Impact of ESG Performance on Enterprise Risk

Yuqing Zhang *

School of Nanjing University of Science and Technology, Nanjing, China

* Corresponding Author Email: zyqxf99@163.com

Abstract. ESG is the application and practice of the concept of sustainable development in enterprises, which is highly compatible with China's social and economic development strategy at this stage. At present, corporate ESG performance has become a hot spot of research and practice at home and abroad. Enterprise risk, as an important factor affecting enterprise development, lacks relevant research on the impact of enterprise ESG performance on enterprise risk, not to mention the exploration of the mechanism of the role of ESG performance on enterprise risk. This paper takes China's A-share listed companies in Shanghai and Shenzhen from 2013 to 2022 as the initial sample to study the effect and mechanism of ESG performance on corporate risk. The results of the study show that: ①good corporate ESG performance can significantly reduce corporate risk, and the conclusion still holds after the robustness test; ②mechanism analysis finds that good corporate ESG performance can reduce corporate risk by inhibiting corporate virtual investment. This paper enriches the related research on the economic consequences of corporate ESG, which helps to promote the risk management of listed companies through ESG strategies, and also provides reference for the decision-making of the government, investors and other stakeholders.

Keywords: ESG; Business Risk; Investment structure.

1. Introduction

"Environmental, Social and Governance" (ESG) is a corporate management concept and investment philosophy put forward by the United Nations in 2004, emphasizing the coordinated development of the economy, society and the environment. ESG ratings are mainly used to evaluate the performance of enterprises in the three areas of ESG is the application and practice of the concept of sustainable development in enterprises, which is highly compatible with China's social and economic development strategy at this stage. More and more companies recognize the importance of ESG practices and gradually begin to disclose ESG reports and formulate ESG-related strategies. ESG Disclosure Status and Suggestions of Listed Companies in China" released by Responsible Cloud Research Institute shows that since 2011, the number of ESG reports released by listed companies, especially A-share listed companies, has increased year by year, with the increase in the past two years showing a clear upward trend, and the level of disclosure has improved year by year. The Environmental, Social and Governance (ESG) Blue Book of Listed Companies of Central Enterprises (2023) shows that the number of A-share listed companies that have released ESG-related reports for the year 2022 has reached 1,817, with a report release rate of over 35%. However, China's ESG development started late and is still in the initial development stage. At present, domestic ESG development exists in the government dimension of the ESG information disclosure framework is less, the information disclosure standard is not uniform, the policy system is incomplete and the lack of special regulatory services departments and non-profit organizations and many other problems, the future enhancement of space is large.

At present, ESG has become a hot spot of research and practice at home and abroad. Some scholars have explored the economic consequences of corporate ESG performance, providing empirical evidence for understanding the meaning and value of ESG practice.

As a crucial factor affecting the development of enterprises, enterprise risk has always been an important part of enterprise management research. However, few studies have focused on the impact of ESG performance on enterprise risk, and the related logical mechanisms have not been clearly analyzed [1]. Since the outbreak of the New Crown Pneumonia epidemic, the macroeconomic

environment has become more complex and volatile, leading to a significant increase in the risks faced by enterprises.

In view of this, this paper takes China's Shanghai and Shenzhen A-share listings from 2013 to 2022 as a research sample to explore the impact of ESG performance on corporate risk and the mediating role of corporate investment structure in it. Compared with previous studies, the contribution of this paper mainly lies in (1) this paper enriches the research related to the economic consequences of corporate ESG performance by taking corporate risk prevention and control as the research perspective. (2) This paper empirically examines the mediating effect of corporate investment structure between ESG performance and corporate risk, and expands the path of ESG performance on corporate risk. (3) The research in this paper helps to promote enterprises to practice ESG concepts, harmonize their own development with the requirements of national strategies, and provide empirical evidence for the development of ESG in China.

2. Literature References

2.1. Economic Consequences of ESG Performance

Currently, domestic and international studies on corporate ESG performance mainly explore the economic consequences of ESG performance.

Most of the studies show that good ESG performance can significantly reduce the cost of corporate financing, and enhance enterprise value, enterprise performance, and enterprise innovation. Good ESG performance can not only significantly reduce the cost of corporate debt financing [2], but also significantly reduce the cost of equity capital [3]. It can promote corporate financial self-discipline, boost investor confidence, and then reduce the cost of corporate debt financing, but also reduce the cost of corporate equity financing through the two paths of information effect and reputation effect [4]. For private enterprises, compared with the individual dimensions of environment, society and corporate governance, the overall ESG performance plays a more prominent role in the enhancement of enterprise value [5]. Good ESG performance can significantly enhance both the quantity and quality of corporate innovation output [6].Both ESG performance and its three dimensions can significantly enhance corporate performance by improving corporate innovation and thus corporate performance [7], and digital transformation can enhance the contribution of ESG performance to corporate performance [8]. For industrial enterprises, the impact of fulfilling ESG responsibilities on financial performance presents a U-shaped nonlinear characteristic, and the low-cost competitive strategy and differentiated competitive strategy strengthen the U-shaped relationship between the two [9].

