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Research on the Relationship between ESG Performance, Financing Constraints and Corporate Performance of Manufacturing Enterprises

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Abstract: Under the background of the dual carbon goals, ESG concept has developed rapidly. It became the information object that more and more enterprises choose to disclose. Manufacturing enterprises should pay more attention to fulfilling ESG responsibilities. Based on this, firstly, this study verifies the relationship between ESG responsibility performance and economic benefits of Chinese manufacturing enterprises. Secondly, this study verifies the moderating effect of financing constraints on the ESG performance and corporate performance of manufacturing enterprises in China. It proves that financing constraints play an important role in the development of manufacturing enterprises in China, and promotes relevant departments to strengthen the management of financing costs. This study will provide some lessons for the development of manufacturing enterprises, and promote business managers and stakeholders to realize the importance of ESG performance for long-term sustainable development.

1. Introduction

In 2021, the "double carbon target" was incorporated into the overall layout of ecological civilization construction. The green transformation, green finance and sustainable development have become buzzwords, while social welfare, labor issues and environmental protection have also received more and more attention. Under the impetus of the "double carbon" target, ESG concept has been developing rapidly. According to the data published by Caixin Intelligence in 2021, the global ESG investment management scale has increased from USD 18.3 trillion in 2014 to USD 40.5 trillion in 2020, an increase of 122 percent, while in the same period, the increase of other categories of investment is only 36 percent. More and more companies are choosing to disclose ESG information to optimize their image and improve their competitiveness.

The development of the manufacturing industry is related to the country's livelihood. It occupies an irreplaceable position in the development process of the national economy. However, China's manufacturing industry is facing many problems while developing. For example, it has meet excessive consumption of resources, which has a large negative impact on the environment; constant production safety accidents, and corruption at the top of enterprises. In this regard, enterprises, investors and financial institutions believe that they should further deepen their attention and

management of ESG performance. They should carry out various economic activities in an environmentally and socially responsible manner. In order to enable Chinese manufacturing enterprises to take the initiative to fulfill their ESG responsibilities, they need to see the economic benefits that ESG performance can bring to their development. What exactly is the relationship between the two? At the same time, the huge economic environment pressure further pushes up the financing cost of the manufacturing industry, coupled with many uncertainties in the capital market, which makes the industry more seriously affected by financing constraints. What role does it play in the relationship between ESG performance and corporate performance?

Based on this, this study verifies the relationship between ESG responsibility fulfillment and economic benefits of manufacturing enterprises in China. Manufacturing enterprises can directly see the economic value brought by ESG investment, which reduces the concern of sunk input cost of ESG responsibility fulfillment, enhances the motivation of ESG responsibility fulfillment of manufacturing enterprises in China. It provides a scientific basis for China's manufacturing industry to find new economic growth points and maintain its sustainable development. Secondly, by verifying the moderating role of financing constraints between ESG performance and corporate performance of manufacturing enterprises in China, this study demonstrates the important role played by financing constraints in the development process of manufacturing enterprises in China and promotes the relevant departments to strengthen the management of financing costs. Finally, the research of this study will provide some experiences for the development of China's manufacturing enterprises, prompt the enterprise managers and various stakeholders to recognize the importance of ESG performance for the long-term sustainable development of enterprises. Then it could promote the development of China's enterprises in the direction of innovation, coordination, green and sustainable, and improve the enterprise performance. It also could provide reference for the decision making of government departments.

2. Literature Review and Research Hypothesis

2.1. ESG Performance and Financing Constraints

Only in recent years have domestic and foreign scholars begun to study ESG performance and financing constraints. Good ESG performance is negatively related to firms' external financing constraints [1]. The more imperfect the relevant policies in the market environment and the more depressed the economy is, the stronger the effect between the two will be. A panel regression model is used to examine the relationship between 23 OECD countries from 2007-2012, the study concluded that good ESG ratings reduce the borrowing costs of national sovereigns [2]. The higher the level of corporate environmental information disclosure, the lower the risk of financing constraints faced by firms [3]. Improving the quality of environmental information disclosure could effectively improve information asymmetry and reduce the financing cost of firms in the next period. This effect is more significant in state-owned enterprises compared to private enterprises [4].

