eta_{3i} + \sigma_{3t} + \varepsilon_{3i,t} \quad (5)$$

3.2.2. Test of institutional investor preferences

In the mediating effect model constructed above, the role of the institutional investors' shareholding ratio in the impact of the ESG performance of listed companies on their financing constraints is tested, but the model can only determine whether the ESG performance of listed companies can reduce their financing constraints through the shareholding ratio of institutional investors. Whether listed companies' good ESG performance is one of the reasons that institutional investors increase their shares, that is, whether institutional investors have ESG investment preferences or institutional investors' shareholding ratio can be used to represent institutional investors' ESG investment is still questionable. This paper thus designs a model to determine whether the investment behavior of institutional investors demonstrates an ESG investment

³ The type of ownership (state owned versus non-state owned) is usually considered as one of the important characteristics of the firm, but this paper does not use it as a control variable, because company ownership does not change during the research period. In controlling for individual and time fixed effects, this variable is deleted due to multicollinearity, so it is not included in the model, and we further study it in 4.4.

preference, and its advantage is that it is not necessary to distinguish the types of institutional investors or to consider whether their investment decisions are rational. As long as their investment behavior is analyzed and defined in detail, their preferences can be determined through their behavior.

First, we determine the company's operating performance. $CH_ROA_{i,t}$ represents the incremental ROA from year $t-1$ to year t . When $CH_ROA_{i,t} > 0$, it indicates that the company's operating performance is good; otherwise, it is poor. Second, we determine the change in shareholdings of institutional investors. $CH_Hold_{i,t}$ represents the increment of institutional investors' shareholding from year $t-1$ to year t . When $CH_Hold_{i,t} > 0$, it indicates that institutional investors increase their holdings, and otherwise they decrease their holdings. Existing research indicates that institutional investors prefer listed companies with good financial performance (Covrig et al., 2006; Prasanna, 2008), so we assume that institutional investors increase their holdings when the companies' operating performance is good and decrease their holdings when it is poor. These two situations are normal investment behaviors, that is, they focus on the current operating performance of the target company. When operating performance is good, institutional investors reduce their holdings, and when operating performance is poor, institutional investors increase their holdings—these are considered abnormal investment behaviors, indicating that institutional investors are not excessively concerned about the current operating performance of the target company. If ESG performance increases the potential for abnormal investment behavior by institutional investors, then, institutional investors have ESG investment preferences. To test this, we use a panel logit model, constructed as follows:

$$H_{i,t} = \alpha_4 + \beta_4 ROA_{i,t} + \delta_4 X_{i,t} + \eta_{4i} + \sigma_{4t} + \varepsilon_{4i,t}$$

$$H_{i,t} = \begin{cases} 1, CH_Hold_{i,t} > 0 \\ 0, CH_Hold_{i,t} \leq 0 \end{cases} \quad (6)$$

where $X_{i,t}$ is the set of control variables, excluding ROA. Model (6) tests whether the premise of the ESG investment preference test holds—that is, whether institutional investors prefer listed companies with good financial performance when ESG factors are not considered. If this premise holds, we can capture the abnormal investment behavior of institutional investors who deviate from their preferred financial performance and use Model (7) to test it.

$$I_{i,t} = \alpha_5 + \beta_5 \ln ESG_{i,t} + \delta_5 X_{i,t} + \eta_{5i} + \sigma_{5t} + \varepsilon_{5i,t}$$

$$I_{i,t} = \begin{cases} 1, CH_{ROA_{i,t}} * CH_{Hold_{i,t}} \leq 0 \\ 0, CH_{ROA_{i,t}} * CH_{Hold_{i,t}} > 0 \end{cases} \quad (7)$$

In the results of Model (7), if the estimated coefficient of $\ln ESG$ is significantly positive, it indicates that, after considering ESG factors, institutional investors' preference for financial performance decreases, and they have an ESG investment preference. H2 can be interpreted as follows: good ESG performance by listed companies can motivate institutional investors to increase their shares and reduce their financing constraints by sending positive signals to the market.

