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Research on the Relationship Between ESG and Firm Value

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Abstract: In recent years, sustainable development has become more and more important to enterprises. While the state controls and controls, investors also have different evaluations on enterprises with different esg performance, and ESG performance has gradually become an important basis for enterprise valuation and other aspects. For the purpose of studying whether ESG indicators are positively associated to enterprise value, this paper uses ESG data and company data from 2015 to 2022, and adopts fixed panel regression analysis after data processing and testing. Through empirical analysis, this study comes to the following conclusion: ESG performance and enterprise value significantly positively correlate. Or, to put it another way, there is a significant connection between ESG performance and company value. Further research revealed that the relationship between the two is also heterogeneous between the nature of the enterprise and the industry. As a consequence, this paper suggests that enterprises should attach importance to the implementation of strategies in the three dimensions of ESG. While improving their own performance, they should not ignore the improvement of ESG performance, enhance their own value, and increase market competitiveness.

Keywords: ESG, Empirical research, Enterprise value

1. Introduction

With the development of the sustainable development, countries and regions which begun to regulate the activities of companies increase gradually. ESG encompasses environmental, social and corporate governance factors, emphasizing the necessity for companies to focus on the protection of the natural environment, the fulfillment of social responsibilities, and the improvement of corporate governance, which show whether companies are making efforts to bring about beneficial impacts on all stakeholders [1], and which have a variety of impacts on companies. ESG data has begun to play a more significant role in the value of companies.

ESG performance affects the cost of financing. Banks tend to extend larger loans with lower interest rates, longer maturities, and lower risk premiums to firms with good ESG performance, reducing the cost of debt for firms [2]. Furthermore, a good ESG evaluation will enhance institutional investors' tolerance for low short-term business performance [3]. For firm performance, ESG also has an impact. Friede, Gunnar, et al's research shows that about 90% of studies find ESG-CFP non-negative correlation, with company-focused studies showing positive correlation between ESG and firm performance [4]. ESG performance also affects the innovation capability, and Li Jinglin et al note that corporate ESG performance can significantly increase the level of corporate innovation [5].

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Most of these factors have a positive influence on company value. Alareeni et al pointed out that ESG disclosure shows a positive correlation with firm value [6].

This study puts forth the hypothesis that ESG indicators are positively associated to enterprise value in light of the growing significance of sustainable development in China.

2. Empirical Experimental Design

2.1. Sample Selection

In this paper, the listed enterprises in 2015-2022 are selected as samples, the main company data indexes are from the Cathay Pacific database, and the ESG data are from the ESG data of Sino-Securities Index Information Service.

In the process of data processing, firstly, the listed companies in the sample in the financial and insurance categories were removed, the companies that were ST and PT during 2015-2022 were removed, the samples with missing values were removed, and the tailing process was carried out in the position of 1% and 99% of the distribution of the variables, and finally, the imbalanced data were removed to ensure that the sample sizes in different years were the same. This process was all carried out through Stata.

The data in this paper has been processed to contain data related to 2023 listed companies.

2.2. Variable Selection

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2.2.1. Explained Variables

$$TobinQ = \frac{Market\ Value}{Replacement\ Value} \tag{1}$$

Tobin's Q refers to the amount of wealth a company creates for society by using a certain amount of society's resources, which is expressed in terms of the value of the company's efficiency [7]. It can be used as an indicator to reflect the value of the enterprise. Lv Bei and Li Yanan also use it to represent enterprise value in their articles [8]. Therefore, this paper uses TobinQ to measure the enterprise value of listed companies.

2.2.2. Key Explanatory Variables

For empirical research, this paper uses ESG score (ESG) as an explanatory variable. Environmental, social, and governance (ESG) aspects are combined to get an ESG score, and it reflects overall ability and attitude of the enterprise's sustainable development. In this paper, we select the percentage scoring scale in the CSI esg data, and the scoring interval is from 1 to 100 points.

