Can corporate ESG performance mitigate short lending and long investment?

Yabo Liu

School of Economics and Business Administration, Chongqing University 400030, China

Abstract. ESG performance is the necessary meaning of "double carbon" goal framework, it is the only way for the enterprise to guard against defusing financial risk, green development to improve quality and efficiency, but there is more serious short loan long investment phenomenon in our country. Based on the sample of Chinese A-share listed companies from 2009 to 2021, the relationship between enterprise ESG performance and short loan long investment is empirically tested. The results show that the phenomenon of "short loan and long investment" in companies with good ESG performance is significantly improved, and three of the mechanisms are easing financing constraints, attracting analysts' attention and improving information transparency. This phenomenon is more significant in enterprises with high competition intensity, good internal control, audited by the four major companies and high media attention. The ESG performance of enterprises can alleviate the problem of "short loan and long investment", and also help companies to improve their risk level and market value. This study enriches the literature on ESG driving factors and investment and financing decisions of enterprises, and has important significance for further promoting enterprises' green transformation.

Keywords: Enterprise ESG performance; Short loan and long investment; Financing constraints; Level of risk taking.

1. Introduction

Since the reform and opening up, thanks to the rapid expansion of fixed asset investment, China's economy has experienced as long as 40 years of high-speed growth. From 1978 to 2019, China's average annual GDP growth rate reached 9.96%, far outpacing developed countries such as the United States and developing countries such as India. However, China's financial system has been in a state of "financial repression" for a long time, and non-financial enterprises, especially private enterprises and small and medium-sized enterprises, are generally facing serious financing constraints (Lin et al., 2015)[1].

Short loan and long term investment refers to the term mismatch problem of enterprises using short-term financing to support long-term investment. At present, the theoretical explanations for the problem of short loan and long investment can be divided into two categories: "capital cost hypothesis" and "alternative choice hypothesis". The former holds that short-term loan-long investment is an active choice made by enterprises to reduce financing costs and transmit positive signals by using short-term debt, while the latter holds that short-term loan-long investment is a forced choice made by enterprises unable to obtain long-term financing. Most scholars believe that short loan and long term investment is a passive choice of enterprises, which is not conducive to the healthy development of enterprises. For Chinese enterprises, how to maintain a sound and safe capital structure, how to manage the term of investment and financing, reduce financial risks, and ease short-term loans and long-term investments is extremely important.

The concept of ESG(Environment, Society, Governance) was originally born out of the concept of social responsibility and formally proposed by the United Nations Responsible Investment Organization (UNPRI). As an important indicator to measure the sustainable development of enterprises, ESG evaluation makes up for the limitations of only financial evaluation of enterprises. As an important standard for the international community to measure the level of green and sustainable development of enterprises, ESG rating, which has attracted wide attention in recent years,

may provide a solution to alleviate the short loan and long investment of enterprises and its negative effects. The WCW initiative, launched by the UN Secretary-General and the UN Global Compact in 2004, has greatly increased the level of awareness and awareness of the concept of ESG(Environmental, social and governance) among the investing public, and has also spawned a growing body of academic research on the relationship between ESG scores and the cost of capital for firms (Li et al., 2024)[2]. At present, ESG has been included in the information disclosure requirements of the capital market by more than 30 countries and regions around the world, and has become an important standard for the international community to measure the level of green and sustainable development of enterprises.

Based on the data of Shanghai and Shenzhen A-share companies from 2009 to 2021 in China, this paper explores the impact of ESG performance on short loan and long term investment behavior. The research results show that the phenomenon of "short loan and long investment" in companies with good ESG performance is significantly improved, and three of the mechanisms are easing financing constraints, attracting analysts' attention and improving information transparency. This phenomenon is more significant in companies with high competition intensity, good internal control, audited by the Big Four, and high media attention.