3.3. Sample selection and data sources

This paper selects a sample that consists of A-share companies listed on the Shanghai and Shenzhen Stock Exchanges from 2013 to 2020, excluding companies with too much missing financial data and samples with missing ESG scores, and ultimately obtains sample data for 3400 companies, including 1794 companies on the main board, 893 companies on the Small and Medium Enterprise (SME) board, and 713 on the Growth Enterprise Market (GEM) board. The ESG data on listed companies is obtained by Python crawling the Social Responsibility Scores of listed companies compiled by [Hexun.com](https://www.hexun.com). The company's financial data come from the China Stock Market Accounting Research (CSMAR) database (<https://www.gtarsc.com>). The binary variables of institutional investors' investment behavior are calculated with companies' financial data. To avoid the influence of data instability and dimensional differences between variables, we use the natural logarithm for all data, except the ratios and binary logical values. The descriptive statistics of the variables are listed in Table 2. In the table, the mean value of $\ln Age$ is 2.8509, and the mean value of $\ln Size$ is 22.1839, which means that the average age of listed companies is about 18 years, and the average asset size is 2.3329 billion USD, indicating that the listed companies studied in this paper are more mature and more representative. LEV, ROA, EM, and Growth, which are related to the financial status of listed companies, differ greatly from the mean, maximum, and minimum values, which indicates that the operating conditions vary greatly between companies, and it is necessary to control for these differences in the process of studying the ESG performance and financing constraints of listed companies. For example, the minimum LEV is -0.1947 percent, which indicates that some listed companies have no short-term borrowing or very little borrowing and, at the same time, have a lot of tax credits to be deducted, which might indicate that the companies are well

Table 2
Descriptive statistics.

Variable	N	Mean	St. dev.	Minimum	Maximum
KZ	23,373	0.7526	2.1979	-11.0451	10.6414
$\ln ESG$	25,566	2.9510	0.7253	-4.6052	4.5094
Hold	24,255	42.7111	24.5778	0.0001	101.1401
H	23,800	0.4038	0.4907	0	1
I	23,800	0.3538	0.4782	0	1
$\ln Age$	24,299	2.8509	0.3431	1.0986	4.7875
$\ln Size$	24,301	22.1839	1.3626	14.9416	28.6364
LEV	24,301	0.4488	1.2695	-0.1947	178.3455
ROA	24,305	0.3467	0.1844	-16.1125	10.0322
EM	24,305	2.3369	11.7454	-339.1706	1557.43
OS	24,305	0.3509	0.4773	0	1
$\ln Ex$	24,091	2.7513	0.2136	1.0986	3.6889
Growth	24,305	0.0310	3.4357	-494.7450	98.6938

Notes: Some accounting items involved in financial indicators have missing values, and Stata software automatically eliminates observations with missing values at the time of estimation. The reason that institutional investors hold more than 100% of shares is that the number of nonmarketable shares held exceeds the number of marketable shares.

Table 3
Regression results of the causal-steps approach.

Variable	(1)	(2)	(3)
	KZ	Hold	KZ
<i>lnESG</i>	-0.4127*** (0.0362)	0.8238*** (0.1251)	-0.4050*** (0.0356)
<i>Hold</i>			-0.0095*** (0.0019)
<i>lnAge</i>	2.7096*** (0.3030)	-11.7822*** (2.3009)	2.6158*** (0.3016)
<i>lnSize</i>	-0.1479*** (0.0558)	5.2462*** (0.4145)	-0.0995* (0.0569)
<i>LEV</i>	-0.0047 (0.0538)	0.3461*** (0.0789)	-0.0013 (0.0530)
<i>ROA</i>	-0.9641 (0.6733)	2.2317** (1.0886)	-0.9418 (0.6645)
<i>EM</i>	0.0076* (0.0041)	-0.0093** (0.0046)	0.0076* (0.0040)
<i>lnEx</i>	0.2689** (0.1251)	2.5695** (1.0371)	0.2851** (0.1252)
<i>Growth</i>	-0.0101 (0.0095)	-0.0460 (0.0472)	-0.0103 (0.0098)
N	22,183	22,808	22,157
Firm effect	YES	YES	YES
Year effect	YES	YES	YES
Adj_R ²	14.37%	8.51%	14.63%