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2.2.3. Control Variables

Referring to the variable selection of Cui Jinrui and Miao Jinfang in their paper [9], this paper selects several control variables related to company value: Basic indicators include enterprise size (SIZE) and enterprise age (AGE), in which Size is expressed by total net assets, and total assets are logarithmically processed in order to reduce the gap in the quantitative scale. Financial indicators include total asset turnover (TATO), which shows the operating capacity of the enterprise, return on equity (ROE), which shows the profitability of the enterprise, and gearing (Lev), which shows the solvency of the enterprise.

2.3. Model Construction

This paper uses a double fixed effects analysis. The model appears to follow this:

$$TobinQ_{i,t} = \alpha_i + \beta_1 ESG_{i,t} + \beta_2 Size_{i,t} + \beta_3 Age_{i,t} + \beta_4 TATO_{i,t} + \beta_5 ROE_{i,t} + \beta_6 Lev_{i,t} + \epsilon_{i,t} \quad (2)$$

The model is a static short panel model. where i represents the list of companies, t represents the year, αi denotes the individual heterogeneity of unobservable random variables, and εi,t is the perturbation term that varies with companies and time.

3. Empirical Analysis

3.1. Descriptive Statistics

Table 1: Descriptive Statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
TobinQ	16184	2.341	1.798	.804	10.847
ESG	16184	73.381	5.399	57.56	84.59
Size	16184	22.724	1.446	20.199	27.349
Age	16184	20.324	5.517	8	34
TATO	16184	.606	.428	.026	2.496
ROE	16184	.063	.118	-.514	.363
Lev	16184	44.225	20.284	6.442	91.787

Analysing the statistical description of the variables, as table 1 shown, TobinQ has a mean of 2.341, a least value of 0.804 and a maximum of 10.847, which shows that the distribution of the data shows a skewed distribution, with long tails on the right hand side. The ESG data has a mean of 73.381, a minimum of 57.56 and a maximum of 84.59, with the presence of lower values. The data on the size of the size of the firms is more centralised and the The difference is small and indexation narrows the large gap between total assets. Company Age's mean value is 20.324, standard deviation is 5.517, minimum value is 8, maximum value is 34, data discrete degree is larger. Total Asset Turnover, which represents the company's operating capacity, has a least value of 0.026 and a maximum of 2.496, with a large gap. ROE has a least value of -0.514 and a maximum of 0.363, with a large gap. Lev which means asset-liability ratio has a mean value of 44.225%, with a least value of 6.442% and a maximum value of 91.787%, with a large gap and large degree of data discretisation.

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3.2. Correlation Analysis

Table 2: Correlation analysis.

	TobinQ	ESG	Size	Age	TATO	ROE	Lev
TobinQ	1						
ESG	-0.0914*	1					
Size	-0.4577*	0.3043*	1				
Age	-0.2388*	0.0393*	0.1970*	1			
TATO	0.0238*	0.00930	-0.0406*	-0.0272*	1		
ROE	0.1603*	0.2109*	0.1524*	-0.0348*	0.1892*	1	
Lev	-0.3945*	0.0328*	0.5780*	0.1818*	0.0409*	-0.1483*	1

From the correlation analysis, as table 2 shown, TobinQ is significantly negatively correlated with ESG, It is consistent with the research conclusions of Xu Mingyu and Liu Cancan et al [10]. This may be due to the lack of control variables, resulting in the overall presentation of the opposite conclusion to the hypothesis.

Firm size is negatively correlated with TobinQ, which is consistent with the results of Lv Bei and Li Yanan in the related study [8]. The asset turnover ratio and ROE are all significantly positively correlated with TobinQ, both of which are consistent with the existing findings that the higher the operating capacity and profitability, the higher the value of the enterprise. Asset-liability ratio and TobinQ show a significant negative correlation, the larger the proportion of debt, the higher the risk of debt repayment, the lower the value of the enterprise, in line with the conclusions of existing research.

3.3. Data Testing

3.3.1. HT Test

To validate the smoothness of the data and prevent the phenomenon of pseudo-regression, it requires the unit root test. As the data is short panel data, IPS test is used.