The possible marginal contributions of this paper mainly include the following three points: First, in terms of research objects, existing literatures focus on the impact of digital transformation (Song Yan et al., 2024)[3], corporate internal culture (Luo Hong et al., 2021)[4] and external economic environment (Wen Wen et al., 2023)[5] on short loan and long term investment, while ignoring the impact of corporate social responsibility performance. This study makes up for the shortcomings of existing literature and builds a bridge of internal and external governance. Second, in terms of research content, this paper innovates the influence mechanism of ESG performance on short loan and long investment, builds a bridge between information disclosure and internal risk control, and opens the "black box" between ESG and enterprise investment and financing decisions. This study finds that improving ESG performance of enterprises can not only alleviate debt financing constraints, but also alleviate short loan and long investment by increasing analyst attention and improving corporate information transparency. Third, the research results of this paper have high practical value. The research responds to the national policy of energy conservation and emission reduction, conforms to the trend of green finance, and is conducive to providing suggestions for the government, enterprises, investors and other stakeholders.

2. Theoretical analysis and research hypothesis

Firstly, good ESG performance can ease the financing constraints of enterprises, and then reduce short loan and long investment. Financing constraints play a partial mediating role in the relationship between ESG performance and firm value. On the one hand, firm ESG performance has a direct effect on firm value, which improves firm value; On the other hand, ESG performance reduces the financing constraints of enterprises, and lower financing constraints promote the improvement of enterprise value (Yi Wen Yu et al., 2023)[6]. According to signal theory, ESG performance disclosed by enterprises will release investment signals to the public, while the information of buyers and sellers is often asymmetrical. Information asymmetry and market sentiment play a regulating role in the ESG-misvaluation relationship, and ESG-related misvaluation further affects capital structure through market timing practice (Khan et al., 2024)[7]. From the perspective of reputation theory, corporate reputation is regarded as a valuable intangible asset by investors, and the disclosure of ESG through media channels has a significant negative impact on corporate valuation (Boon et al., 2022)[8]. On the one hand, good ESG performance can reduce corporate financial risks and ease financing constraints.

Secondly, good ESG performance can increase analysts' attention, and thus reduce short-term lending and long-term investment. On the one hand, from the perspective of sustainable investment, analysts form an embedded sentiment about the ESG performance of companies, and ESG disclosure

is a value driver for sell-side analysts (Enrica et al., 2023)[9]. For example, ESG disputes will significantly reduce the overall investment efficiency of an enterprise, and this negative impact is more obvious in companies with large scale and high analyst coverage (Xue et al., 2023)[10]; In the model integrating ESG disputes, ESG disclosure and the uncertainty of the company's future prospects, the forecast error of the analysts of the company facing the higher risk of ESG disputes is usually higher (Frank et al., 2022)[11]. On the other hand, the more companies are tracked by analysts, the more their true ESG information will be absorbed by the market, which undoubtedly increases the "good" news for the company and helps the company obtain more support from stakeholders, thus reducing the level of investment and financing risk (Jiang Yiyan et al., 2023)[12].

Thirdly, good ESG performance can improve corporate transparency, and thus reduce short-term lending and long-term investment. On the one hand, according to the reputation mechanism theory, corporate reputation is considered as a valuable intangible asset by investors (Boon et al., 2022)[8]. In order to obtain higher market value, enterprises with good ESG performance will reduce information asymmetry and increase corporate transparency through voluntary information disclosure, so as to convey positive corporate signals to the outside world, thus shaping their own image and enhancing corporate reputation (Sun Hui et al., 2023)[13]. On the other hand, the higher the information transparency, the more inclined banks are to make short-term loans (Armstrong et al., 2010)[14]. According to signal theory, the better the ESG performance of a firm, the more motivated it is to disclose the "good" news to the outside world, which not only expands the channels for external investors to know the internal news of the firm, but also can mine the "soft" information and reduce the information asymmetry between the supply and demand of funds. As a disadvantaged party in the financing market, the information quality of enterprises will affect the availability of credit, and the existence of information asymmetry will encourage financial institutions such as banks to provide short-term loans (Custodio et al., 2013)[15]. Therefore, only with the increase of information transparency can banks be willing to provide long-term financing, thus increasing the probability of companies obtaining long-term financing and alleviating the "short-term lending and long-term investment".