Notes: Robust *t*-statistics adjusted for clustering at the firm level are reported in parentheses. **p* < 0.10; ***p* < 0.05; ****p* < 0.01.

financed. But the maximum is 178.3455 percent, which indicates that some listed companies are too highly leveraged, and the interests of creditors are not protected. The minimum Growth is -494.7450 percent, and the maximum is 98.6938 percent, which indicates that some companies have unsustainable operations, and some companies have a high growth rate. Such outliers may have an impact on our findings, but those that are due to the special operating conditions of listed companies such as asset restructuring, negative profit growth, and it is not robust to eliminate them directly, which is further discussed in the robustness section of this paper.

4. Analysis of the results

4.1. The results of the mediating effects model

Table 3 reports the regression results of the mediating effects model. Column (1) lists the results on the impact of ESG performance by listed companies on their financing constraints. The estimated coefficient of the variable *lnESG* is significantly negative at the 1 percent level, indicating that good ESG performance by listed companies can significantly reduce their financing constraints. H1 is confirmed. Column (2) lists the results on the impact of listed companies' ESG performance on the shareholding ratio of institutional investors. The estimated results show that the estimated coefficient of the variable *lnESG* is significantly positive at the 1 percent level, indicating that good ESG performance by listed companies can drive an increase in the shareholding ratio of institutional investors. The mediating variable Hold is added to Model (3), and the estimated results are listed in Column (3). The estimated

Table 4
ESG investment preference test of institutional investors.

Variable	(1)	(2)	(3)	(4)
	H	H	I	I
<i>lnESG</i>			0.1033*** (0.0274)	0.1033*** (0.0334)
<i>ROA</i>	1.0657*** (0.2208)	1.0657*** (0.2776)	0.3420 (0.2132)	0.3420 (0.4798)
<i>lnAge</i>	-0.3394 (0.3597)	-0.3394 (0.3842)	1.2507*** (0.3713)	1.2507*** (0.3632)
<i>lnSize</i>	0.0379 (0.0417)	0.0379 (0.0331)	-0.0403 (0.0428)	-0.0403 (0.0408)
<i>LEV</i>	-0.3565** (0.1453)	-0.3565** (0.1522)	-0.0249 (0.0614)	-0.0249 (0.0761)
<i>EM</i>	-0.0017 (0.0020)	-0.0017 (0.0020)	-0.0001 (0.0011)	-0.0001 (0.0057)
<i>lnEx</i>	-0.1670 (0.1612)	-0.1670 (0.1801)	-0.3374** (0.1676)	-0.3374** (0.1571)
<i>Growth</i>	0.0037 (0.0105)	0.0037 (0.0132)	0.0101 (0.0114)	0.0101 (0.0191)
N	21,203	21,203	21,902	21,902
Firm effect	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
Pseudo_R ²	2.60%	2.60%	13.84%	13.84%

Notes: The numbers in parentheses in Columns (2) and (4) are robust *t*-statistics adjusted by the bootstrap method with a sample size of 50 times. Due to the randomness of the sampling, each estimation result using the bootstrap method could be different. Therefore, Columns (1) and (3) show *t*-statistics without robust estimation. **p* < 0.10; ***p* < 0.05; ****p* < 0.01.

coefficients of *lnESG* and Hold are both significantly negative at the 1 percent level, indicating a partial mediating effect of the shareholding ratio of institutional investors, Hold, that is, financing constraints on listed companies can be reduced not only by good ESG performance but also by increases in shareholding by institutional investors.