In summary, domestic and foreign research on ESG performance and financing constraints started late. In recent years, most of the research has studied the impact of the performance of one aspect of environment, social responsibility and corporate governance on corporate financing costs. The results obtained are basically consistent with foreign countries, in that good environmental, social responsibility and corporate governance performance will be beneficial to reduce corporate financing constraints.

2.2. ESG Performance and Corporate Performance

Scholars found that good ESG performance positively affects corporate performance from

different stakeholder perspectives. From the government's perspective, Liu Lin argues that the "visible hand" of the government plays a significant role in the economy and society. A good interaction with the government can make it easier for companies to obtain a more relaxed business environment and financial support in the development process, thus improving financial performance [5]. For consumers, Yamin Hu argues that good ESG performance means being able to meet the public's expectations of the company on environmental issues, giving the product the label of being more environmentally friendly and easily gaining the favor of environmentalists [6].

Based on signaling theory, Quan and Jia argue that firms with higher ESG scores send positive signals to the outside world and build a better corporate image, making them more likely to gain investor support and increase investment confidence, which in turn increases corporate value [7]. Zhou and Fangzhao argue that institutional investors are more inclined to invest in firms with good ESG performance [8]. There is a significant positive relationship between the level of ESG responsibility fulfillment and CFP, but a negative relationship between the level of ESG responsibility fulfillment and CFP for emerging market multinational companies [9].

The above findings suggest that although most scholars believe that corporate ESG responsibility fulfillment has a positive impact on corporate financial performance. There are still different opinions and no consensus has been reached.

2.3. Financing Constraints and Corporate Performance

Domestic and foreign scholars' research on the relationship between financing constraints and corporate performance ultimately leads to two conclusions.

On the one hand, the two have a negative relationship. There is an empirical study on financial constraints and investment efficiency based on relevant data from 2000-2014, using 18 listed Canadian forest companies. The results show that financial constraints are negatively related to investment efficiency, which leads to a 40% loss in investment efficiency due to the presence of financial constraints, which carries out to affect corporate performance [10]. Based on Cleary index equation, some scholars used the data of A-share real estate listed companies as a research sample to construct the financing constraint index model equation through relevant financial data indicators. The research results showed that in China's real estate listed companies, there is a widespread financing constraint situation, which seriously inhibits the development of enterprises.

On the other hand, the two have a positive relationship. Some scholars used the KZ index and the Fama-Mac Beth regression model to conduct an empirical study. The more serious the financing constraint situation exists, the more difficult it is for enterprises to raise funds, so enterprises should improve the efficiency of capital use and enhance the efficiency of R&D investment, which also helps to improve the performance of enterprises, the better the stock returns [11].

2.4. Research Hypothesis

Stakeholder theory states that companies should ensure stakeholders' right to know and provide them with corporate-related information. ESG is widely supported and valued because of its wide scope and abundant information, which can reflect the business status and potential risks of companies. At the same time, enterprises with good ESG performance are more likely to be recognized by government departments, thus gaining the trust of consumers, investors and government departments, improving their credibility and competitiveness, and reducing the losses caused by related penalties.

According to sustainability theory, the disclosure of ESG-related information is beneficial for companies to gain social recognition and social capital and promote sustainable development. Environmental protection measures, fulfillment of social responsibility and governance status of

enterprises directly affect the evaluation of ESG aspects of enterprises, and the improvement of such evaluation is conducive to the enhancement of corporate value. Based on the above analysis, this paper proposes the following hypotheses.

H1: Corporate ESG performance is positively related to corporate performance.

According to the information asymmetry theory, enterprises generally have more or less unsound systems and opaque information. For example, when there is incomplete information disclosure and enterprises do not have enough funds to finance projects, investors are often less inclined to invest funds in enterprises when they cannot grasp the true information of enterprises. Thus, the most intuitive manifestation of financing constraints is that it restricts the investment behavior of enterprises, which in turn has an impact on it. Based on its business characteristics, when listed companies in the manufacturing industry need a large amount of capital as a stable guarantee for their business activities, it is difficult to measure its value accurately due to the long cycle and the degree of confidentiality of relevant information. It's difficult to obtain sufficient funds from outside for the production and operation activities of the manufacturing industry and highly dependent on internal capital resources. So domestic and foreign Scholars generally believe that the financing constraint problem of enterprises will seriously restrict the performance of enterprises, and the more the enterprises with financing constraint lack funds to invest in projects, which puts them in an unfavorable situation. Based on this, hypothesis is proposed.