To sum up, good ESG performance of enterprises can reduce short-term lending and long-term investment by easing financing constraints, increasing analysts' attention and improving corporate information transparency. This paper proposes the following research hypotheses:

H1: ESG performance is negatively correlated with short loan and long investment

H2: Good ESG performance can reduce short loan and long investment by easing financing constraints, increasing analyst attention, improving corporate information transparency and other mechanisms

3. Research design

(1) Sample selection and data source

This paper selects the data of Shanghai and Shenzhen A-share listed companies from 2009 to 2022 for testing. In this paper, the ESG rating data, property rights nature data and the number of regional financial institutions are from the WIND database, the internal control index is from the Dibo database, the company stock bar post data is from the CNRDS database, and other financial data are from the CSMAR database. In this paper, the samples are screened according to the following criteria :(1) The financial listed companies are excluded; (2) ST stocks are excluded; (3) Eliminate listed companies that lack ESG performance and other relevant data records. The final remaining 9883 company-annual records were used for inspection. In order to avoid the influence of extreme values on the conclusion of this paper, all continuous variables were indorned at 1% above and below each year. At the same time, in order to ensure the robustness of the conclusions, clustering adjustments are made for standard errors at the firm level during the regression analysis.

(2) Model setting and variable definition

1. Explained variables

Referring to the measurement method of Liu Xiaoguang and Liu Yuanchun (Liu Xiaoguang et al., 2019)[16], this paper uses the difference (LS) between the proportion of short-term liabilities (current liabilities/total liabilities) and the proportion of short-term assets (current assets/total assets) to measure the situation of enterprises' short loans and long investments. The larger the index is, the more serious the mismatching degree of investment and financing term is. At present, there is no unified standard for the measurement of investment and financing term mismatch in the academic circle. In order to ensure the robustness of the conclusions of this paper, LS is still used in the robustness part to measure the degree of enterprise investment and financing term mismatch.

2. Explain the variables

This paper intends to use the ESG score of China Securities to measure the level of ESG performance of enterprises. Based on the core essentials of international ESG and combining China's national conditions and company characteristics, the ESG evaluation system of China Securities has built A comprehensive index evaluation system covering all A-shares. Compared with other domestic ESG scores, the ESG index evaluation system of China Securities has the advantages of more comprehensive coverage and higher updating frequency. Specifically, the ESG rating of Huazheng is divided into 9 grades, from high to low :AAA, AA, A, BBB, BB, B, CCC, CC, C; Its score is 100 out of 100, and the comprehensive score is obtained according to the scores of the three sub-indicators E, S and G. Its ratings are updated quarterly, four times a year, on January 31, April 30, July 31 and October 31. In this paper, the ESG Composite score /100 for December 31 of year t is selected to measure the annual ESG performance of the company in year t. The higher the index, the better the ESG performance level of the enterprise.

3. Control for variables

Referring to the research[13] of Li Changqing and Di Ran (2023)[17], in order to exclude the influence of other factors on the regression results, In this paper, the total asset Size (Size), asset-liability ratio (Lev), return on total assets (Roa), Growth ability (Growth), institutional investor shareholding (Inst), proportion of independent directors (Indep), board size (Dsize), ownership concentration (Top1), listing time (Age), chairman and general manager are analyzed Job integration (Dual), property nature (Soe), book-to-market ratio (Mtb), industry (Ind) and Year are controlled.