4.2. Test of ESG investment preferences of institutional investors

The estimated results of Model (6) are in Table 4, Columns (1) and (2). The estimated coefficient of the variable ROA is significantly positive at the 1 percent level, indicating that good operating performance can increase the likelihood of increased ownership behavior by institutional investors. The estimated results of Model (7) are in Columns (3) and (4), and the estimated coefficient of *lnESG* is positive, indicating that the behavior of institutional investors changes after they consider ESG factors, and good ESG performance can increase the potential of institutional investors to engage in abnormal investment behavior, as seen in the previous section, so we can conclude that institutional investors have ESG investment preferences.

Institutional investors have ESG investment preferences and play an active role in the process in which ESG reduces the financing constraints of listed companies, which helps to improve the quality of not only Chinese listed companies but also China's capital market. Institutional investors with ESG preferences pay more attention to stable and long-term investment benefits, which is a positive medium- and long-term

Table 5
Change of the explained variable.

Variable	KZ index excluding outliers		WW index	
	(1)	(2)	(3)	(4)
lnESG	-0.4486*** (0.0341)	-0.4422*** (0.0337)	-0.0135*** (0.0032)	-0.0125* (0.0068)
Hold		-0.0081*** (0.0020)		-0.0014*** (0.0005)
Control variable	YES	YES	YES	YES
N	21,184	21,158	18,721	18,699
Firm effect	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES
Adj_R ²	8.79%	8.96%	10.90%	19.63%

Notes: The estimation results in Model (4) are the same as in Column (2) in Table 3. Robust *t*-statistics adjusted for clustering by firm are reported in parentheses. **p* < 0.10; ***p* < 0.05; ****p* < 0.01.

force in the capital market, so they can stabilize the capital market and are crucial for its healthy development.

First, institutional investors having ESG investment preferences can raise the quality of listed companies. While pursuing investment returns, institutional investors can also intervene in the governance and management of enterprises, affecting the major business decisions of enterprises. Motivated by the pursuit of stable long-term investment returns, institutional investors can drive management to engage in ESG practices, thereby improving the company's level of management and governance and optimizing its operating mechanism, which raises the efficiency of listed companies and ultimately protect the interests of investors. Therefore, listed companies with good ESG performance attract institutional investors with an ESG investment preference to hold shares, and institutional investors' shareholding strengthens the ESG practices of listed companies, thus forming a benign mutual promotion mechanism between ESG practices by listed companies and institutional investors to raise the quality of listed companies.

Second, institutional investors having ESG investment preferences drives the effective conversion of household savings into long-term funds in the capital market. The Guidance of the China Banking and Insurance Regulatory Commission on Promoting the High-Quality Development of the Banking and Insurance Industry issued by the Chinese government in 2020 states that it is necessary to cultivate the concept of value investment and long-term investment and promote the effective conversion of household savings into long-term funds in the capital market through multiple channels. Institutional investors with ESG investment preferences can effectively achieve this goal. On the one hand, institutional investors can absorb household savings and develop strategies based on their preferences to invest in listed companies with good ESG performance, thus indirectly attract “retail investors” entering the market. On the other hand, as the weathervane of the basic market, institutional investors with ESG investment preferences can lead the investment direction of “retail investors,” which not only reduces the risk of individuals’ investment but also enhance the resilience of the capital market.

Third, institutional investors having ESG investment preferences can promote the healthy development of the capital market. Financing constraints are an important factor that restricts the growth of enterprises (Du & Guo, 2012). Nowadays, it is difficult to meet the capital needs of enterprises solely by relying on internal financing. External financing is an important way for enterprises to obtain funds. Institutional investors with ESG preferences focus on analyzing corporate sustainable profitability and invest in these listed companies, which supports survival of the fittest and the healthy development of the capital market and helps to create a standardized, transparent, open, dynamic, and resilient capital market.

