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ESG Performance, R&D Investment and Enterprise Value

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Abstract

In recent years, with the sustainable and green development getting more and more attention from the government and the public, more and more investors pay attention to the performance of enterprise ESG. Based on the unbalanced panel data of Shanghai and Shenzhen A-share listed companies from 2010 to 2020, this paper empirically tests the relationship between enterprise ESG performance and enterprise value. The results show that ESG performance is positively correlated with enterprise value, and ESG can improve enterprise value by increasing enterprise R&D investment. Further research finds that for non-state-owned enterprises, ESG performance plays a more significant role in promoting enterprise value, and enterprise R&D investment plays a greater intermediary role in the process of ESG promoting enterprise value. The analysis of the relationship between ESG performance and enterprise value as well as the mechanism of action enriches the research on the relationship between ESG and enterprise value, and provides a certain theoretical basis for enterprises to attach importance to ESG.

Keywords

ESG Performance; Enterprise R&D Investment; Enterprise Value.

1. Introduction

With the proposal of China's high-quality development and "double carbon" goals, how to achieve green and sustainable development under the guidance of high-quality economic development has become a hot topic in recent years. As a national microeconomic entity, enterprises are of great significance to promote the overall realization of green and sustainable development. However, at this stage, there are still some enterprises that, driven by the goal of profit maximization, make decisions that damage the long-term sustainable development of enterprises and the ecological environment. Therefore, it is urgent to promote enterprises to practice the concept of green and sustainable development. As early as 2004, the concept of ESG was put forward by the United Nations Environment Programme. It requires enterprises to pay attention to environmental protection, fulfill social responsibilities and improve corporate governance in their development. ESG is a non-financial system constructed by three indicators of environment, social responsibility and corporate governance to evaluate the sustainable development ability of enterprises. It represents a greener development direction and is highly consistent with the new development concept of "innovation, coordination, green, openness and sharing". Therefore, the implementation of ESG rating system is of great significance to promote the green and sustainable development of enterprises.

After the government departments and relevant regulatory agencies launched a series of policies to guide the market, ESG has also attracted more and more attention from enterprises and investors. However, it is difficult for enterprises to pay attention to their own ESG performance only by relying on policies and external supervision. The value effect that can be improved by improving ESG performance and how much economic benefits it will bring to the enterprise are the first issues that business operators should consider when making decisions. Then, can good ESG performance improve enterprise value? If yes, how does ESG improve enterprise value? Based on the data of Shanghai and Shenzhen A-share listed companies from

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2010 to 2020, this paper empirically studies the relationship between enterprise ESG performance and enterprise value. The possible contributions of this paper are as follows: first, in China, there are few studies on the value effect of ESG performance, and there is still a lack of sufficient theoretical basis and empirical evidence. Therefore, the study of the relationship between ESG and enterprise value and its mechanism can enrich the study of ESG and enterprise value. Second, through the research on the relationship between ESG and enterprise value, it provides a certain theoretical basis for enterprises to pay attention to ESG performance and how to improve ESG performance, and also has a certain reference value for enterprises to carry out green and sustainable development.

2. Theoretical Analysis and Research Hypothesis

According to stakeholder theory, the development of any company can not be separated from the input or participation of various stakeholders, such as shareholders, creditors, employees, consumers, suppliers, etc. [1]. According to the signal transmission theory, enterprises with good ESG performance will send positive signals to the outside world in three aspects: environmental governance, social responsibility and corporate governance, help enterprises establish an image of strong social responsibility and efficient management, and enhance the confidence and recognition of external stakeholders. Thus, the enterprise can reduce the transaction costs and agency costs with stakeholders [2], and make it easier to obtain the resources and channels of stakeholders, laying a foundation for accelerating the development of the enterprise and creating more profits. At the same time, the disclosure of enterprise ESG information also reduces the information asymmetry between the enterprise and the investors in the capital market, reduces the uncertainty, and sends a positive signal of sustainable development to the market, so that investors can have good expectations for the prospects of the enterprise, thus enhancing the value of listed companies in the capital market [3]. Therefore, this paper first proposes hypothesis 1:

H1: when other conditions are certain, the enterprise ESG performance is positively correlated with the enterprise value.