Table 1 Variable definitions

Variable names	Variable symbol	Variable definition
Total asset size	Size	Natural log of total assets at year-end
Asset-liability ratio	Lev	Total liabilities/total assets at year-end
Return on total assets	Roa	Net profit/total assets at year end
Ability to grow	Growth	Current operating income/Last year operating income −1
Institutional investor holdings	Inst	Number of shares held by institutional investors/total shares
Proportion of independent directors	Indep	Number of independent directors/Board of directors
Board size	Dsize	The natural logarithm of the number of people on the board
Concentration of ownership	Top1	Number of shares held by the largest shareholder/total number of shares
Time to market	Age	ln (year of the year − year of listing +1)
Property right nature	Soe	Soe = 1 for state-owned enterprises or 0 otherwise
Double duty	Dual	1 for chairman who also serves as general manager, 0 otherwise
Book-to-market ratio	Mtb	Total shareholders' equity/total market value
Year	Year	Dummy variables
Industry	Ind	Dummy variables

(3) Model construction

In order to investigate the impact of ESG performance on enterprises' short loan and long investment, this paper constructs the following model for verification:

$$LS_{i,t} = \alpha_0 + \alpha_1 ESG_{i,t} + \alpha Controls_{i,t} + \beta_{i,t} + \theta_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where, LSi,t is the "short loan and long investment" behavior of enterprise i in year t, ESGi,t represents the ESG score of enterprise i in year t, and Controls is a series of control variables. In order to avoid the influence of missing variables such as enterprise, industry and macroeconomic changes, this paper controls industry (β) and year (θ) respectively.

4. Empirical results and analysis

(1)Descriptive statistical results

Table 1 shows the descriptive statistical results of the main variables in this paper. Among them, the mean value and standard deviation of LSi,t is 0.2411 and 0.2006, which is similar to the results of previous studies. The mean value of ESGi,t performance (ESG) of Chinese listed companies is 0.7487 and the standard deviation is 0.0526. In addition, the descriptive statistical results of other control variables in this paper are also listed in Table 2, all of which are relatively similar to the existing literature and belong to the normal range, indicating that the data in this paper have a certain credibility.

Table 2 describes the descriptive statistics of major variables

Variables	Sample size	Average	Median	Standard deviation	Minimum	Maximum
LS	9883	0.2411	0.2453	0.2006	0.3018	0.7019
ESG	9883	0.7487	0.7518	0.0526	0.5882	0.8568
Size	9883	23.2692	23.1477	1.3136	20.6177	27.0279
Lev	9883	0.4755	0.4872	0.1954	0.0681	0.8636
Roa	9883	0.0491	0.0410	0.0559	0.1462	0.2194
Growth	9883	0.1504	0.1020	0.2218	0.2269	1.2506
Inst	9883	0.5674	0.6029	0.2242	0.0360	0.9512
Indep	9883	0.3759	0.3636	0.0552	0.3333	0.5714
Dsize	9883	2.2877	2.3026	0.1819	1.7918	2.7726
Top1	9883	0.3888	0.3791	0.1627	0.0641	0.7845
Age	9883	2.4811	2.7081	0.6572	0.6931	3.3322
Soe	9883	0.5216	0	0.4996	0.0000	1.0000
Dual	9883	0.2065	1	0.4048	0.0000	1.0000
Mtb	9883	1.3637	0.8380	1.4976	0.0904	8.6601

Note: ***, **, * indicate significant at 1%, 5%, and 10% levels, respectively.

(2)Baseline regression analysis

Table 3 shows the regression results of the main hypothesis in this paper. As can be seen from column (1) of Table 3, $ESG_{i,t}$ performance *(ESG)* and the degree of short loan and long investment $(LS_{i,t})$ of enterprises are significantly negative at 1% level. This means that the ESG performance of enterprises can help alleviate the short-term loan and long-term investment of enterprises, which verifies hypothesis 1 of this paper. In column (2) of Table 3, in order to further alleviate the endogenous problem, this paper reexamines the individual fixed effect, and the test results still show a significant negative correlation between the two. The possible reason is that public disclosure of ESG information can show investors the performance of enterprises in environmental, social and governance aspects, which helps to build trust, reduce uncertainty and reduce financing costs. On the other hand, by developing clear ESG policies and processes, companies can also improve their overall performance, reduce potential financial risks, and reduce short-term lending and long-term investment.