H2: The financing constraint of the firm is related to the firm.

Based on the relevant theories and the combing analysis of domestic and international studies, it is found that the relationship between ESG performance, financing constraints and corporate performance is very close. The financing constraint of enterprises has an impact on the relationship between ESG performance and corporate performance. According to stakeholder theory and sustainability theory, corporate ESG information disclosure is responsible to stakeholders and is intended to be supported by stakeholders. Good ESG performance will improve the confidence of stakeholders and investors, and thus improve corporate performance. The presence of financing constraints, on the other hand, affects the quality of ESG disclosure, and higher financing constraints also diminish the incentive for firms to obtain external funding for proactive ESG disclosure. Firms with less financing constraints can cultivate stronger environmental protection concepts, assume more social responsibility, and improve corporate governance, and sufficient and low-cost capital will facilitate ESG-related information disclosure. Therefore, this paper proposes the following hypothesis.

H3: There is a negative moderating effect of financing constraints on the positive relationship between ESG performance and corporate performance.

3. Research Design

3.1. Sample and Data Sources

This study conducts an empirical study with a sample of A-share listed companies in Shanghai and Shenzhen. The data are obtained from WIND database (WIND). Among them, ESG data are obtained from a third-party independent institution, China Securities ESG Rating. Considering the accuracy of sample company selection and reliability of empirical research, companies with incomplete data are excluded; financial companies are excluded; ST and ST* companies are excluded. Considering the influence of extreme values in the sample on the results of empirical analysis, continuous variables are Winsorized by 1% and 99%. In order to improve the quality of data and reliability of research value, this study performs balanced processing. The final balanced panel data of 1498 enterprises for 6 years from 2016 to 2020 were obtained, with a total of 97370 sample points. In this study, the data are processed and regression analysis is performed by Excel and Stata.

3.2. Description of Variables

3.2.1. Explained Variables

Corporate performance draws on the DuPont analysis system, and the corresponding financial ratio indicators are selected from four aspects: debt service, earnings, operations, and growth, respectively, to measure corporate performance using factor analysis measure values (Table 1).

Table 1: Selection of corporate performance indicators

Indicator	Code
Gearing ratio	X1
Current ratio	X2
Return on net assets	X3
Net operating margin	X4
Total Assets Turnover Ratio	X5
Current Assets Turnover Ratio	X6
Operating revenue growth rate	X7
Growth rate of total profit	X8

3.2.2. Explanatory Variables

At present, there is no unified measurement standard in the domestic ESG empirical research. Zhang Lin and Zhao Haitao draw on the rating methods of S&P and Moody's to assign 1 to companies with Shang Dao Rong Green ESG rating of B+ and above, and 0 otherwise. Then quantify the ESG performance of companies, but such methods are difficult to capture the changes in ESG performance of companies. Qiu, Muyuan, and Yin, Hong measure ESG performance based on data on the number of annual environmental penalties, the proportion of independent directors, and the amount of annual corporate social donations, but such methods are limited in scope and cannot measure corporate ESG performance comprehensively. To summarize the above, this study measures the ESG performance of enterprises through the total score of ESG rating of China Securities, which has a higher quality of information disclosure and wider coverage in Wind database.

3.2.3. Moderating Variables

This study selects SA index to measure the degree of financing constraints faced by manufacturing listed companies, which was proposed by foreign scholar Hadlock Pierce in 2009, using two indicators of company size and age to calculate the financing constraints faced by enterprises. Combined with the situation of listed manufacturing companies in China, the SA index is used to construct the degree of financing constraints in this paper, and the specific model is as follows.

$$\mathrm{FCI} = -0.737 * \mathrm{Size} + 0.043 * \mathrm{Size}^2 - 0.04 * \mathrm{Age} \quad (1)$$

FCI represents the financing constraint of the sample enterprises. Size indicates the company size of the enterprises. Age indicates the age of the enterprises, where the company age uses the natural logarithm of the difference between the years in which the observations of the company establishment time values are located. Both variables are significantly correlated with the financing constraint. The financing constraint index constructed by the method of SA index can well avoid the endogeneity problem, and the value of the index. The larger the value of the index, the less it is considered to be affected by the financing constraint. Similarly, the smaller the value of the index, the more it is considered to be affected by the financing constraint.