The resource-based theory points out that the unique resources and capabilities of enterprises in some aspects can not be imitated and copied by other enterprises. These unique resources and capabilities are the source of sustainable competitive advantage of enterprises. Therefore, in order to maintain long-term development, enterprises will continue to try to obtain heterogeneous resources, and R&D investment is an important way for enterprises to obtain heterogeneous resources. Enterprises with good ESG performance can often perform contracts with stakeholders with high quality, so as to obtain the trust and support of stakeholders, obtain key resources mastered by stakeholders and have a better development environment [4]. After a good ESG performance shows that the enterprise obtains more resources in external competition, it will use part of the obtained resources for innovation projects to maintain or further enhance its competitive advantage and achieve the goal of long-term sustainable development. Based on the resource allocation theory, external investors want to invest in enterprises with high investment value and higher return. Limited by their own conditions, enterprises often need external resources to carry out innovation activities. When external investors choose investment targets, enterprises with better ESG performance are more likely to be favored [5]. At the same time, the R&D investment of enterprises has a positive impact on enterprises [6,7]. On the one hand, R&D can improve productivity and reduce production costs. The new technologies or methods developed by enterprises through R&D investment can reduce production time, improve the utilization efficiency of production factors and form economies of scale. The product quality of enterprises is also more competitive, thus promoting the performance of enterprises; On the other hand, after R&D investment, enterprises can

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obtain technology and knowledge. These technical knowledge stocks can improve the technological innovation ability of enterprises, thus bringing future market value to enterprises [8].

Based on the above analysis, this paper proposes hypothesis 2 and hypothesis 3:

H2: when other conditions are certain, enterprise ESG performance is positively correlated with R&D investment.

H3: good ESG performance can enhance the enterprise value by increasing the enterprise R&D investment.

3. Research Design

3.1. Sample Selection and Data Source

Based on the data of China's Shanghai and Shenzhen A-share listed companies from 2010 to 2020, after excluding the financial and St, st* enterprises, and deleting the variables with missing values, this paper carries out 1% and 99% tail reduction on all continuous variables, and finally obtains the unbalanced panel data with a sample observation number of 16488. ESG data of the article comes from wind database, and other data come from CSMAR database.

3.2. Variables Definition

1. Explained variable: enterprise value (TobinQ). TobinQ is a commonly used indicator for measuring enterprise value. The calculation formula is the market value of listed companies / total assets, where the market value of companies =market value of a shares + market value of B shares + (total shares - number of a shares - number of B shares) * (total closing value of owner's equity / paid in capital at the end of the current period) + total closing value of liabilities at the end of the current period.

2. Explanatory variable: ESG performance (ESG). The ESG rating of listed companies by Huazheng is used as the proxy variable of enterprise ESG performance. The ESG rating of Huazheng is c-aaa grade 9 from low to high. Therefore, the score system of 1-9 corresponds to c-aaa respectively. The higher the score, the better the ESG performance of the enterprise.

Table 1. Control Variables and Other Control Variables

Variable name	Variable symbol	Variable description
Enterprise value	TobinQ	Market value / total assets
Enterprise R&D investment	R&D	Total R&D input of the current year is taken as natural logarithm
ESG performance	ESG	Huazheng ESG rating
Enterprise size	Size	Natural logarithm of total assets
Asset liability ratio	Lev	Total liabilities / total assets
Operating cash flow	Cashflow	Net cash flow from operating activities / total assets
Enterprise growth	Growth	Increase in operating income / operating income of the previous year
Independence of the board of directors	Indep	Number of independent directors / board of directors
Nature of enterprise	Soe	1 for state-owned enterprises and 0 for others
Shareholding ratio of the largest shareholder	Top1	Number of shares held by the largest shareholder / total shares

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3. Intermediary variable: enterprise R&D input (R&D). In this paper, the natural logarithm of the company's total R&D investment in this year (in millions of yuan) is taken as the proxy variable of the enterprise's R&D investment.

4. control variables: referring to previous studies [4][9], this paper selects a series of characteristic variables that may affect the enterprise value for control. Control variables and other main variables are shown in Table 1.