Table 3: HT Test.

	t-bar	t-tilde-bar	Z-t-tilde-bar	p-value
TobinQ	-2.7878	-1.5543	-21.5191	0.0000
ESG	-2.2052	-1.4831	-17.0164	0.0000
Size	-2.7055	-1.3462	-8.3565	0.0000
Age	-6.2580	-1.9974	-49.5361	0.0000
TATO	-2.2409	-1.4589	-1.4589	0.0000
ROE	-1.4589	-1.5336	-20.2086	0.0000
Lev	-2.5080	-1.4778	-16.6774	0.0000

According to table 3, as seen from the p-values, all variables are smooth.

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3.4. Main Regression Model

Table 4: Result of Main Regression Model.

	(1)
VARIABLES	TobinQ
ESG	0.014***
	(0.003)
Size	-0.833***
	(0.096)
Age	0.066
	(0.088)
TATO	0.399*
	(0.185)
ROE	1.761***
	(0.193)
Lev	-0.004
	(0.003)
2016.year	-0.995***
	(0.098)
2017.year	-1.697***
	(0.186)
2018.year	-2.356***
	(0.271)
2019.year	-2.057***
	(0.356)
2020.year	-1.830***
	(0.442)
2021.year	-1.751***
	(0.527)
2022.year	-2.103***
	(0.614)
Constant	20.350***
	(2.472)
Observations	16,184
Number of company	2,023
R-squared	0.315

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

According to the findings of the regression, as shown in table 4, the regression coefficient of ESG is positive and significant at the 0.1% level, which showing that ESG and enterprise value is a significantly positive correlation, then the hypothesis is valid. This can be explained by an investor's perspective. The better the ESG metrics, the higher the investor's trust in the enterprise, and the higher the investment value and market value of the enterprise. In addition, investors are more tolerant of temporary declines in corporate performance, which helps companies maintain their corporate value.

In addition, the coefficient of Size is negative and significant at the 0.1% level, which indicate that correlation between firm size and enterprise value is significantly negative, which is consistent with

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the results of the study by Lv Bei and Li Yanan [8]. On the one hand, the developing capacity of an enterprise is higher the smaller its scale.; on the other hand, with the increase of enterprise scale, the replacement cost of the enterprise will augment, resulting in the lower Tobin Q value. Total asset turnover and ROE are both significantly positively related to firm value. As an indicator to evaluate the operation capacity of an enterprise, the better the operation capacity, the higher the profitability, the higher the enterprise value.

3.5. Robustness Test

For the purpose of testing the robustness of the impact of each explanatory variable on firm value, this paper adopts the replacement variable method. Replacing the Tobin's Q value with the total annual stock market value (Value), which can also represent the value of the firm, fixed effect regression analyses are conducted with the following results.

Table 5: Regression results of the Robustness Test.

VARIABLES	Value
ESG	0.004***
	(0.001)
Size	0.636***
	(0.024)
Age	0.014
	(0.015)
TATO	0.205***
	(0.031)
ROE	0.779***
	(0.046)
Lev	-0.007***
	(0.001)
2016.year	-0.239***
	(0.017)
2017.year	-0.489***
	(0.032)
2018.year	-0.919***
	(0.046)
2019.year	-0.744***
	(0.061)
2020.year	-0.667***
	(0.076)
2021.year	-0.574***
	(0.091)
2022.year	-0.749***
	(0.106)
Constant	8.568***
	(0.600)
Observations	16,180
Number of company	2,023
R-squared	0.484

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As indicated in table 5, it can be shown that the ESG coefficient is substantial and positive at the level of 0.1%. and is significantly positively correlated with the company value, which is consistent with the conclusions obtained previously, proving that the experiment is robust.

3.6. Heterogeneity Test

In order to further study whether the impact of ESG is heterogeneous among enterprises with different characteristics, this paper selects two classification methods for heterogeneity test, and puts forward two hypotheses accordingly:

Ha: The impact of ESG is even more pronounced in the private enterprise.