Table 3 Benchmark regression results

Variables	(1)	(2)	(3)
ESG	0.4588 * * *	0.4019 * * *	0.1538 * * *
	(5.9192)	(5.5673)	(4.2052)
Size		0.0032	0.0055 * *
		(0.6654)	(2.4781)
Lev		0.1926 * * *	0.1085 * * *
		(5.9744)	(7.8909)
Roa		0.2576 * * *	0.1534 * * *
		(3.6012)	(3.7950)
Growth		0.1091 * * *	0.0906 * * *
		(8.0832)	(10.2427)
Inst		0.0423 *	0.0458 * * *
		(1.9483)	(4.3078)
Indep		0.2202 * * *	0.1985 * * *
		(2.6285)	(5.3506)
Dsize		0.1177 * * *	0.0786 * * *
		(4.0342)	(6.6375)
Top1		0.0521 *	0.0648 * * *
		(1.7044)	(4.8745)
Age		0.0243 * * *	0.0330 * * *
		(3.5549)	(9.7865)
Soe		0.0091	0.0087 *
		(1.0072)	(1.8553)
Dual		0.0045	0.0180 * * *
		(0.3948)	(3.9474)
Mtb		0.0178 * * *	0.0036 *
		(4.0452)	(1.9246)
Constant term	0.5846 * * *	0.1999	0.2805 * * *
	(10.2314)	(1.5878)	(4.9467)
Vintage	Uncontrolled	Uncontrolled	Controls
Industries	Uncontrolled	Uncontrolled	Controls
Sample size	9883	13983	13983
Adjusted R	0.014	0.098	0.234

Note: t values in brackets, ***, **, and * indicate significant at 1%, 5%, and 10% levels, respectively. The following table is the same.

(3)Robustness test

Substitution of explanatory variables

In order to mitigate the impact of ESG rating differences among different institutions on the conclusion of this paper, Wind's ESG rating is used as the explanatory variable to measure the ESG performance of enterprises in year t. The regression results are shown in column (1) of Table 4. According to Table 3, Wind_ESGi,t and LSi,t showed a significant negative correlation at 5% level, indicating that the conclusion of this paper is still robust.

Replace the explained variables

Refer to the research of Liu Xiaoguang and Liu Yuanchun (Liu Xiaoguang et al., 2019)[16] to define short loan for long investment (SDLA)= ratio of short-term liabilities (short-term liabilities/total liabilities)- ratio of short-term assets (short-term assets/total assets). The higher the index, the more serious the enterprise's short-term loan and long-term investment. The regression results are shown in column (2) of Table 4. According to Table 4, ESGi,t and SDLAi,t show a

significant negative correlation at the 5% level, indicating that the conclusions of this paper are still robust.

Delete Some Data

To test robustness, data from 2012 to 2014 were deleted in this paper, and the regression results are shown in column (3) of Table 4. According to Table 3, after deleting part of the data, ESGi,t and SDLAi,t showed a significant negative correlation at the level of 1%, indicating that the conclusion of this paper is still robust.

The independent variable lags by one stage

Because ESG performance may have a lag effect on short loan and long investment, this paper adopts the method of delaying the independent variable by one stage. The regression results are shown in column (4) of Table 4. According to Table 4, ESGi,t+1 and LSi,t show a significant negative correlation at 1% level, indicating that the conclusion of this paper is still robust.

Table 4 Robustness test results

Variables	Replace liquidity indicator variables				PSM regression
	LS	SDLA	LS	LS	
	(1)	(2)	(3)	(4)	(5)
Wind_ESG	0.0147 * * (2.5280)				
ESG		0.1099 * * (2.1741)	0.3700 * * * (5.0861)		0.1146 * * (2.2861)
H_ESG1				0.1144 * (1.6947)	
Constant term	0.0473 (0.2382)	0.4926 * * * (6.2857)	0.7067 (0.3281)	0.2339 * (1.6821)	0.2689 * * * (3.2743)
Control variable	Controls	Controls	Controls	Controls	Controls
Individual	Control	Controls	Controls	Controls	Controls
Vintage	Controls	Controls	Controls	Controls	Controls
Industries	Controls	Controls	Controls	Controls	Controls
Sample size	2451	9983	7474	8305	5182
Adjusted R	0.249	0.337	0.123	0.242	0.243