Some scholars have also explored the impact of ESG performance on corporate foreign investment, corporate resilience, audit opinion, and high-quality development. Firms can utilize ESG advantages to overcome outsider disadvantages caused by environmental factors, thus enhancing the likelihood and scale of outward investment [10]. Good ESG performance can make firms more resistant and resilient to crisis [11]. When firms have better ESG performance, auditors are more likely to issue a standard audit opinion [12]; while when firms have poor ESG performance, auditors disclose more and more detailed key audit matters to address risks. In addition, corporate fulfillment of ESG responsibilities can significantly enhance corporate total factor productivity [13] as well as employment levels [14], which is important for promoting the high-quality development of China's economy.

2.2. Factors Influencing Enterprise Risk

In 2006, the Guidelines on Comprehensive Risk Management for Central Enterprises issued by SASAC defined enterprise risk as "the impact of future uncertainty on the achievement of an enterprise's business objectives". According to the content of risk, enterprise risk is generally categorized into strategic risk, financial risk, market risk, operational risk, legal risk and so on. According to the cause of risk and whether it can be diversified, enterprise risk can be divided into

systematic risk and idiosyncratic risk [15]. Systemic risk is caused by factors at the market and macroeconomic levels and is an undiversifiable risk; idiosyncratic risk is caused by factors at the individual enterprise level and is a diversifiable risk [16].

The factors affecting business risk are broadly categorized into external and internal factors.

In terms of external factors, first, the macroeconomic environment has a significant impact on enterprise risk. Fang Yi et al. (2021) [17] used the trade friction between China and the United States as the research background, and found that the rise of systemic financial risk will lead to the intensification of real economic risk. Second, economic policy uncertainty also increases business risk, especially the risk impact on weaker market position, higher degree of competition in the industry and private enterprises [18]. Declining monetary policy uncertainty can reduce business risk of enterprises, and the effect will gradually increase under loose monetary policy [19]. Policy uncertainty triggered by changes in local officials will significantly increase the market risk of local firms [20]. Finally, the market environment also affects firm risk. Based on the study of interbank certificate of deposit (IBD) business conducted by financial institutions in various provinces, Ni Chuanran and Liu Shida (2020) show that financial interbank activities at the regional level significantly increase the risk of a significant drop in the share price of local listed companies [21]. In addition, analyst attention helps to reduce business risk [22].

In terms of internal factors, first, corporate managerial characteristics can significantly affect firm risk. CEOs with financial expertise can reduce firm risk by influencing the firm's surplus management decisions and the quality of internal controls and thus reduce firm risk [23]. Board social capital formed by interlocking director network relationships can significantly reduce the level of firm risk, but this effect is mainly found in non-state-owned firms and small-sized firms [24]. Second, at the level of corporate governance, firms implementing an industry diversification strategy can significantly reduce the idiosyncratic risk of firms, while adopting an international diversification strategy can significantly reduce the systemic risk of firms [25]. High-quality internal controls can significantly reduce firms' systemic and idiosyncratic risks [15]. Finally, firm behavior can also significantly affect firm risk. Enterprises engaging in tax avoidance can significantly increase enterprise risk, but the potential enterprise risk increased by tax avoidance can be suppressed by improving the level of internal control [26]. Enterprise participation in precision poverty alleviation can improve corporate reputation, resource acquisition capacity, and productivity, which in turn reduces enterprise risk [27].

2.3. ESG Performance and Corporate risk

Currently, there are fewer domestic and international studies on the impact of ESG performance on corporate risk. Most of the existing relevant studies believe that good ESG performance is conducive to reducing corporate risk. Based on stakeholder theory, the fulfillment of ESG responsibilities by enterprises is a manifestation of safeguarding the rights and interests of their stakeholders, which is conducive to obtaining the support of stakeholders and thus more resource inputs [28]. Good ESG performance helps enterprises to obtain high-quality transactions and more profits from consumer and supply chain channels, lower-cost financing from investor and creditor channels, and government subsidy support from government channels. ESG reduces enterprise risk by improving the ability of enterprises to obtain resources from stakeholder channels [1]. Good ESG performance can send positive signals to investors, promote their correct investment decisions, and help to reduce the risk of corporate stock price collapse [29]. However, a few studies have argued, based on agency theory, that corporate fulfillment of ESG responsibilities increases corporate risk. Catello et al. (2022) examined the impact of corporate social performance, as represented by ESG assessment, on corporate financial risk using a dual risk measure, and found that investor uncertainty about corporate sustainability performance is high, and that the overall ESG assessment corresponds to a higher systemic corporate risk, while corporate environmental ratings have an upward effect on the same risk dimension [30].

Although some scholars do not study the impact of overall ESG performance on corporate risk, it is also informative to explore the impact on corporate risk from one of the dimensions of environment, social responsibility, and corporate governance. Liu Bai and Wang Xinzhu (2021) found that corporate green innovation can promote stock returns, i.e., firms can obtain risk compensation from green innovation [31]. Huang Yuxuan et al. (2023) found that social responsibility demonstrated a strong risk-hedging effect during the shock of the new Crown pneumonia epidemic, and in terms of economic significance, for every one-unit standard deviation increase in social responsibility, the systematic risk of the firm declined by 6.127% and the idiosyncratic risk declined by 3.250% [32]. Zeng Jin (2010) found that the level of corporate governance has a negative impact on firms' risk and a positive impact on firms' returns [33].