3.3. Model Design

First, this paper builds a model (1) to verify hypothesis 1:

$$TobinQ_{i,t} = \alpha_0 + \beta_1 ESG_{i,t} + \sum Controls_{i,t} + U_{i,t} + \varepsilon_{i,t} \quad (1)$$

In the model (1), if the parameter β_1 is significantly positive, it indicates that the ESG performance of the enterprise is positively correlated with the enterprise value, which verifies hypothesis 1.Secondly, hypothesis 2 and hypothesis 3 are tested by building models (2) and (3):

$$R\&D_{i,t} = \alpha_0 + \beta_2 ESG_{i,t} + \sum Controls_{i,t} + U_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$TobinQ_{i,t} = \alpha_0 + \beta_3 R\&D_{i,t} + \beta_4 ESG_{i,t} + \sum Controls_{i,t} + U_{i,t} + \varepsilon_{i,t} \quad (3)$$

In the model (2), if the coefficient of β_2 is significantly positive, it indicates that the enterprise ESG performance can promote the enterprise R&D investment. Hypothesis 2 is thus verified. In combination with models (1), (2) and (3), if β_1 and β_2 are significantly positive, while β_3 and β_4 are also significantly positive. It proves that a good ESG performance of an enterprise can increase R&D investment, thus enhancing enterprise value, and verifies hypothesis 3.

In the above model, I is the enterprise, t is the year, TobinQ is the enterprise value, ESG is the ESG performance score of the enterprise, R&D is the R&D level of the enterprise, controls is the selected control variables, and U is the fixed effect of industry and year, ε represents the random disturbance term.

4. Empirical Results and Analysis

4.1. Descriptive Statistics

Table 2. Descriptive Statistics of Main Variables

Variable name	Number of observations	Average value	Median value	Standard deviation	Minimum value	Maximum value
TobinQ	16488	1.974	1.572	1.225	0.850	7.984
ESG	16488	6.545	6	1.133	1	9
R&D	16488	4.039	4.087	1.700	-8.722	11.210
Size	16488	22.380	22.200	1.286	20.090	26.370
Lev	16488	0.434	0.428	0.196	0.064	0.886
Cashflow	16488	0.051	0.049	0.065	-0.132	0.238
Growth	16488	0.147	0.099	0.338	-0.481	2.074
Indep	16488	0.374	0.333	0.0530	0.333	0.571
Soe	16488	0.388	0	0.487	0	1
Top1	16488	0.354	0.337	0.149	0.091	0.749

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Table 2 reports the descriptive statistical results of the main variables. The mean value of tobinq is 1.974, the minimum and maximum values are 0.850 and 7.984 respectively, and the standard deviation is 1.225. It can be seen that there are great differences in the values of different enterprises. The average ESG performance scores of enterprises are 6 and 6.545, indicating that the average ESG rating of the sample companies is roughly between bbb-a. The minimum value of R&D is -8.722, the maximum value is 11.21, and the large standard deviation is 1.700, indicating that there is obvious differentiation in R&D investment among enterprises.

4.2. Correlation Analysis

In order to test the multicollinearity among variables, this paper makes Pearson correlation analysis and tests the Vif of variables. The results of Pearson correlation analysis are shown in Table 3. The correlation coefficient between the variables in the table is not greater than 0.6. At the same time, the results of Vif test showed that the average value was 2.63, far below 10. Therefore, this paper believes that the multicollinearity between the variables is small and will not have a great impact on the regression results. However, it is worth noting that the Pearson correlation coefficient between TobinQ and ESG and TobinQ and R&D is negative, which is related to partial correlation and does not affect the conclusion of the article.