4.3. Robustness test

4.3.1. Robustness test of mediating effects model

4.3.1.1. *Change the explained variable.* To prevent the results of this paper from being due to the selection of the explained variables and by changing the explained variable, we can test robustness with two alternative indicators. The descriptive statistics show some outliers in the variables, such as negative values of the asset-liability ratio (LEV). Thus we omit samples that have been listed for less than one year, delisted or suspended from each company's data, and the financing constraints of listed companies are measured with the calculation method of the KZ index to avoid the influence of abnormal samples on our results.

The reliability of our results depends on an accurate measurement of financing constraints. When other methods are used to measure financing constraints, we can obtain the same results as with the KZ index, which means that our measurement of financing constraints is accurate, and the results are not affected by the choice of measurement method. Following the methods by Whited and Wu (WW; 2006), we construct the WW index to measure the financing constraints of listed companies. The WW index is calculated as follows:

$$WW = -0.091*CF - 0.062*DivPos + 0.021*Lev - 0.044*Size + 0.102*ISG - 0.035*SG \tag{8}$$

in which CF is the ratio of cash flow to total assets. DivPos is the dummy variable for cash dividend payments. If the cash dividend is paid in the current period, DivPos is 1; otherwise, it is 0. Lev is the ratio of long-term liabilities to assets. Size is the natural logarithm of total assets. ISG is the average sales growth rate in an industry. In the industrial classification standard by the China Securities Regulatory Commission in 2012, manufacturing industry has a two-digit code, and other industries have a one-digit code. SG is the sales revenue growth rate.

As Table 5 indicates, Whether we use the KZ index obtained after excluding outliers or the WW index obtained by changing the measurement method, the coefficients of the main explanatory variable lnESG and the mediating variable Hold are significantly negative, indicating that good ESG performance of listed companies can reduce their financing

constraints, and there is a partial mediation effect in the shareholding ratio of institutional investors, which is consistent with the previous conclusions. Therefore, the conclusions of this paper are not affected by variable selection.

4.3.1.2. *Change the test method.* MacKinnon (2002) compares the calculation of empirical power and the Type I error rate of different mediating effect detection methods through simulation experiments and finds that the stepwise regression method is less effective in testing for mediating effects and that direct tests of the significance of the coefficients of the product of $\beta_2 * \gamma_3$ were more likely to detect mediating effects. However, when the mediating effect can be detected using the causal-steps approach, the Type I error rate is lower, and the results are easier to understand and interpret (Wen & Ye, 2014), so we use this method.

To avoid having the results biased by the test method selection, we use the Sobel-Goodman method and bootstrap method to test the robustness of the mediating effects. The estimated results are shown in Table 6. Columns (1) and (2) list the Sobel-Goodman test results, and the estimated coefficients of the impact of lnESG on KZ and Hold are both significant at 1 percent, indicating that the good ESG performance of listed companies can reduce their financing constraints and increase the shareholding ratio of institutional investors. The estimated results after the mediating variable is added to the equation are shown in Column (3). The estimated coefficients of lnESG and Hold are both significantly negative at the level of 1 percent, indicating a partial mediating effect on the shareholding ratio of

institutional investors. The estimated coefficients of the parameters did not change much compared with the previous estimation results, so the results are not affected by the test method. In addition, this table shows that the direct impact of ESG performance by listed companies on their financing constraints accounts for 98.11 percent of the total effect, and the indirect impact of ESG performance on financing constraints through institutional investors' shareholding accounts for 1.89 percent of the total effect. Both direct and indirect effects were significant in the bootstrap test results.

4.3.1.3. *Instrumental variable (IV) estimation.* Although we add to the regression model several important factors that influence financing constraints, the empirical tests related to ESG performance and financing constraints may have endogeneity problems, which affects the robustness of the results. To solve this problem, we use an instrumental variable (IV) estimation.