3. Theoretical Analysis and Research Hypothesis

3.1. ESG Performance and Corporate Risk

According to the theory of information asymmetry, there is an information gap between stakeholders such as investors and the management of an enterprise, with the latter possessing more information about the operating conditions of the enterprise than the former. Usually, investors can only obtain limited financial information about the enterprise, which is easy for them to form wrong judgments about the enterprise's operating conditions and then make wrong investment decisions. This will not only cause investors to suffer losses, but also increase the risk of the enterprise. By practicing ESG and disclosing information on environment, society and corporate governance, enterprises can allow stakeholders to better understand the operating conditions and sustainable development ability of the enterprise from non-financial channels and reduce the degree of information asymmetry. Therefore, ESG has an "information effect"[34], and improving ESG performance can help reduce the problems caused by information asymmetry, and thus reduce the market risk of enterprises.

Good ESG performance can convey positive signals to stakeholders and help enterprises establish a good image of environmental friendliness, active fulfillment of social responsibility, and sound internal governance, thus improving corporate reputation. Based on reputation theory, a good long-term reputation can increase stakeholders' trust in the enterprise, improve the enterprise's ability to withstand the impact of negative news, and play the role of "insurance buffer" [35]. When a company breaks negative news and there is no evidence that the company is malicious, many stakeholders will choose to trust the company because of its past good reputation and believe that the company has the ability to solve the problem, thus avoiding the situation of investors selling a large number of shares. Therefore, good ESG performance can provide hedge-like protection for firms by enhancing their reputation.

Resource dependence theory suggests that in order to maintain survival, organizations must obtain the resources they need from the environment. The quantity and quality of resources owned by an organization determines the solidity of its foundation and provides basic protection for its production and operation. In order to cope with unknown risks, firms must have sufficient reserves of resources. Therefore, whether an enterprise can obtain and maintain the supply of key resources is the core issue for its survival and development. On the basis of maintaining survival, enterprises need to form competitive advantages to seek better development. One of the important sources of competitive advantage for enterprises is heterogeneous resources. Resources that are scarce, irreplaceable, difficult to imitate and valuable can contribute to the formation of long-term competitive advantage of enterprises. In addition, in order to gain more competitive advantages, enterprises need to invest resources in technology research and development and product innovation; at the same time, they need to consume a certain amount of resources to cope with various unpredictable conditions. For enterprises, coping with unknown risks is an extremely resource-consuming activity, and the resource constraints of an enterprise are an important factor affecting enterprise risks, and the enterprise's ability to acquire resources determines the level of enterprise risks. Therefore, the stronger the

enterprise's ability to obtain resources, the more stable its operating conditions and the lower its own risk.

Based on the stakeholder theory, the production and operation activities of an enterprise not only need the capital input of investors, but also need the support of employees, consumers, suppliers and government and other stakeholders. Stakeholders are the participants in the production and operation process of the enterprise, providing the enterprise with the required resources. The credit resources provided by investors and creditors, the human resources provided by employees, the policy resources provided by the government, and the product market competitiveness resources provided by consumers and the supply chain are all important resources needed for the development of enterprises. The practice of ESG concepts by enterprises helps to enhance their social reputation and makes them more likely to be favored by stakeholders. Since most of the enterprise's resources come from stakeholders, good ESG performance helps the enterprise to obtain more resources from stakeholders, which in turn reduces enterprise risk.

Based on the above analysis, this paper proposes the following hypotheses:

H1: Good ESG performance can significantly reduce corporate risk.

3.2. Intermediation in the Investment Structure of Firms

Following the 20th Party Congress, which explicitly called for "insisting on placing the focus of economic development on the real economy", the first meeting of the 20th Central Financial and Economic Commission emphasized "accelerating the construction of a modern industrial system supported by the real economy".

Since 2016, China's economy has been characterized by a relatively obvious "deconstruction to emptiness" [36]. Due to the decline in the profitability of the real economy, many non-financial enterprises have invested the funds that should have been invested in the industrial economy in the high-yield financial industry and real estate industry, resulting in the contraction of the real economy and the expansion of the virtual economy, with a structural imbalance between the two. The rapid growth of equity investment does not necessarily lead to the formation of real production capacity, and its scale continues to accumulate and may engulf the real economy in the long term [37]. International experience has also shown that the "de-realization to virtualization" will lead to excessive hollowing out of the real economy of the country, a large amount of capital influx into the virtual economy to generate economic bubbles, and the final bursting will cause a serious financial crisis. 2008 global financial crisis proved that the "de-realization to virtualization" is very harmful. The global financial crisis of 2008 proved that the "de-realization to virtualization" is very harmful.