Table 3. Pearson Correlation Analysis

variables	TobinQ	ESG	R&D	Size	Lev	Cashflow	Growth	Indep	Soe	Top1
TobinQ	1									
ESG	-0.056***	1								
R&D	-0.134***	0.175***	1							
Size	-0.380***	0.350***	0.507***	1						
Lev	-0.290***	0.074***	0.148***	0.502***	1					
Cashflow	0.124***	0.077***	0.117***	0.062***	-0.179***	1				
Growth	0.023***	-0.0100	0.048***	0.039***	0.029***	0.034***	1			
Indep	0.024***	0.018**	0.050***	0.050***	0.014*	0.00200	-0.014*	1		
Soe	-0.117***	0.263***	0.054***	0.341***	0.291***	-0.051***	-0.063***	-0.013*	1	
Top1	-0.083***	0.131***	0.049***	0.193***	0.042***	0.091***	0.00200	0.062***	0.219***	1
Note: * P < 10%, **P < 5%, * * * P < 1%, the same below.										

4.3. Regression Result Analysis

According to the above assumptions, this paper sets up models for testing in turn. See Table 4 for the specific regression results:

It can be seen from Table 4 that in the model regression results of testing the three hypotheses, the coefficients of the main variables are significant at the 1% level, as shown below:

The ESG coefficient in column (1) is 0.053, indicating that each increase in the ESG rating of an enterprise will increase the value of TobinQ by 0.053, accounting for 2.68% of the average TobinQ of the sample company. It can be seen that good ESG performance can improve enterprise value. There is a positive correlation between enterprise ESG performance and enterprise value. Hypothesis 1 is supported.

Column (2) tests the way ESG improves the enterprise value. The ESG coefficient is 0.078, indicating that good ESG performance can promote the enterprise's R&D investment, which verifies hypothesis 2. Further, column (3) adds R&D variables on the basis of column (1) to clarify the mechanism of R&D in ESG's promotion of enterprise value with the help of the test idea of intermediary effect model.

The R&D coefficient in column (3) is positive, indicating that the R&D investment of an enterprise can improve the enterprise value. The ESG coefficient remains positive, and the coefficient decreases from 0.053 to 0.051, that is, the direct effect of ESG on enterprise value is less than its total effect on enterprise value. It is preliminarily confirmed that enterprise R&D investment plays an intermediary role in ESG's improvement of enterprise value. The

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intermediary effect is 0.0023, accounting for 4.27% of the total effect. Further, through Sobel test, the value of Z statistic is 3.797, which is significant at the level of 1%, thus confirming the existence of intermediary effect, that is, hypothesis 3: good ESG improves enterprise value by increasing enterprise R&D investment.

Table 4. Main Regression Results

	(1) TobinQ	(2) R&D	(3) TobinQ
ESG	0.053***	0.078***	0.051***
	(6.747)	(8.792)	(6.446)
R&D			0.029***
			(4.210)
Size	-0.357***	0.864***	-0.382***
	(-42.182)	(89.723)	(-36.987)
Lev	-0.314***	-0.665***	-0.294***
	(-6.173)	(-11.508)	(-5.775)
Cashflow	2.261***	2.065***	2.201***
	(17.653)	(14.183)	(17.092)
Growth	0.108***	0.098***	0.105***
	(4.549)	(3.631)	(4.430)
Indep	0.886***	0.030	0.885***
	(5.971)	(0.177)	(5.968)
Soe	0.050***	-0.134***	0.054***
	(2.694)	(-6.284)	(2.898)
Top1	-0.063	0.102	-0.066
	(-1.121)	(1.592)	(-1.174)
_cons	9.815***	-17.634***	10.324***
	(52.841)	(-83.483)	(46.595)
year	Yes	Yes	Yes
industry	Yes	Yes	Yes
r2_a	0.337	0.555	0.338
F	131.964	322.482	130.338
N	16488	16488	16488

4.4. Analysis of Property Right Heterogeneity

The intermediary role of enterprise R&D investment in the process of ESG promoting enterprise value may be affected by the heterogeneity of property rights. On the one hand, state-owned enterprises do not have as much pressure to survive as non-state-owned enterprises, so they are less motivated to carry out R&D than non-state-owned enterprises. At the same time, compared with non-state-owned enterprises, state-owned enterprises have closer relations with the government, banks and other state institutions, and are easier to obtain resources and contacts. Non state owned enterprises do not have the "inborn advantages" of state-owned enterprises. They need to improve ESG performance to obtain support from the government, banks, etc. Therefore, compared with state-owned enterprises, non-state-owned enterprises can obtain more marginal income and resources by improving ESG performance, and R&D projects that were previously unable to be carried out due to their insufficient conditions can also be implemented smoothly, and R&D investment has been increased. On the other hand, as a pure market participant, non-state-owned enterprises invest in R&D mainly to obtain corresponding economic returns. However, state-owned enterprises do not simply pursue profit creation, and social responsibility is also a factor to be considered.