Instrumental variable method

Since the ESG performance of each firm is likely to be affected by the ESG performance of other firms in its industry or in its year, the ESG performance of other firms is unlikely to affect the degree of short lending and long investment of its own firm. This paper intends to use the mean ESGIV of ESG scores of enterprises in the same industry in the same year as the instrumental variable for 2sls regression. The specific test results are shown in column (1)(2) of Table 5. In general, the test results of instrumental variables show that ESG_lv as instrumental variable is effective. According to Table 5, in the first stage regression, ESGIV and ESG showed a significant positive correlation at the level of 1%, indicating that the instrumental variables met the correlation requirements. Secondly, in the second stage regression, ESG and LS are still significantly negatively correlated at the level of 1%, indicating that the conclusion of this paper is still robust.

Table 5 Estimation results of instrumental variables

Variables	First stage	Stage Two
	(1)	(2)
	LS	LS
ESGIV	13.652 * * * (15.855)	

ESG		0.779 * * * (3.408)
Control variables	Controls	Controls
Industry/year	Controls	Controls
Sample size	9883	9883
R^2	0.092	0.178
Phase one F value	35.79	
Wald Chi2 statistic		2368.78

5. Further analysis

(1) Mechanism inspection

This paper holds that the key to alleviate short-term loan and long-term investment lies in making enterprises obtain more long-term debt financing that matches long-term investment and easing the financing constraints of enterprises; Increase the attention of analysts, play the role of media attention, and make executives more cautious; And improve the company's information transparency.

1. Corporate financing constraints

Existing studies have pointed out that the ESG performance of enterprises mainly inhibits the maturity mismatch of enterprises' investment and financing by easing corporate financing constraints and extending corporate debt maturity structure (Li Changqing et al.,2023)[17]. Alleviating financing constraints is an important channel for enterprises to restrain the maturity mismatch of investment and financing through a series of behaviors such as issuing green bonds and integrating industry and finance. Therefore, this paper also holds that financing constraint easing is a key channel through which corporate ESG performance inhibits short loan and long investment. To verify the above logic, refer to the research of Wei Zhihua et al., Liu Liya et al. (Wei Zhihua et al., 2014[18]; Liu et al., 2015[19]), this paper uses KZ index to measure the degree of financing constraints faced by enterprises. The larger the KZ index is, the more serious the financing constraints are. As can be seen from column (1) of Table 6, ESGi,t and KZi,t present a significant negative correlation at the level of 5%, indicating that ESG performance of enterprises is conducive to easing the financing constraints of enterprises and reducing enterprises' short loan and long investment.

2. Analyst concern

The higher the analyst attention of a company, the more its good ESG performance will be fully revealed and widely disseminated from multiple perspectives, and the better its reputation in the capital market (Ying et al., 2019)[20]. Jiang Yiji and Yao Shujie (Jiang Yiji et al., 2023)[12] believe that the more companies are tracked by analysts, the more their true ESG information will be absorbed by the market, which undoubtedly increases the "good" news of the company and helps the company to obtain more support from stakeholders, thus reducing the risk level. However, when the company has poor performance in ESG information disclosure, It will also attract the attention of securities analysts. At this time, securities analysts can effectively explain the company's strategic intention to market investors, so as to reduce the degree of misjudgment of corporate investors on the company's business strategy. In this paper, the logarithm of the number of analysts +1 is chosen to represent the attention of analysts. The higher the index, the higher the attention of analysts. As can be seen from column (2) of Table 6, ESGi,t and AnaAttentioni，t are significantly negatively correlated at the level of 1%, indicating that ESG performance of enterprises is conducive to alleviating financing constraints of enterprises and reducing short loan and long investment.