The practice of ESG by enterprises can promote enterprises to increase the proportion of real investment, which is conducive to solving the problem of "de-realization to virtualization" [38]. First, good ESG performance means that enterprises have more perfect governance mechanisms and reasonable governance structure. Hu Nan et al. (2021) argued that an effective monitoring mechanism in corporate governance can inhibit managers' short-sighted behavior, thus reducing the negative relationship between managers' short-sighted behavior and long-term corporate investment [39]. Second, more studies have found that good ESG performance can alleviate firms' financing constraints [4]. The main reason for non-financial firms to make large-scale financial investments is to obtain high profits in the short term, which is essentially due to the lack of capital and the high degree of financing constraints of the firms. The practice of ESG concepts by enterprises can reduce the degree of financing constraints, which in turn inhibits enterprises from carrying out financial investment. Third, the disclosure of ESG information by enterprises can improve the transparency of information, inhibit the opportunistic behavior of management, and thus avoid managers from investing in the financial industry in order to pursue "superficial profits".

Compared with the real economy, the virtual economy has significantly different characteristics, mainly manifested in four aspects: high liquidity, instability, high risk and high speculation. Virtual economy in addition to the financial market and the real estate market, the excess return rate of the two induced some enterprises to over-invest in it. Enterprise resources are limited, over-investment

in the virtual economy will inevitably crowd out the resources used by enterprises for physical investment, resulting in tightening of the physical investment of enterprises, and the investment structure is unbalanced. When the enterprise investment structure is excessively biased towards equity investment, it will inevitably increase the instability of production and operation and bring risks to the enterprise.

Therefore, this paper argues that the practice of ESG concepts by enterprises is conducive to promoting enterprise entity investment, optimizing enterprise investment structure, and thus reducing enterprise risk.

Based on the above discussion, this paper proposes the following hypotheses:

H2: Good ESG performance can promote enterprises to increase the proportion of real investment and balance the investment structure.

H3: Good ESG performance can reduce enterprise risk by promoting enterprises to carry out real investment.

4. Research Design

4.1. Data Sources and Sample Selection

In this paper, China's Shanghai and Shenzhen A-share listed companies are selected as the initial research sample from 2013 to 2022.ESG rating data are from Wind database and other data are from CSMAR database.

In order to eliminate the influence of extreme outliers on the empirical results, this paper screens the initial sample according to the following steps: (1) excluding the sample observations of listed companies in the ST and *ST categories during the sample period; (2) excluding the sample observations of listed companies in the financial category; (3) excluding the samples with missing data; and (4) shrinking the tails of all the continuous variables at the 1% and 99% levels (Winsorize) processing. Finally, 26706 sample observations for 4065 companies are obtained. This paper uses STATA 16.0 software to analyze the data.

4.2. Variable Definition and Measurement

4.2.1. Explained variable: firm risk (Risk).

Many previous studies have used the volatility of return on total assets (ROA) as a measure of corporate risk, with two types of measures: the standard deviation of a company's ROA adjusted for industry and annual averages; and the extreme deviation of ROA adjusted for industry and annual averages. Both types of measures are calculated on a rolling basis with a period of T years. In this paper, the standard deviation of return on total assets is used as a measure of financial risk. The specific calculations are as follows:

$$AdjROA_{ijt} = \frac{EBIT_{ijt}}{Asset_{it}} - \frac{1}{n_{jt}}\left(\sum_{k=1}^{n_{jt}} \frac{EBIT_{ijt}}{Asset_{ijt}}\right) \tag{1}$$

$$Risk_{it} = \sqrt{\frac{1}{T-1}\sum_{t=1}^{T}\left(AdjROA_{ijt} - \frac{1}{T}\sum_{t=1}^{T} AdjROA_{ijt}\right)^2} \tag{2}$$

Where T is the rolling calculation period, this paper takes T=3.

In order to eliminate the order of magnitude difference to make the regression results more intuitive, this paper adopts the processing method of He Ying et al [40], which multiplies the calculated results by 100 to get the final index.

4.2.2. Explanatory variables: corporate ESG performance (ESG).

Currently, there is no uniform standard for evaluating corporate ESG performance, and there are many different ESG evaluation systems at home and abroad, such as: MSCI, FTSE Russell, Sustainalytics, Huazhou, and Shangdao Ronglv ESG evaluation system. Because the CSI ESG

evaluation data is close to the Chinese market, covers a wide range, and has a high timeliness, this paper chooses the CSI ESG ratings to measure the ESG performance of companies. The CSI ESG ratings are C, CC, CCC, B, BB, BBB, A, AA, AAA, from low to high, with a total of 9 grades. Higher ratings indicate better ESG performance. Therefore, this paper assigns CSI ESG ratings from low to high from 1 to 9. For example, when the rating is AAA, ESG=9; when the rating is AA, ESG=8, and so on.

4.2.3. Mediating variable: investment structure (IS).

Drawing on the studies of Fu Wenlin, Zhao Yonghui (2014) [37] and Xu Guangwei et al. (2020) [41], this paper categorizes firms' investment into physical investment and equity investment. Among them, entity investment refers to the cash paid by enterprises used to purchase and construct fixed assets, intangible assets and other long-term assets; equity investment includes the cash paid by enterprises to acquire trading financial assets, held-to-maturity investments, and available-for-sale financial assets other than cash equivalents, etc. [1-2]. Drawing on the research of Hou Xiaoxian and Zheng Tiandan (2021), the variable is created: enterprise investment structure = equity investment / entity investment. The larger the indicator, it indicates that the enterprise investment is biased towards equity investment, and vice versa, it is biased towards entity investment [42].