3.2.4. Control Variables

In this study, with reference to the research results at home and abroad, from the specific situation of China, enterprise size, enterprise age, shareholding ratio of the largest shareholder, and enterprise nature are selected as the control variables of the model to ensure the robustness of the conclusion.

Enterprise size. The amount of external attention an enterprise receives is related to the size of the enterprise itself; the larger the size, the more likely it is to receive external attention.

Firm age. Most scholars agree that the longer an enterprise survives, the more financial and social resources it has and the stronger its core competitiveness. In this paper, we refer to the study of Zhou and others and use Ln (year of observation - time of firm establishment + 1) to measure the age of the firm.

The shareholding ratio of the first largest shareholder. If the shareholding is too concentrated, although it reduces the problem of agency conflict, it is easy to create a situation of "one voice".

Nature of the enterprise. Compared with non-SOEs, SOEs have certain social functions and are subject to higher public expectations and attention in fulfilling ESG responsibilities, and are under more pressure from the government and the media, and therefore bear more ESG responsibilities.

In addition, in order to control for the impact of time-varying macroeconomic conditions on firm performance, annual dummy variables are included in the regression model of this study. The main variables used in this study are defined as shown in Table 2.

Table 2: Variable definitions

Variable Name		Variable Code	Variable Measurement
The variable being explained	Business performance	F	Factor analysis synthesis measurement
Explanatory variables	ESG performance	ESG	The total score of the ESG rating of China Securities
Modulating variables	Financing constraints	FCI	SA index
Control variables	Enterprise size	Size	The natural logarithm of the total assets of China's manufacturing enterprises at the end of the period
	Enterprise age	Age	Ln (Year of observation - Establishment of the company +1).
	The shareholding ratio of the largest shareholder	FH	The shareholding ratio of the largest shareholder
	Nature of the enterprise	State	State-owned enterprises are denoted as 1, otherwise 0
	Annual dummy variable	Year	2015-2020

3.3. Model Selection

To test the hypotheses, the models are constructed in this study as follows.

(1) Regression model between ESG performance and corporate performance.

$$F_t = \beta_0 + \beta_1 ESG_t + \beta_j \sum Control_t + \sum Year + \varepsilon_t \quad (2)$$

(2) Regression model between financing constraints and firm performance.

$$F_t = \beta_0 + \beta_1 FCI_t + \beta_j \sum Control_t + \sum Year + \varepsilon_t \quad (3)$$

(3) Moderating effect model of financing constraints with main explanatory term and interaction term for regression analysis.

$$F_t = \beta_0 + \beta_1 ESG_t + \beta_2 FCI_t + \beta_3 ESG_t \times FCI_t + \beta_j \sum Control_t + \sum Year + \varepsilon_t \quad (4)$$

4. Empirical Analysis

4.1. Factor Analysis of Firm Performance

4.1.1. Data Processing

(1) Dimensionless processing. Generally, the data outline will be different for different samples, and there are differences in the size of the values. It is only by dimensionless processing of data that valid financial performance measurement results can be obtained. At present, the common method of dimensionless processing used in academia is the standardization method, i.e.

$$Y = (X - M) \div S \quad (5)$$

M, S are the mean and standard deviation of indicator X, respectively. After the standardization process, the mean value of indicator X is 0 and the variance is 1, eliminating the influence of magnitude and order of magnitude.

(2) Positivization process. The absolute value of the original value minus the standard value is taken as a negative number, i.e.

$$Y_t = -|X_t - A| \quad (6)$$

Yt: the positivized index. Xt: the original financial index. A: the average of the original financial index.

4.1.2. Factor Analysis

The data need to be tested for suitability before conducting factor analysis. The KMO statistic can be used to compare the simple correlation coefficient matrix and bias correlation coefficient between variables. Bartlett's sphericity can test the correlation between variables. So, the results of KMO test and Bartlett's test are used to determine whether the original variables are suitable for factor analysis.