3. Transparency of information

Aouadi and Marsat found that the external attention, namely corporate visibility, greatly affects the incremental value that corporate social responsibility performance can bring to the enterprise (Aouadi et al., 2018) [21]. Since 2005, Shenzhen Stock Exchange has been reviewing the annual information disclosure of Shenzhen A-share listed companies from various aspects with reference to

strict and unified evaluation standards, and the evaluation results are divided into four grades: A(excellent), B(good), C(qualified) and D(unqualified). Referring to the research of Sun Hui et al. (2023) (Sun Hui et al., 2023) [13], according to the annual appraisal results of the information disclosure work of listed companies by the Shenzhen Stock Exchange, the opacity of corporate information will be measured by using the CompanyOpacity, and levels A, B, C and D will be set to 4, 3, 2 and 1. The larger the value is, the key will be set to 4. Represents the better the information disclosure of the listed company and the higher the information transparency. As can be seen from column (3) of Table 6, ESGi,t and CompanyOpacityi，t present a significant negative correlation at the level of 1%, indicating that the performance of enterprise ESG will be conducive to easing corporate financing constraints and reducing short lending and long investment.

(ii) Heterogeneity analysis

Table 6 Mechanism test

Variables	Mechanism 1	Mechanism 2	Mechanism 3
	(1)	(2)	(3)
ESG	1.1180 * *	1.8497 * * *	2.1128 * * *
	(2.4359)	(6.2276)	(4.8155)
Constant term	6.4067 * * *	8.9078 * * *	1.3471
	(8.4526)	(19.0657)	(1.5601)
Control variables	Controls	Controls	Controls
Vintage	Controls	Controls	Controls
Industries	Controls	Controls	Controls
Sample size	9883	9883	9883
Adjusted R	0.632	0.431	0.356

1. Industry competition intensity

In this paper, the Herfindahl index HHI is used to represent the intensity of industry competition. The heterogeneity test results are shown in Table 7 (1) (2), and the coefficient of difference between groups is 0.0000, passing the significance level of 1%. This indicates that the ESG performance of enterprises has a more significant inhibitory effect on short loan and long investment under higher industry competition intensity. The possible reason is that in a highly competitive environment, the uncertainty of the external environment is greater, and the risk appetite of enterprises may be more cautious, thus reducing high-risk behaviors such as investment and financing maturity mismatch.

2. Internal controls

In this paper, the internal control index of Dibo database is used. The heterogeneity test results are shown in Table 7 (3) (4). The difference coefficient between groups is 0.0010, passing the significance level of 1%. This indicates that good internal control will amplify the inhibition effect of ESG performance on short loan and long investment. The possible reasons is that in investment and financing activities, good internal control is crucial for enterprises, it can not only affect the ability of enterprises to obtain funds, but also improve the efficiency and effect of investment.

3. Whether the "Big Four" audit is available

According to existing literature studies (Xia Tongshui et al., 2023)[22], from the perspective of the "deep pocket" theory, the "Big Four" will provide high-quality audit services in order to maintain a good reputation in the context of the existence of equity pledge in the audited units. In this paper, the grouping regression method is adopted to test the influence of accounting firms on short loans and long investments, and Big4 is constructed as a measurement index. If an enterprise employs the top four accounting firms, Big4=1, and if it employs the top four accounting firms, it is 0. The heterogeneity test results are shown in Table 7 (5) (6), and the coefficient of difference between groups is 0.0825, passing the significance level of 10%. This indicates that among the Big Four audited enterprises, ESG performance has a more significant mitigation effect on enterprises' short

loan and long investment. The possible reason is that as the top accounting firms in the world, the Big Four auditors not only objectively provide higher quality audit services and improve the quality of information disclosure; To some extent, they also have higher visibility and public influence, so that investors have stronger confidence; Moreover, because the audit fee is relatively high, the affordability of the invested enterprises also reflects its strength from the side, thus affecting investors psychologically.