4.2.4. Control variables.

Drawing on previous related studies, this paper selects enterprise age (Age), enterprise size (Size), return on assets (ROA), gearing ratio (Lev), the proportion of shares held by the first largest shareholder (Top1), and book-to-market ratio (Market) as control variables.

Table 1. List of variable definitions.

Variable Nature	Variable Name	Variable Symbol	Variable Definition
dependent variable	business risk	Risk	3-year moving average standard deviation of the company's return on total assets, adjusted for industry and annual averages
independent variable	ESG performance	ESG	CSI ESG Rating
intermediary variable	investment structure	IS	equity/entity investments
control variable	age of business	Age	sample year - year of incorporation +1
	enterprise size	Size	natural logarithm of total assets at the end of the period
	return on assets	ROA	net profit/average total assets
	asset-liability ratio	Lev	total liabilities/total assets at end of period
	shareholding ratio of the largest shareholder	Top1	number of shares held by the largest shareholder at the end of the period/total share capital
	book-to-market ratio	Market	ratio of market value outstanding to book value of the enterprise at the end of the year

4.3. Model Building

The model for testing H1 is as follows (Model 1):

$$Risk_{it} = \alpha_0 + \alpha_1 ESG_{it} + \alpha_2 Age_{it} + \alpha_3 Size_{it} + \alpha_4 ROA_{it} + \alpha_5 Lev_{it} + \alpha_6 Top1_{it} + \alpha_7 Market_{it} + \varepsilon \quad (3)$$

The model for testing H2 is as follows (Model 2):

$$IS_{it} = \alpha_0 + \alpha_1 ESG_{it} + \alpha_2 Age_{it} + \alpha_3 Size_{it} + \alpha_4 ROA_{it} + \alpha_5 Lev_{it} + \alpha_6 Top1 + \alpha_7 Market + \varepsilon \quad (4)$$

The model for testing H3 is as follows (Model 3):

$$Risk_{it} = \alpha_0 + \alpha_1 ESG_{it} + \alpha_2 IS_{it} + \alpha_3 Age_{it} + \alpha_4 Size_{it} + \alpha_5 ROA_{it} + \alpha_6 Lev_{it} + \alpha_7 Top1_{it} + \alpha_8 Market_{it} + \varepsilon \quad (5)$$

5. Empirical Analysis

5.1. Descriptive Statistics and Correlation Coefficient Analysis

Table 2 shows the descriptive statistics of the variables. The mean value of Risk is 3.065, the minimum value is 0.169, the maximum value is 19.41, and the standard deviation is 3.32, which indicates that there is a large difference in the level of corporate risk among listed companies. The mean value of ESG is 4.192, the minimum value is 1, and the maximum value is 8, with a standard deviation of 1.065.This indicates that, as a whole, the average level of ESG of listed companies in China is not high, and there is a large difference in ESG performance among companies. This indicates that there is a large difference in ESG performance among listed companies. The average level of ESG is not high, and there is a big difference in ESG performance between companies. the mean value of IS is 0.334, the minimum value is 0, the maximum value is 5.289, and the standard deviation is 0.752, which shows that from an overall point of view, the problem of "deconcentration" of China's listed companies has been improved compared with that of the previous years, and the investment structure of enterprises is more balanced, but the investment structure between enterprises is more balanced. The investment structure of enterprises is more balanced, but there are big differences in the investment structure among enterprises. The distributions of the remaining variables are all in the expected reasonable range, and there is no big difference with previous studies, so we will not repeat them.

Table 2. Descriptive statistics.

variable	N	mean	p50	sd	min	max
Risk	26706	3.065	1.964	3.320	0.169	19.41
ESG	26706	4.192	4	1.065	1	8
IS	26706	0.334	0.0910	0.752	0	5.289
Age	26706	20.13	20	6.026	4	123
Lev	26706	0.410	0.403	0.194	0.0590	0.855
ROA	26706	0.0400	0.0380	0.0570	-0.201	0.198
Top1	26706	33.96	31.87	14.73	8.350	74.24
Size	26706	22.33	22.11	1.289	20.15	26.41
Market	26706	0.620	0.611	0.252	0.125	1.199

Before carrying out the regression, this paper analyzes the correlation coefficients of the variables to avoid the problem of multicollinearity, so as not to affect the reliability of the regression results. Table 3 is the Pearson correlation coefficient table of the variables, it can be seen that the maximum value of the correlation coefficient is 0.54, and most of the correlation coefficients are less than 0.3. Because the correlation analysis can only measure the correlation between the two variables, this paper carries out the covariance diagnosis of the variables, in which the maximum value of the VIF is 1.97, which is less than 5, which again indicates that there is no multicollinearity problem between the variables, and the variable selection is is more reasonable and can be analyzed by regression.

Table 3. Correlation coefficients.

	Risk	ESG	IS	Age	Lev	ROA	Top1	Size	Market
Risk	1								
ESG	-0.164***	1							
IS	0.142***	-0.010*	1						
Age	-0.011*	0.002	0.074***	1					
Lev	-	-	-	0.149**	1				

	0.097***	0.036***	0.167***	*					
ROA	-0.246***	0.195***	0.029***	-0.067***	-0.341***	1			
Top1	-0.120***	0.085***	-0.050***	-0.053***	0.057***	0.132***	1		
Size	-0.188***	0.206***	-0.038***	0.191***	0.532***	-0.005	0.177***	1	
Market	-0.136***	0.091***	-0.045***	0.176***	0.401***	-0.229***	0.136***	0.540***	1

Note: ***, ** and * indicate significant at the 1%, 5% and 10% levels, respectively (same table below).