According to the result, the KMO value is 0.622, greater than 0.6, which indicates that there is a certain correlation between the variables. The Bartlett's sphericity test significance level Sig=0.000, the test result rejects the original hypothesis, and there is no mutual independence between the variables. Taken together, the original variables are suitable for factor analysis.

Table 3: Factor analysis results

Factor analysis/correlation			Number of obs=7,490	
Method: principal-component factors			Retained factors=3	
Rotation: (unrotated)			Number of params =21	
Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	2.67009	0.41155	0.3338	0.3338
Factor2	2.25854	1.11330	0.2823	0.6161
Factor3	1.14524	0.34186	0.1432	0.7592
Factor4	0.80338	0.32017	0.1004	0.8597
Factor5	0.48322	0.16674	0.0604	0.9201
Factor6	0.31648	0.12647	0.0396	0.9596
Factor7	0.19000	0.05696	0.0238	0.9834
Factor8	0.13305		0.0166	1.0000
LR test: independent vs. saturated: chi2(28) = 2.9e+04 Prob>chi2 = 0.0000				

After the preliminary application test through factor analysis, the sample data is reduced by

dimensionality using State. The corresponding feature values are obtained, and the factor score is solved on the load on each extracted factor (Table 3).

Among the 8 variables selected, the first three feature values are greater than 1. So, the extraction of 3 common factors can make a good explanation of the problem. The weights of 3 common factors are obtained.

The lithotripsy plot visually shows the extraction of the principal factor (Figure 1). There are three principal factors with feature values greater than 1 in the figure. So, it is judged that extracting three principal factors can explain most of the information.

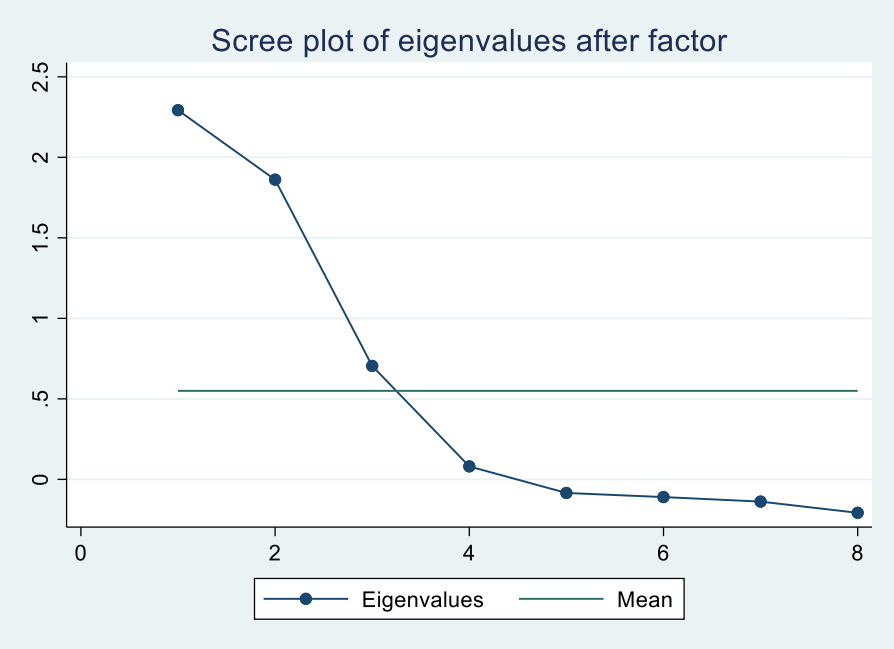


Figure 1: Gravel diagram

In order to make the data better reflect the actual situation, the main factors F1, F2, F3 and factor load matrix of the enterprise performance evaluation index are rotated (Table 4).