4. Media attention

With reference to the study of Li Changqing and Di Ran (2023) (Li Changqing et al., 2023) [17], this paper intends to use the natural logarithm of the annual sum of the total number of posts in the stock bar of a listed company (natural day) to measure corporate social media attention. The larger the index, the higher the external attention of the enterprise. Further, in order to test the moderating effect of social media attention on ESG performance of enterprises and short loan and long investment, this paper divides enterprises' social media attention into high and low groups according to the annual provincial average. The specific regression results are shown in columns (3) and (4) of Table 7. As can be seen from Table 7, although in the group with high or low social media attention, ESGi，t and SFLIi，t+1 both show a significant positive correlation at the level of 1%, the coefficient of ESGi and t in the group with high social media attention is significantly larger. The results of heterogeneity test are shown in Table 7 (7) (8), and the coefficient of difference between groups is 0.0090, passing the significance level of 10%. This indicates that under high media attention, ESG performance has a more significant mitigation effect on enterprises' short loan and long investment. The possible reason is that the higher media attention makes the management more cautious and reduces the risky behaviors such as short loan and long investment. The quality of corporate disclosure may be higher, and it also makes companies take corporate social responsibility (CSR) and corporate reputation more seriously.

Table 7 Heterogeneity test

Variables	Herfindahl index		Internal control Index		Big Four audit		Media attention	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	high	low	high	low	is	no	high	low
ESG	0.0535 (0.9826)	0.3125*** (6.3926)	0.0005 (0.0086)	0.2397*** (4.7993)	0.6856*** (3.9056)	0.3785*** (9.6805)	0.2443*** (4.8644)	0.0550 (1.0330)
Constant term	0.1917** (2.3058)	0.4483*** (5.8185)	0.0352 (0.4541)	0.4770*** (5.4518)	0.0161 (0.0645)	0.2288*** (3.7377)	0.4052*** (5.2922)	0.1493* (1.6531)
Control variables	Controls	Controls	Controls	Controls	Controls	Controls	Controls	Controls
Vintage	Controls	Controls	Controls	Controls	Controls	Controls	Controls	Controls
Industries	Controls	Controls	Controls	Controls	Controls	Controls	Controls	Controls
Sample size	4564	5319	4897	4986	422	9461	4878	5015
Adj_R^2	0.243	0.262	0.250	0.231	0.352	0.094	0.268	0.224
Difference P-value	0.0000		0.0010		0.0825		0.0090	

6. Conclusions and Suggestions

As the global attention on sustainable development increases year by year, as a reflection of the concept of sustainable development at the enterprise level, enterprise ESG behavior has been widely concerned and discussed by all walks of life.

In this context, this study finds that the ESG performance of enterprises is negatively correlated with the short loan and long investment, that is, the improvement of ESG performance of enterprises is conducive to alleviating the problem of short loan and long investment. The results of this study show that corporate ESG performance can inhibit corporate short loan and long term investment by easing corporate financing constraints, increasing analyst attention, and improving corporate transparency. Further research shows that in enterprises with greater industry competition, stronger internal control, Big Four audit, and stronger social media attention, ESG performance has a more significant mitigation effect on short loan and long term investment.

Based on the above research conclusions, this paper draws the following enlightenments: First, from the perspective of enterprises, enterprises should actively improve their ESG performance to alleviate the phenomenon of short loan and long investment. Enterprises need to be aware of the positive economic consequences of improving ESG performance, and invest in ESG behavior with a long-term perspective. Second, from the perspective of investors, investors should pay full attention to the ESG performance of enterprises and analyze their financial status in combination with their social responsibility performance. Taking responsibility for stakeholders other than shareholders does not necessarily harm the interests of shareholders, and can even provide further protection for the interests of shareholders. Shareholders should understand enterprises' investment in ESG behavior from the perspective that ESG performance can alleviate enterprises' short-term lending and long-term investment, and actively supervise enterprises' improvement of ESG performance to promote enterprises' sustainable development. Third, from the perspective of the government and other relevant supervisory and administrative agencies, first of all, the government and other relevant supervisory and administrative agencies should continue to improve and develop laws and regulations, improve the quality of information disclosure, and standardize the ESG evaluation system. Additionally, develop a multi-level financial market system to provide channels for enterprises to obtain financing that matches the investment period, prevent and dissolve financial risks, and promote the smooth development of China's financial work.

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