5.2. Main Regression Analysis

In this paper, OLS multiple regression analysis is used to test the research hypotheses and the regression results of model (1) are shown in Table 4. Among them, column (1) shows the regression results without adding control variables, and the coefficient of ESG is -0.550 and is significant at 1% level. Column (2) shows the regression results with the addition of the core explanatory and control variables, and the coefficient of ESG is -0.330 and significant at the 1% level. Both regressions control for industry and year fixed effects. The results show that the relationship between ESG and firm risk is significantly negative, i.e., good ESG performance can significantly reduce firm risk. Hypothesis 1 is verified.

Table 4. Results of main regression test.

VARIABLES	(1) Risk	(2) Risk
ESG	-0.550***	-0.330***
	(-29.66)	(-17.69)
Size		-0.053**
		(-2.53)
Age		-0.018***
		(-5.28)
ROA		-16.573***
		(-44.07)
Lev		-1.668***
		(-12.84)
Top1		-0.007***
		(-5.01)
Market		-2.025***
		(-20.09)
Constant	6.411***	9.528***
	(30.95)	(21.71)
Observations	26,706	26,706
R-squared	0.093	0.177
ID FE	YES	YES
year FE	YES	YES

T-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.3. Analysis of Intermediation Effects

Table 5 presents the regression results of the mediating effect of investment structure in the relationship between ESG performance and firm risk for models (2) and (3). The results in column (1) show that the regression coefficient of ESG is significantly negative at the 1% level. Therefore, good ESG performance can significantly reduce firms' equity investment. Hypothesis 2 is verified. The results of column (2) show that the regression coefficient of ESG is -0.311 and significant at 1% level, and the coefficient of IS is 0.474 and significant at 1% level, which indicates that good ESG performance can reduce corporate risk by decreasing corporate equity investment and increasing corporate entity investment. Hypothesis 3 is verified.

Table 5. Results of the mediation effect test.

	(1)	(2)
VARIABLES	IS	Risk
ESG	-0.040***	-0.311***
	(-9.35)	(-16.74)
IS		0.474***
		(17.86)
Size	0.046***	-0.075***
	(9.49)	(-3.57)
Age	0.006***	-0.021***
	(8.28)	(-6.21)
ROA	-0.059	-16.545***
	(-0.69)	(-44.26)
Lev	-0.980***	-1.203***
	(-32.90)	(-9.13)
Top1	-0.001***	-0.006***
	(-4.44)	(-4.55)
Market	-0.041*	-2.005***
	(-1.79)	(-20.01)
Constant	-0.452***	9.742***
	(-4.49)	(22.32)
Observations	26,706	26,706
R-squared	0.156	0.187
ID FE	YES	YES
year FE	YES	YES

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.4. Robustness Check

In order to ensure the reliability of the relationship between ESG performance and firm risk, this paper replaces the measures of firm risk and ESG performance and re-runs the regression analysis. The CSI ESG score (percentage) is used to measure corporate ESG performance, while the extreme deviation of return on total assets adjusted by industry and annual mean is used to measure corporate risk. The specific calculations are as follows:

$$Risk_{it} = Max(AdjROA_{ijt}, AdjROA_{ijt+1},..., AdjROA_{ijt+T}) - Min(AdjROA_{ijt}, AdjROA_{ijt+1},..., AdjROA_{ijt+T}) \quad (6)$$

Table 6. Robustness test results.

VARIABLES	(2) Risk	(3) IS	(4) Risk
ESG	-0.138***	-0.009***	-0.130***
	(-18.86)	(-9.66)	(-17.88)
Size	-0.086**	0.047***	-0.127***
	(-2.18)	(9.63)	(-3.25)
Age	-0.035***	0.006***	-0.040***
	(-5.50)	(8.25)	(-6.42)
ROA	-30.322***	-0.051	-30.277***
	(-43.33)	(-0.59)	(-43.52)
Lev	-3.155***	-0.983***	-2.289***
	(-13.05)	(-32.98)	(-9.33)
Top1	-0.012***	-0.001***	-0.011***
	(-4.86)	(-4.40)	(-4.41)
Market	-3.791***	-0.041*	-3.755***
	(-20.23)	(-1.77)	(-20.15)
IS			0.881***
			(17.86)
Constant	25.154***	0.004	25.150***
	(28.46)	(0.03)	(28.63)
Observations	26,706	26,706	26,706
R-squared	0.179	0.156	0.189
ID FE	YES	YES	YES
year FE	YES	YES	YES

T-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As can be seen in Table 6, the results are still significant at the 1% level after replacing the measures of the explanatory and interpretive variables, again validating hypotheses 1, 2, and 3.