Hb: The impact of ESG is more pronounced in high-tech industries.

3.6.1. Form of Enterprise Ownership

For the purpose of studying whether the impact of ESG on firm value is different in enterprises of different nature, this paper assumes a new variable, in which the state-owned enterprise is assigned 1, the private enterprise is assigned 2, and the regression is performed respectively.

Table 6: Heterogeneity test (Form of enterprise ownership).

VARIABLES	TobinQ(1)	TobinQ(2)
ESG	0.001	0.014***
	(0.3957)	(3.4697)
Size	-0.483***	-0.828***
	(-4.5993)	(-8.9006)
Age	0.016	0.209
	(0.2865)	(1.3520)
TATO	0.128	0.734***
	(1.3247)	(5.0012)
ROE	1.093***	1.501***
	(6.1404)	(7.8682)
Lev	0.001	-0.003
	(0.1880)	(-1.2670)
2015.year	0.000	0.000
	(.)	(.)
2016.year	-0.453***	-1.278***
	(-7.2668)	(-8.0513)
2017.year	-0.816***	-2.312***
	(-6.9616)	(-7.3868)
2018.year	-1.269***	-3.246***
	(-7.3862)	(-6.9820)
2019.year	-1.033***	-3.023***
	(-4.6127)	(-4.8921)
2020.year	-0.879**	-2.917***
	(-3.1634)	(-3.7812)
2021.year	-0.805*	-2.886**
	(-2.4301)	(-3.1271)
2022.year	-1.009**	-3.505**

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Table 6: (continued).

	(-2.6194)	(-3.2557)
Constant	13.302***	18.154***
	(5.1991)	(5.8773)
Observations	7911	8273
R-squared	0.261	0.499

As illustrated in the table 6, the coefficient between ESG score and Tobin Q value is not significant in the group of state-owned enterprises, which suggests that in state-owned enterprises, there is no significant positive relationship between the ESG and enterprise value. Additionally, ESG's normative role in state-owned enterprises is not obvious and its influence is minimal, which means it cannot effectively promote businesses.

This may be because state-owned enterprises, who enjoy the support of the state, have a dominant position in the market, and the influence of ESG performance is smaller; For private firms, the market competition is more intense, and they need to release signals such as "good business conditions" to enhance the value of enterprises [11]. Therefore, for non-state-owned enterprises, ESG performance, as a signal of compliance with sustainable development, will affect enterprise value more, and the positive correlation between the two is more significant.

3.6.2. High-tech Enterprises

For the purpose of studying whether hypothesis b is valid, like hypothesis a, this paper divides enterprises into two groups: high-tech enterprises and non- high-tech enterprises. This paper assumes a new variable, in which the non-high-tech enterprise is assigned 1, and the high-tech enterprise is assigned 2, and regression is performed respectively.

Table 7: Heterogeneity test(Form of high-tech enterprises).

VARIABLES	TobinQ(1)	TobinQ(2)
ESG	0.014***	0.006
	(4.4692)	(1.4272)
Size	-0.624***	-0.887***
	(-7.7571)	(-6.6934)
Age	0.021	0.081
	(0.3331)	(0.5569)
TATO	0.150	0.860***
	(1.4470)	(4.9320)
ROE	1.216***	1.675***
	(7.5409)	(7.4976)
Lev	-0.005	-0.006
	(-1.8587)	(-1.5529)
2015.year	0.000	0.000
	(.)	(.)
2016.year	-0.589***	-1.176***
	(-8.4184)	(-7.7901)
2017.year	-1.118***	-1.999***
	(-8.5303)	(-6.7312)

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Table 7: (continued).