The factor with the highest contribution rate is F1, with a contribution rate of 33.38%. Return on net assets and operating net profit margin are the main impact factors of F1, and the load values are 0.8603 and 0.8497, respectively. These two indicators describe the profitability of manufacturing enterprises. The contribution rate of F2 is 28.23%. The total asset turnover rate and current asset turnover rate are the main impact factors of F2. The load values are 0.9427 and 0.9252, respectively, which are used to describe the operating capacity of manufacturing enterprises. The contribution rate of F3 is 14.32%. The gearing ratio is the main impact factor of F3, and its load value is 0.8865, which describes the solvency of manufacturing enterprises. After the factor rotation, the score of each factor can be obtained, as shown in Table 5.

Table 4: Factor load matrix after rotation

Variable	Factor1	Factor2	Factor3	Uniqueness
X1	-0.1467	0.1	0.8865	0.1825
X2	0.08	-0.1736	-0.8782	0.1922
X3	0.8603	0.2464	-0.1294	0.1824
X4	0.8497	-0.0078	-0.2919	0.1928
X5	0.0983	0.9427	0.0669	0.0972
X6	0.0771	0.9252	0.1737	0.1079
X7	0.5374	0.0457	0.2867	0.6269
X8	0.8069	0.0493	0.0472	0.3442

Table 5: Component score coefficients

Variable	Factor1	Factor2	Factor3
X1	0.02772	-0.07972	0.5242
X2	-0.04717	0.04161	-0.51365
X3	0.33774	0.06486	-0.02318
X4	0.34586	-0.06017	-0.08129
X5	-0.0678	0.55256	-0.11568
X6	-0.06228	0.52532	-0.04762
X7	0.26866	-0.09187	0.237
X8	0.36002	-0.0808	0.11737

According to the score of manufacturing enterprises at each capability level, the scores of manufacturing enterprises in three aspects: operating capacity, profitability and solvency can be calculated.

F1 reflects the profitability of manufacturing companies and is as follows:

$$F1 = 0.02772X1 - 0.04717X2 + 0.33774X3 + 0.34586X4 - 0.0678X5 - 0.06228X6 + 0.26886X7 + 0.36002X8 \quad (7)$$

F2 reflects the operating capacity of manufacturing companies and is as follows:

$$F2 = -0.07972X1 + 0.04161X2 + 0.06486X3 - 0.06017X4 + 0.55256X5 + 0.52532X6 - 0.09187X7 - 0.0808X8 \quad (8)$$

F3 reflects the solvency of manufacturing companies and is as follows:

$$F3 = 0.5242X1 - 0.51365X2 - 0.02318X3 - 0.08129X4 - 0.11568X5 - 0.04762X6 + 0.237X7 + 0.11737X8 \quad (9)$$

Using the data in Table 5, the scores of each factor of the manufacturing enterprise can be calculated (Table 6).

Thus, the comprehensive score of enterprise performance of manufacturing enterprises can be calculated, which is denoted by F, and the calculation formula is as follows.

$$F = 0.3057f1 + 0.2313f2 + 0.2223f3 \quad (10)$$

Table 6: Weights of each factor

Factor analysis/correlation			Number of obs =	7,490
Method: principal-component factors			Retained factors =	3
Rotation: orthogonal varimax (Kaiser off)			Number of params =	21
Factor	Variance	Difference	Proportion	Cumulative
Factor1	2.44558	0.59543	0.3057	0.3057
Factor2	1.85015	0.072	0.2313	0.537
Factor3	1.77815		0.2223	0.7592
LR test: independent vs. saturated: chi2(28) = 2.9e+04 Prob>chi2 = 0.0000				

4.2. Descriptive Analysis

A descriptive statistical analysis of 7490 sample data was performed (Table 7).

Table 7: Descriptive statistics

VarName	Obs	Mean	Median	Min	Max
ESG	7490	72.69	73.13	55.42	84.90
FCI	7490	4.68	4.47	2.28	9.35
Age	7490	8.84	8.86	8.12	9.38
FH	7490	31.98	30.00	8.73	70.36
State	7490	0.30	0.00	0.00	1.00
Size	7490	22.33	22.20	20.17	25.87
F	7490	0.00	0.02	-2.55	1.99