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Therefore, non-state-owned enterprises' R&D investment can create higher economic benefits and improve enterprise value. Based on the above analysis, this paper speculates that the role of ESG performance in improving enterprise value and enterprise R&D investment is more obvious in non-state-owned enterprises, and the intermediary role of enterprise R&D investment in improving enterprise value by ESG is also more significant.

Table 5 reports the regression results under the heterogeneity of property rights. Comparing columns (1) and (4), it can be seen that ESG plays a more obvious role in promoting enterprise value in non-state-owned enterprises; Compared with column (2) and column (5), ESG in non-state-owned enterprises can better promote R&D investment; Through the comparison of ESG coefficients of (1), (3) and (4), (6), it can be found that the intermediary utility of R&D investment in non-state-owned enterprises is greater than that in state-owned enterprises. On the whole, the regression results in Table 5 are consistent with the above assumptions.

Table 5. IntermEdiary Function under Different Property Rights

	State-owned enterprise			Non state-owned enterprise		
	(1)	(2)	(3)	(4)	(5)	(6)
	TobinQ	R&D	TobinQ	TobinQ	R&D	TobinQ
ESG	0.039***	0.044***	0.038***	0.063***	0.097***	0.058***
	(3.453)	(2.762)	(3.416)	(5.810)	(9.383)	(5.373)
R&D			0.009			0.047***
			(0.986)			(4.473)
Size	-0.352***	0.904***	-0.359***	-0.377***	0.833***	-0.416***
	(-30.564)	(55.004)	(-25.708)	(-30.345)	(70.437)	(-27.415)
Lev	-0.588***	-1.135***	-0.578***	-0.118*	-0.383***	-0.101
	(-8.119)	(-10.973)	(-7.908)	(-1.680)	(-5.700)	(-1.424)
Cashflow	1.640***	1.282***	1.629***	2.533***	2.547***	2.399***
	(8.400)	(4.599)	(8.330)	(15.064)	(15.923)	(14.188)
Growth	0.090**	0.129***	0.089**	0.097***	0.072**	0.094***
	(2.559)	(2.577)	(2.526)	(3.071)	(2.409)	(2.965)
Indep	0.746***	0.763*	0.739***	0.966***	-0.590***	0.994***
	(3.549)	(2.543)	(3.515)	(4.685)	(-3.005)	(4.821)
Soe	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)
Top1	0.097	0.017	0.096	-0.142*	0.158**	-0.150**
	(1.156)	(0.143)	(1.154)	(-1.864)	(2.175)	(-1.962)
_cons	9.840***	-18.415***	9.999***	10.188***	-17.031***	10.987***
	(40.256)	(-52.761)	(34.102)	(36.181)	(-63.592)	(32.968)
year	Yes	Yes	Yes	Yes	Yes	Yes
industry	Yes	Yes	Yes	Yes	Yes	Yes
r2_a	0.389	0.595	0.389	0.310	0.540	0.311
F	70.008	160.274	68.857	72.953	189.103	72.262
N	6400	6400	6400	10088	10088	10088

5. Robustness Check

5.1. Replace Variable

Learning from Xie et al.[10], This paper uses roe to replace the explained variable, and uses the percentage of R&D investment in the total assets of the enterprise to replace the original

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intermediary variable. Further test the impact of ESG performance on enterprise value and the intermediary role of R&D investment. See Table 6 for specific regression results. From the results in Table 6, it can be found that after replacing the explained variable and intermediary variable, all coefficients are still positive and significant at the 1% level, and the ESG coefficient in column (6) is lower than that in column (4). Although the ESG coefficient in column (3) is not significantly different from that in column (1), the Z values of the two replacement variable tests are 6.756 and 6.902 respectively, which are significant at the 1% level, confirming the existence of the intermediary effect.