6. Conclusions and Recommendations

This paper concludes three points: (1) good ESG performance can reduce enterprise risk; (2) good ESG performance can reduce enterprise equity investment, promote enterprise real investment, balance enterprise investment structure, so as to alleviate the problem of "de-realization to virtualization" of enterprises. Good ESG performance can reduce corporate equity investment, promote corporate entity investment, and thus reduce corporate risk.

Based on the above conclusions, this paper puts forward the following suggestions for the government and enterprises respectively:

The government should further improve the ESG disclosure system of listed companies and build an ESG disclosure system that adapts to China's national conditions. China's ESG practice is still in the preliminary stage of development, and currently lacks a unified ESG disclosure and rating standard, therefore, the Chinese government should actively learn from international ESG standards, form a complete ESG disclosure framework and a rich indicator system, and accelerate the construction of an ESG standard system adapted to China's national conditions. In addition, the ESG disclosure of listed companies in China is at a semi-mandatory stage, and only requires the disclosure of ESG reports by companies on the Science and Technology Creation Board (STB), which leads to the lack of awareness of ESG disclosure or poor quality of the disclosed information by some companies, which affects the ESG ratings of the companies. Therefore, China's government should accelerate the formulation of ESG disclosure guidelines covering all listed companies and standardize corporate ESG disclosure.

Enterprises should strengthen ESG capacity building and improve the quality of ESG information disclosure. For enterprises, actively assuming ESG responsibilities can establish a good relationship between enterprises and stakeholders and help enterprises obtain resources provided by stakeholders, thus reducing enterprise risks. Therefore, enterprises should firstly integrate ESG concepts into their corporate strategic planning. Fulfillment of ESG responsibilities can help enterprises form long-term competitive advantages and stand invincible in the fierce market competition. In addition, enterprises should improve the quality of information disclosure on the basis of actively practicing ESG concepts. Enterprises can learn from the excellent experience of foreign countries in terms of disclosure framework and indicators, and at the same time, combine with their own characteristics to prepare ESG disclosure reports. Improving the transparency of ESG disclosure by enterprises can help them show their own advantages to investors, customers and other stakeholders, thus attracting stakeholders to provide resources to the enterprise and promoting its development.

References

[1] Tan Jinsong, Huang Renyu, Zhang Jingxin. ESG performance and corporate risk-an explanation based on resource acquisition perspective [J]. Management Science, 2022, 35(05):3-18.

[2] Goss A, Roberts S G .The impact of corporate social responsibility on the cost of bank loans [J].Journal of Banking and Finance, 2010, 35(7):1794-1810.

[3] EI Ghoul. S., O. Guedhami. Kwok, and D. R. Mishra.2011. "Does Corporate Social Responsibility Affect the Cost of Capital" Jounal of Banking and Finance.35 (9), 2388-2406.

[4] Wang Yiqiu,Xie Meng. The Impact of ESG Disclosure on Corporate Financing Costs - Empirical Evidence Based on Chinese A-share Listed Companies[J]. Nankai Economic Research, 2022, (11):75-94.

[5] Zhang Xiaoyan, Bao Simeng. Does the ESG performance of private enterprises enhance enterprise value - a test based on the perspective of economic policy uncertainty [J]? Friends of Accounting, 2023, (22):61-69.

[6] Fang Xianming, Hu Ding. Corporate ESG Performance and Innovation-Evidence from A-share Listed Companies [J]. Economic Research, 2023, 58(02):91-106.

[7] LI Jinglin, YANG Zhen, CHEN Jin et al. A study on the mechanism of ESG for corporate performance - based on the perspective of corporate innovation [J]. Science and Science and Technology Management, 2021, 42(09):71-89.

[8] ZHU Ai-Ping, WEI Hong-Shan. The relationship between ESG performance and corporate performance-A study on the moderating effect based on digital transformation [J]. Friends of Accounting, 2024, (02):44-52.

[9] WANG Shuangjin, TIAN Yuan, DANG Lili. ESG responsibility fulfillment, competitive strategy and financial performance of industrial enterprises [J]. Accounting Research, 2022, (03):77-92.

[10] Xie Hongjun, Lv Xue. Responsible international investment: ESG and China's OFDI [J]. Economic Research, 2022, 57(03):83-99.

[11] Liu Jianqiu, Xu Yulu.ESG performance and corporate resilience [J]. Auditing and Economic Research, 2024, 39(01):54-64.

[12] WANG Yao, ZHANG Yunmeng, HOU Deshuai. Does corporate ESG performance affect audit opinion? [J]. Auditing and Economic Research, 2022, 37(05):54-64.

[13] Li, Sweet Li,Li, Jin-Tian Li. How green governance empowers high-quality development: an explanation based on the relationship between ESG compliance and total factor productivity [J]. Accounting Research, 2023, (06):78-98.

[14] MAO Qilian, WANG Yueqing. Research on the employment effect of ESG: Evidence from Chinese listed companies [J]. Economic Research, 2023, 58(07):86-103.

[15] FANG Hongxing, CHEN Zuohua. Can high-quality internal control effectively cope with idiosyncratic and systemic risks? [J]. Accounting Research, 2015, (04):70-77+96.

[16] Yang Youde,Xu Guanghua, Shen Yi. "From the outside in": The dynamic evolutionary logic of the risk-resistant effect of corporate ESG performance [J]. Accounting Research, 2023, (02):12-26.