Following Wang et al. (2022), we use the percentage of female members of the board of directors of listed companies (Female) as an IV. Financing constraints are influenced by the firm's operating decisions, but the gender ratio of the board of directors has difficulty in influencing it, satisfying the requirement of exogeneity in the IV. Ismail and Latiff (2019) find that the percentage of female members of the board of directors is significantly correlated with ESG performance, which is consistent with the relevance of the IV. Lin et al. (2012) state that if the endogeneity problem exists only at the firm level, the industry/regional mean can be used as an IV for firm-level explanatory variables. As in Chen (2021), we use the mean value of shareholdings by institutional investors of listed companies in the same industry (MHold) as an IV, based on China's National Economic Classification of Industries. The shareholdings of institutional investors of listed companies in the same industry is affected by common factors, such as the economic environment and the degree of marketization, but is rarely affected by a single company, satisfying the requirements of correlation and exogeneity of IVs.

Table 7 shows the results of the two-stage least squares (2SLS) estimation of Model (5). The first-stage regression in Column (1) shows that the IVs Female and Mhold are significantly correlated with the explanatory variables, which indicates that IVs are correlated with the endogenous variable lnESG. The second-stage regression in Column (2) show that KZ is negatively correlated with lnESG ($p < 0.05$) and with Hold ($p < 0.1$), which indicates that our results still hold after the endogeneity problem is solved.

4.3.2. *Robustness test of institutional investors' ESG investment preferences*

The previous test of the ESG investment preference of institutional investors identifies the ESG preference of institutional investors by testing whether institutional investors increase their share of companies with poor operating performance but good ESG performance or reduce their share of companies with good operating performance but poor ESG performance. To ensure the robustness of our results, we next design a model to exclude alternative hypotheses. We divide

Table 6
The result of robustness testing of the mediating effect.

Variable		(1)	(2)	(3)
		KZ	Hold	KZ
Sobel-Goodman test	lnESG	-0.4207*** (0.0167)	0.7478*** (0.0964)	-0.4128*** (0.0167)
	Hold			-0.0106*** (0.0013)
	Control variable	YES	YES	YES
	N	22,157	22,157	22,157
	Firm effect	YES	YES	YES
	Year effect	YES	YES	YES
	Adj_R ²	60.01%	89.74%	
	Indirect effect		-0.0080*** (0.0014)	
	Direct effect		-0.4128*** (0.0167)	
	Total effect		-0.4207*** (0.0167)	
Bootstrap test	Indirect effect		-0.0087*** (0.0021)	
	Direct effect		-0.8888*** (0.1197)	

Notes: The Sobel-Goodman test and bootstrap test for mediating effects are performed to test the product of coefficients β_2 and γ_3 in Models (4) and (5). The bootstrap test is performed 500 times, and the time and individual fixed effects are controlled for by adding time trend variables and individual variables. Robust *t*-statistics adjusted for clustering by firm are reported in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Table 7
Regression results of IV estimation.

Variable	First stage	Second stage
	lnESG	KZ
Female	-0.1212*** (0.0413)	
MHold	0.0119** (0.0055)	
lnESG		-1.2773** (0.6319)
Hold		-0.0057* (0.0031)
lnAge	-0.4444*** (0.0955)	2.1188*** (0.3660)
lnSize	0.1754*** (0.0300)	0.0622 (0.1211)
LEV	0.0705* (0.0362)	0.0545 (0.0548)
ROA	1.5022** (0.6710)	0.3239 (0.9546)
EM	-0.0039 (0.0025)	0.0042 (0.0051)
lnEx	-0.0479 (0.0575)	0.2186* (0.1251)
Growth	0.0079 (0.0126)	-0.0042 (0.0145)
Firm effect	YES	YES
Year effect	YES	YES
N	20,070	20,070
Adj_R ²	11.44%	18.90%
Kleibergen-Paap rk LM statistic: P_value	0.0026	
Hansen J statistic: P_value	0.2680	

Notes: Robust *t*-statistics adjusted for clustering by firm are in parentheses. **p* < 0.10; ***p* < 0.05; ****p* < 0.01.

the sample based on whether the change in the return on assets CH_ROA is greater than zero and use the screened sample to examine whether the variable ESG affects the shareholding ratio of institutional investors. When institutional investors have ESG investment preferences, regardless of whether current operating performance is good—that is, whether the change in CH_ROA is greater than zero—the estimated coefficient of lnESG should be positive, indicating that ESG and the ratio of shareholding by institutional investors change in the same direction.