Table 6. Test of Replacement Variables

	Replace explained variable			Replace mediation variable		
	(1)	(2)	(3)	(4)	(5)	(6)
	ROE	R&D	ROE	TobinQ	vR&D	TobinQ
ESG	0.008***	0.078***	0.008***	0.053***	0.001***	0.046***
	(11.061)	(8.792)	(10.348)	(6.747)	(7.904)	(5.903)
R&D			0.007***			
			(10.668)			
vR&D						5.508***
						(14.167)
Size	0.020***	0.864***	0.014***	-0.357***	-0.002***	-0.349***
	(24.908)	(89.723)	(14.368)	(-42.182)	(-9.228)	(-41.311)
Lev	-0.163***	-0.665***	-0.158***	-0.314***	-0.002**	-0.302***
	(-33.210)	(-11.508)	(-32.256)	(-6.173)	(-2.130)	(-5.974)
Cashflow	0.531***	2.065***	0.517***	2.261***	0.036***	2.062***
	(43.041)	(14.183)	(41.754)	(17.653)	(14.080)	(16.107)
Growth	0.087***	0.098***	0.086***	0.108***	0.001**	0.102***
	(37.864)	(3.631)	(37.684)	(4.549)	(2.194)	(4.333)
Indep	-0.041***	0.030	-0.042***	0.886***	-0.003	0.901***
	(-2.889)	(0.177)	(-2.917)	(5.971)	(-0.958)	(6.113)
Soe	-0.017***	-0.134***	-0.016***	0.050***	-0.001***	0.058***
	(-9.605)	(-6.284)	(-9.103)	(2.694)	(-3.847)	(3.134)
Top1	0.056***	0.102	0.055***	-0.063	-0.000	-0.062
	(10.346)	(1.592)	(10.243)	(-1.121)	(-0.059)	(-1.121)
_cons	-0.383***	-17.634***	-0.259***	9.815***	0.028***	9.663***
	(-21.381)	(-83.483)	(-12.159)	(52.841)	(7.468)	(52.247)
year	Yes	Yes	Yes	Yes	Yes	Yes
industry	Yes	Yes	Yes	Yes	Yes	Yes
r2_a	0.313	0.555	0.318	0.337	0.251	0.345
F	118.301	322.482	119.032	131.964	87.382	134.601
N	16476	16488	16476	16488	16488	16488

5.2. Endogenetic Treatment

5.2.1. ESG Lags behind Phase I

In order to alleviate the problem of two-way causality, this paper deals with the ESG rating of the explanatory variable enterprises with a lag period to test the research conclusion. The regression results are reported in columns (1), (2) and (3) of Table 7. The coefficient of each variable is significantly positive at the level of 1%, and the ESG coefficient in column (1) is lower

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than that in column (3), which is consistent with the previous conclusions, which verifies the hypothesis again.

5.2.2. Instrumental Variable Method

Considering the possible endogenous problems in the research, this paper uses the earliest ESG rating of the enterprise as a tool variable to test the research conclusion by referring to Wang et al.[4]Columns (4) and (5) in Table 7 respectively show the first and second stage regression results of the two-stage least squares method. The instrumental variables and ESG coefficients are significantly positive. At the same time, the tool variables were tested for weak tool variables, and the results showed that they were not weak tool variables. Therefore, the conclusion is still valid after considering the endogenous problem.