[17] FANG Yi, HE Wenjia, JING Zhongbo. A study of risk spillovers between China's real economy and financial markets [J]. World Economy, 2021, 44(08):3-27.

[18] YAN Zhongbao, ZHANG Yuehua, ZHAO Feng. Economic Policy Uncertainty and Firm Risk-Analysis Based on Dual Mediation Effect and Dual Regulation Effect [J/OL]. Soft Science, 1-11[2024-02-23].

[19] LI Shengqi, ZHAO Xinyu. The impact of monetary policy uncertainty on business risk [J]. Operations Research and Management, 2023, 32(05):226-231.

[20] LUO Danglun, LIAO Junping, WANG Jue. Local officials' change and corporate risk - Empirical evidence based on Chinese listed companies [J]. Economic Research, 2016, 51(05):130-142.

[21] NI Primrose, LIU Shida. Financial interbank activities and real firms' business risks-Evidence from interbank certificate of deposit business at the regional level [J]. Financial Research, 2020, (09):136-153.

[22] Jo H, Harjoto M. Analyst Coverage, Corporate Social Responsibility, and Firm Risk [J]. Business Ethics a European Review, 2014, 23 (3):272-292.

[23] Sun, F. C., Zeng, L., Zhong, T. Y. CEO Financial Expertise, Career Focus, and Firm Risk [J]. Research in Financial Economics, 2020, 35(02):150-160.

[24] WU Yingxuan,SHI Jianjun,CHENG Student. Board Social Capital and Corporate Risk - Empirical Evidence Based on Listed Firms in China's Manufacturing Industry [J]. East China Economic Management, 2019, 33(05):116-122.

[25] Geng Zhang, Pengxiang GAO. Industry Diversification, International Diversification and Firm Risk-A Study Based on M&A Data of Chinese Listed Companies [J]. Nankai Management Review, 2020, 23(01):169-179.

[26] Zhang Xinmin, Ge Chao, Yang Daoguang et al. Tax avoidance, internal control and corporate risk [J]. China Soft Science, 2019, (09):108-118.

[27] Zhen Hongline, Wang Sanfa. Does corporate precision poverty alleviation behavior affect corporate risk? [J]. Financial Research, 2021, (01):131-149.

[28] Subhan U, Di S .Corporate social responsibility corporate innovation: a cross-country study of developing countries [J].Corporate Social Responsibility and Environmental Management, 2021, 28(3):1066-1077.

[29] Cao Tingqiu, Zhang Guangli. Voluntary disclosure and the risk of stock price collapse: A teleconference-based study [J]. Economic Research, 2020, 55(11):191-207.

[30] Catello G L ,Francesca I ,Antonio R , et al. Embedding sustainability in risk management: the impact of environmental, social, and governance ratings on corporate financial risk[J].Corporate Social Responsibility and Environmental Management,2022,29(4):1096-1107.

[31] Liu B, Wang XZ. The "risk compensation" effect of corporate green innovation on stock returns [J]. Economic Management, 2021, 43(07):136-157.

[32] HUANG Yu-Huan, YANG Sheng-Gang, ZHU Qi et al. Social responsibility and corporate risk--evidence based on the shock of the new crown infection epidemic [J]. Management Science, 2023, 36(01):132-146.

[33] Zeng J. The impact of corporate governance on corporate risk-return--empirical evidence from Chinese listed companies [J]. Management Review, 2010, 22(07):46-52.

[34] XI Longsheng, WANG Yan. Corporate ESG disclosure and stock price crash risk [J]. Economic Issues, 2022, (08):57-64.

[35] Godfrey C P .The Relationship between Corporate Philanthropy and Shareholder Wealth: A Risk Management Perspective [J].The Academy of Management Review, 2005, 30(4):777-798.

[36] TANG Feipeng, HUO Wenxi. The other side of preventing "de-realization to virtualization": deed tax rate reduction and corporate property speculation [J]. Research on Quantitative and Technical Economics, 2024, 41(01):151-171.

[37] FU Wenlin, ZHAO Yonghui. Tax incentives, cash flow and corporate investment structure bias [J]. Economic Research, 2014, 49(05):19-33.

[38] HYUN Cheng-Yi, ZHANG Jia-Hao. Research on the impact of corporate ESG performance on entity investment [J/OL]. Friends of Accounting, 1-10[2024-02-23].

[39] HU Nan, XUE Fujing, WANG Haonan. Does managerial myopia affect long-term corporate investment? --Based on text analysis and machine learning [J]. Management World, 2021, 37(05):139-156+11+19-21.

[40] He Ying, Yu Wenlei, Yang Minzhi. CEO Composite Career Experiences, Corporate Risk Taking and Firm Value [J]. China Industrial Economy, 2019, (09):155-173.

[41] Xu Guangwei, Sun Zheng, Liu Xing. The impact of economic policy uncertainty on firms' investment structure bias--empirical evidence based on China's EPU index [J]. Management Review, 2020, 32(01):246-261.

[42] Hou Xiaoxian, Zheng Tiandan. Financialization, fiscal incentives and corporate investment structure [J]. Auditing and Economic Research, 2021, 36(03):117-127.