Table 8 shows that, after the sample is dividing by CH_ROA, the estimated coefficients of lnESG are all

Table 8
Robustness test of ESG investment preference of institutional investors.

Sample division criteria	CH_ROA <0	CH_ROA >0
	Hold	Hold
ln ESG	0.6381*** (0.1787)	1.0209*** (0.2430)
Control variable	YES	YES
N	10,633	12,174
Firm effect	YES	YES
Year effect	YES	YES
Adj_R ²	11.71%	8.91%

Notes: Robust *t*-statistics adjusted for clustering by firm are reported in parentheses. **p* < 0.10; ***p* < 0.05; ****p* < 0.01.

significantly positive at the 1 percent level and have no heterogeneity, indicating that when operating performance is poor, good ESG performance can promote an increase in the ratio of shareholding by institutional investors; when operating performance is good, poor ESG performance reduces the ratio of shareholding by institutional investors. These results are consistent with the earlier results and are robust.

4.4. Further study

Listed companies in China can be divided into state-owned (SOEs) and non-state-owned enterprises (non-SOEs) based on their ownership. These two types of companies have huge differences in business objectives, organizational structure, and management methods. In addition, listed companies in different industries differ in their environmental protection, social responsibility, and corporate governance, and the public expectations of their ESG performance are also different. Based on these considerations, we distinguish the sample firms based on their ownership and the Classification of National Economic Industries (GB/T4754-2017) and examine whether heterogeneity is found among different categories of listed companies with respect to reduction in financing constraints due to ESG and institutional investors' ESG investment preferences.

4.4.1. Heterogeneity in the impact of ESG performance on financing constraints

The two groups of sample firms are inserted into Equation (3) for testing. Table 9 shows that regardless of whether a firm is state owned, good ESG performance can reduce its financing constraints, but non-SOEs experience a larger impact. SOEs are backed by the government and hence have certain advantages over non-SOEs when it comes to policy loans and subsidies, local government support, bank loans and budget constraints and face fewer financing constraints. However, non-SOEs rely on their own credit for financing and face higher financing constraints due to information asymmetry between creditors and debtors. ESG assessment requires greater disclosure of corporate information, so the ESG performance of non-SOEs has a larger influence on financing constraints.

Table 9
Heterogeneity test of the impact of listed companies' ESG performance regarding financing constraints.

Variable	Ownership		Industry		
	State owned	Non-state owned	Primary	Secondary	Tertiary
	KZ	KZ	KZ	KZ	KZ
lnESG	-0.2299*** (0.0480)	-0.4595*** (0.0401)	0.0903 (0.0714)	-0.4063*** (0.0609)	-0.3286*** (0.0439)
Control variable	YES	YES	YES	YES	YES
N	8539	13,644	270	15,955	5958
Firm effect	YES	YES	YES	YES	YES
Year effect	YES	YES	YES	YES	YES
Adj_R ²	19.13%	15.59%	50.97%	14.87%	20.74%

Notes: Robust *t*-statistics adjusted for clustering by firm are reported in parentheses. **p* < 0.10; ***p* < 0.05; ****p* < 0.01.

Table 10
Heterogeneity test of ESG investment preferences of institutional investors.