2018.year	-1.645***	-2.783***
	(-8.5828)	(-6.3531)
2019.year	-1.411***	-2.390***
	(-5.6333)	(-4.1153)
2020.year	-1.183***	-2.232**
	(-3.7947)	(-3.0835)
2021.year	-1.084**	-2.090*
	(-2.9175)	(-2.4173)
2022.year	-1.287**	-2.598*
	(-2.9743)	(-2.5762)
Constant	16.033***	22.100***
	(7.7273)	(6.0589)
Observations	9605	6579
R-squared	0.348	0.476

As illustrated in the table 7, the coefficient between ESG and enterprise value is considerable in non-high-tech enterprise group, but not significant in another group. The coefficient is higher in non-high-tech enterprises, and another coefficient is lower.

It can be seen that ESG has little influence in high-tech industry, and enterprise value is not affected by ESG evaluation criteria. On the one hand, scientific and technological progress is inevitably accompanied by a certain degree of environmental pollution; On the other hand, it may be because the value judgment of high-tech industry is highly correlated with the technological level of enterprises, and ESG has little influence in it.

4. Conclusion

In this paper, a fixed panel regression analysis is conducted on 2,023 listed companies in China from 2015 to 2022. Fixed panel regression analysis shows that there is a significant positive correlation between ESG and enterprise value. In other words, the improvement of enterprise ESG performance has a positive effect on the improvement of enterprise value.

In the aspect of heterogeneity, the influence of ESG on firm value is significantly different between different firm natures and high-tech firms. The main conclusions are as follows: 1. Compared to state-owned businesses, there is a stronger association between ESG score and enterprise value in private businesses. 2. The relationship between ESG and enterprise value is particularly substantial in non-high-tech industries.

These conclusions can guide enterprises to adjust. We should prioritize improving the ESG performance of businesses and their capacity for sustainable development by focusing on the management of ESG factors in high-tech and state-owned enterprise, which will have a positive impact on society and enterprises themselves.

References

[1] *Allred, Catherine M. Environmental, Social, and Governance (ESG) Investing: From Scarlet to Green, 2020.*

[2] *Wang YiQiu, Xie Meng, Guo Chong. Does corporate ESG Performance affect bank credit decisions? Based on empirical evidence from Chinese A-share listed companies. Financial Economics Research,pp:1-18,2023.*

[3] *Bai Xiong, Zhu Yifan, Han Jinmian. ESG performance, institutional investor preferences and firm value. Statistics & Information Forum,vol.37,pp:117-128,2022.*

DOI: 10.54254/2754-1169/65/20231651

[4] *Friede, Gunnar, et al. ESG and Financial Performance: Aggregated evidence from more than 2000 empirical studies. Journal of Sustainable Finance & Investment, vol. 5, pp:210–233,2015.*
[5] *Li Jinglin, Yang Zhen, Chen Jin et al. Research on the mechanism of ESG promoting firm performance -- based on the perspective of firm innovation. Science of Science and Management of S.& T., vol.42,pp:71-89,2021.*
[6] *Alareeni,Bahaaeddin A,Allam H.ESG Impact on Performance of US S&P 500-Listed Firms. Corporate Governance(Bradford),vol.20,pp:1409-1428,2020.*
[7] *Liu Hongchen. Tobin's Q value and Related theoretical Results. Hebei Enterprise,(01),pp:14-15,2012.*
[8] *Lv Bei & Li Yanan. The relationship between environmental information disclosure and enterprise value from the perspective of system management. Chinese Journal of Systems Science,(02),pp:123-128,2020.*
[9] *Cui Jinrui, Miao Jinfang. Study on the impact of ESG Performance on corporate value: A Case study of listed biomedical companies. Qinghai Finance,(06),pp:19-,2022.*
[10] *Xu Mingyu, Liu Cancan, Hu Yixiang, Yue Xiukui. An empirical study on the impact of Listed companies' ESG Performance on firm value: A Case study of A-share Listed Companies. Appraisal Journal of China,(07),pp:27-37,2021.*
[11] *Lin Lin, Yang Hongjuan, Yang Bin. Does ESG Performance Improve Enterprise Value in the context of dual-carbon target? An Empirical Study based on CSI 300 and CSI 500 Stocks. Scientific Decision-Making,(06),pp:42-63,2023.*