The maximum value of enterprise performance (F) in the sample companies was 1.99 and the minimum value was -2.55, and the listed companies with higher and lower enterprise performance were included. The maximum ESG performance (ESG) was 84.90, the minimum value was 55.42, and the average value was 72.69, indicating that the ESG performance of manufacturing enterprises in the sample had a large gap and the overall environmental information disclosure degree was average, which shows that ESG performance needs to be further improved. The maximum value of financing constraint (FCI) is 9.35, the minimum value is 2.28, and the average value is 4.68, indicating that the financing constraint of manufacturing enterprises is relatively serious. The maximum size of the enterprise is 25.87, the minimum value is 20.17, and the average value is 22.33, and the overall scale of manufacturing enterprises is relatively average. The largest shareholding ratio (FH) of the largest shareholder is 70.36% and the minimum value is 8.73%, indicating that the shareholding ratio of the largest shareholder of an enterprise exceeds 50%, while the average value is 31.98%, indicating that the largest shareholder of a manufacturing enterprise has a higher shareholding ratio. The average value of enterprise nature (state) is 0.30, indicating that manufacturing enterprises are mostly non-state-owned listed companies.

4.3. Correlation Analysis

The correlation analysis of the variables is shown in Table 8.

The correlation coefficients of ESG performance, enterprise size, shareholding ratio of the largest shareholder, corporate nature, corporate age and corporate performance all passed the significance test at the 1% level. It shows that ESG performance, enterprise size, largest shareholder shareholding ratio, corporate nature, corporate age and corporate performance are positively correlated. The correlation coefficient between financing constraints and firm performance passed the significance test at the 1% level. Therefore, it shows that financing constraints are negatively correlated with firm performance, that is, the larger the enterprise, the lower the level of enterprise performance.

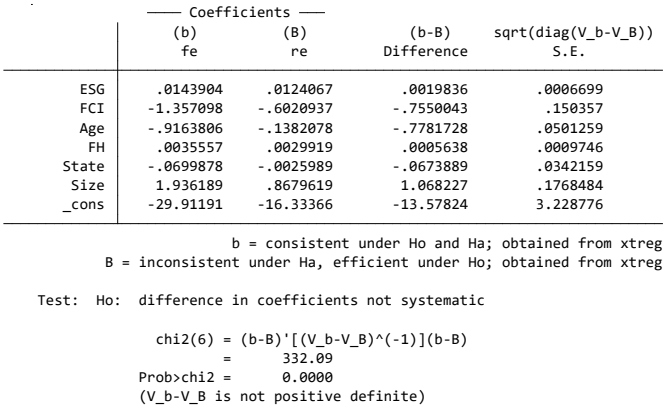
Table 8: Correlation coefficient matrix

	F	ESG	FCI	Age	FH	State	Size
F	1						
ESG	0.20***	1					
FCI	-0.37***	0.24***	1				
Age	0.06***	0.02**	0.13***	1			
FH	0.13***	0.10***	0.15***	-0.03**	1		
State	0.14***	0.14***	0.31***	0.25***	0.17***	1	
Size	0.38***	0.24***	1.00***	0.14***	0.15***	0.31***	1
Lower-triangular cells report Pearson's correlation coefficients, upper-triangular cells are Spearman’s rank correlation							
*** p<0.01, ** p<0.05, * p<0.1							

4.4. Analysis of Regression Results

4.4.1. Hausman Test

The Hausman test was performed on the model. The chi-sq statistic was 332.09, and the accompanying probability p value was 0.0000, which rejected the null hypothesis at the significance level of 1%. The model was suitable for fixed effects. So, the fixed effect model was finally adopted (Figure 2).



	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
ESG	.0143904	.0124067	.0019836	.0006699
FCI	-1.357098	-.6020937	-.7550043	.150357
Age	-.9163806	-.1382078	-.7781728	.0501259
FH	.0035557	.0029919	.0005638	.0009746
State	-.0699878	-.0025989	-.0673889	.0342159
Size	1.936189	.8679619	1.068227	.1768484
_cons	-29.91191	-16.33366	-13.57824	3.228776

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 332.09
Prob>chi2 = 0.0000
(V_b-V_B is not positive definite)

Figure 2: Hausman test

4.4.2. ESG Performance and Corporate Performance

The relationship between the firm is tested by controlling the influence of enterprise size, shareholding ratio of the largest shareholder, nature of the enterprise and enterprise age (Table 9).