Table 7. Endogenetic Treatment

	ESG lags behind phase I			Instrumental variable method	
	(1)	(2)	(3)	(4)	(5)
	TobinQ	R&D	TobinQ	ESG	TobinQ
L.ESG	0.043***	0.074***	0.040***		
	(4.857)	(7.752)	(4.511)		
R&D			0.040***		
			(5.083)		
ESG					0.069**
					(2.288)
IV				0.393***	
				(34.46)	
Size	-0.345***	0.868***	-0.380***	0.312***	-0.381***
	(-36.671)	(84.669)	(-32.613)	(38.29)	(-28.118)
Lev	-0.502***	-0.606***	-0.478***	-0.803***	-0.402***
	(-8.831)	(-9.782)	(-8.379)	(-15.83)	(-6.770)
Cashflow	2.405***	2.080***	2.321***	0.734***	2.295***
	(16.660)	(13.230)	(15.989)	(5.66)	(16.654)
Growth	0.152***	0.124***	0.147***	-0.029	0.096***
	(5.532)	(4.130)	(5.352)	(-1.24)	(3.893)
Indep	0.797***	-0.102	0.801***	0.269*	0.917***
	(4.908)	(-0.575)	(4.937)	(1.81)	(5.901)
Soe	0.010	-0.089***	0.014	0.399***	0.006
	(0.482)	(-3.982)	(0.658)	(21.68)	(0.263)
Top1	0.142**	0.115*	0.137**	0.295***	0.080
	(2.262)	(1.676)	(2.190)	(5.15)	(1.327)
_cons	8.968***	-17.411***	9.671***	-3.013***	10.285***
	(43.299)	(-77.177)	(38.864)	(-15.70)	(52.140)
year	Yes	Yes	Yes	Yes	Yes
industry	Yes	Yes	Yes	Yes	Yes
r2_a	0.342	0.567	0.344	0.293	0.350
F	113.654	283.966	112.468	101.75	
Wald chi2					8315.80
N	13418	13418	13418	15303	15303

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6. Conclusion and Recommendations

With the proposal of the "double carbon" goal, green and sustainable development is gradually concerned by more and more people, and the ESG performance of enterprises is increasingly valued by the public and other stakeholders. Based on the data of Shanghai and Shenzhen A shares from 2010 to 2020, this paper empirically verifies the impact of enterprise ESG performance on enterprise value. The results show that ESG performance is positively correlated with enterprise value, and ESG can improve enterprise value by increasing enterprise R&D investment. Further research finds that for non-state-owned enterprises, ESG performance plays a more significant role in promoting enterprise value, and enterprise R&D investment plays a greater intermediary role in the process of ESG promoting enterprise value. Based on the above conclusions, this paper puts forward the following suggestions:

First, at the enterprise level. As an important indicator to measure the sustainable development of enterprises, ESG should be given enough attention and strive to improve its own ESG performance under the background that external investors and other stakeholders pay more attention to it. First, bring ESG into the strategic planning of the enterprise, and take improving ESG performance as a strategic goal to guide the sustainable development of the enterprise; The second is to put the ESG concept into the specific practice of the enterprise and establish the corresponding assessment mechanism; Third, actively disclose ESG information, transfer more information to external investors, reduce the degree of information asymmetry, establish a good image of the enterprise, improve investors' confidence in the enterprise, and promote the benign development of the enterprise. In addition, this paper analyzes that good ESG performance can greatly improve the value of non-state-owned enterprises. Therefore, non-state-owned enterprises should pay more attention to the construction of ESG, and implement it in enterprises from top to bottom, so as to obtain more support and resources from the government, banks, investors and other external stakeholders.

Secondly, at the level of government and relevant regulatory authorities. At this stage, China's ESG information disclosure system and relevant laws and regulations are not perfect and are still in the initial stage. Therefore, the government needs to improve the legal environment and speed up the process of mandatory ESG information disclosure requirements, and constantly expand the scope of ESG information disclosure and improve the quality of ESG information disclosure, so as to give full play to the role of ESG. In addition, the domestic third-party ESG rating agencies have not yet entered the mature stage due to their late development, and there are great differences in evaluation standards, which often lead to great differences in the rating of enterprises. Relevant regulatory authorities urgently need to establish a unified evaluation standard system for the reference of major institutions, so that they can give more scientific and reasonable ESG rating of enterprises.

Finally, at the investor level. Investors can only obtain the financial information of enterprises in the past investment process, while the disclosure of ESG information reduces the degree of information asymmetry, and investors can obtain more non-financial information of enterprises. Therefore, investors should establish the ESG investment concept when making investment, and make investment judgment by combining the ESG with the enterprise's financial information. This can not only reduce their own investment risk, but also promote the development of enterprise ESG, thus forming a virtuous circle.

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