Variable	Firm ownership		Industry		
	State owned	Non-state owned	Primary	Secondary	Tertiary
	I	I	I	I	I
ln ESG	0.0879 (0.0601)	0.1164*** (0.0424)	-0.2023 (0.3202)	0.0825** (0.0383)	0.1591** (0.0669)
Control variable	YES	YES	YES	YES	YES
N	8564	13,338	238	15,748	5916
Firm effect	yes	yes	yes	yes	yes
Year effect	yes	yes	yes	yes	yes
Pseudo_R ²	15.65%	12.92%	25.83%	13.65%	14.62%

Notes: Robust *t*-statistics adjusted according to the bootstrap method are reported in parentheses. **p* < 0.10; ***p* < 0.05; ****p* < 0.01.

Table 9 shows that the impact of ESG performance on financing constraints is heterogeneous across industries. In primary industry, the estimated coefficient of lnESG is positive and insignificant, indicating that improvement in the ESG performance of listed companies does not reduce financing constraints.

In secondary and tertiary industries, the estimated coefficients of lnESG are significantly negative, indicating that good ESG performance by listed companies can reduce their financing constraints. The possible reason is that the public has different expectations of different types of listed companies. In China's industrial classification, primary industry comprises agriculture, forestry, animal husbandry, and fishery. Listed companies in secondary and tertiary industries have a larger impact on the environment, higher profitability, and higher operating risks than those in primary industries. The public is more concerned about whether they are committed to protecting the environment, have undertaken more social responsibility, and are regulated companies, so their ESG performance with respect to financing constraints is more obvious.

4.4.2. Heterogeneity of ESG investment preferences by institutional investors

In this paper, the subsamples are substituted into Model (7) for testing. Table 10 shows that the ESG investment preferences of institutional investors are more significant among non-SOEs and companies in secondary and tertiary industries. This may be because institutional investors pay attention to not only capital security, preferring stable operation, but also pay attention to profits. Non-SOEs and listed companies in secondary and tertiary industries have greater profitability. Listed companies with good ESG performance and strong profitability are preferred by institutional investors, so they exhibit heterogeneity.

5. Conclusions

This paper studies the effects of Chinese listed companies' ESG performance on their financing constraints in 2013–2020. First, we find that good ESG performance by listed companies can reduce their financing constraints. Second, we find a partial

mediating effect of the ratio of shareholding by institutional investors—that is, good ESG performance by listed companies can encourage institutional investors to increase their shares, thereby sending positive signals to the market and reducing their financing constraints. Most important, we find that institutional investors have a preference for ESG investment and that good ESG performance by listed companies can increase institutional investors' tolerance for poor current operating performance. The examination of heterogeneity determines that good ESG performance can alleviate the financing constraints of non-SOEs more so than SOEs. When we divide companies by industry, we find that for companies in primary industry, good ESG performance does not reduce financing constraints. In addition, institutional investors prefer listed companies with good ESG performance and strong profitability, and their preference for ESG investment is more dominant for non-SOEs and listed companies in secondary and tertiary industries.

Institutional investors in the Chinese capital market have gradually made ESG an important factor in their investment decisions, and listed companies' active engagement in ESG practices is more likely to reduce their financing constraints by attracting institutional investors with a preference for ESG investment. Our findings support the positive view of corporate ESG practice (Chen, 2021; Ge et al., 2022; Peng et al., 2020). We confirm not only the positive role of institutional investors in the relationship between ESG performance and financing constraints of listed companies but also the existence of ESG investment preferences among institutional investors.

The paper has some limitations. First, we only examine a sample of Chinese listed companies, so non-listed companies are not included, hence, further data needs to be obtained in order to study them. Second, although the data on ESG performance in this paper have been widely used in other research, their evaluation systems are not exactly the same as those of other international institutions, so it is necessary to verify our results using relevant data from other institutions. Third, the test methods and conclusions of this paper on institutional investors' ESG investment preferences need to be confirmed using other methods.

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Conflict of interest

We declare that we have no conflict of interest with other people or organizations that can inappropriately influence our work, the manuscript entitled "ESG Performance, Institutional Investors' Preference and Financing Constraints: Empirical Evidence from China".

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