Model 1 uses ESG performance as the explanatory variable and enterprise performance as the explanatory variable. Model 2 introduces control variables based on Model 1. The F value is 285.92, which is significant at the level of 1%. The regression results are significant. The model is significantly valid. The goodness-of-fit R2 was 0.160, and the fitting effect of the model was good. The regression coefficient of ESG performance is 0.009 and the P value is 0.000, indicating that ESG performance has a significant positive impact on corporate performance, and the improvement of ESG performance will promote the improvement of corporate performance, which verifies H1.

Table 9: ESG performance and firm performance regression analysis results

	ESG		Age		FH	
Model 1	0.015***	(18.12)				
Model 2	0.009***	(10.72)	0.019	(1.01)	0.002***	(6.14)
	State		Size		_cons	
Model 1					-1.108***	(-18.06)
Model 2	0.006	(0.51)	0.128***	(29.22)	-3.724***	(-19.93)
	N	adj. R-sq	F	Prob > F		
Model 1	7490	0.042	328.31	0.0000		
Model 2	7490	0.160	285.92	0.0000		

Among the control variables, the regression dilution of the shareholding ratio of the largest shareholder and the size of the enterprise were 0.002 and 0.128, respectively, which passed the significance test at the 1% level, indicating that the increase of the shareholding ratio of the largest shareholder and the scale of the enterprise had a significant positive impact on the performance of the enterprise. The nature of the firm and the age of the firm did not have a significant impact on the performance of the firm.

4.4.3. Financing Constraints and Corporate Performance

The relationship between the firm is tested by controlling the influence of enterprise size, shareholding ratio of the largest shareholder, nature of the enterprise and enterprise age (Table 10).

Table 10: Results of regression analysis of financing constraints and firm performance

	Model 3	Model 4
FCI	-0.117***	-0.338***
	(-34.76)	(-5.70)
Age		0.005
		(0.24)
FH		0.003***
		(7.06)
State		0.017
		(1.53)
Size		0.547***
		(7.59)
_cons	-0.547***	-10.760***
	(-33.28)	(-8.10)
N	7490	7490
adj. R-sq	0.1390	0.1512
F	1208.59	266.58
Prob > F	0.0000	0.0000

Model 3 uses financing constraints as the explanatory variable and enterprise performance as the explanatory variable. Model 4 introduces control variables based on Model 3. After importing the control variables, the F value is 266.58. It's significant at the level of 1%. The regression results are jointly significant, and the model is significantly valid. The goodness-of-fit R2 was 0.1512, and the fitting effect of the model was good. The regression coefficient of the financing constraint FCI is -0.338 and the P value is 0.000, which passed the test at the 1% level, indicating that the financing constraint had a significant negative impact on the performance of the enterprise, and the improvement of the financing constraint would hinder the improvement of the performance of the enterprise, which verified H2.

Among the control variables, the regression dilution of the shareholding ratio of the largest shareholder and the scale of the enterprise were 0.003 and 0.547, respectively, which passed the significance test at the 1% level, indicating that the increase of the shareholding ratio of the largest shareholder and the scale of the enterprise had a significant positive impact on the performance of the enterprise. The nature of the firm and the age of the firm did not have a significant impact on the performance of the firm.

4.4.3. ESG Performance, Financing Constraints and Corporate Performance

This study takes enterprise performance as the explanatory variable and ESG performance as the explanatory variable, and introduces the regulating variable financing constraint, financing constraint and ESG performance interaction terms to verify the moderating effect of financing constraint. This regression is used to test whether financing constraints have a moderating effect on the relationship between ESG performance and corporate performance (Table 11).

Table 11: ESG performance, financing constraints and firm performance regression analysis results

	Model 5	Model 6	Model 7
ESG	0.009***	0.023***	0.016***
	(11.18)	(8.74)	(5.68)
FCI	0.108***	-0.333***	-0.176*
	(31.34)	(-8.26)	(-1.94)
ESG*FCI		-0.003***	-0.002***
		(-5.61)	(-2.69)
Age			0.013
			(0.68)
FH			0.002***
			(6.45)
State			0.008
			(0.74)
Size			0.484***
			(6.20)
_cons	-1.166***	-2.222***	-10.816***
	(-20.20)	(-11.28)	(-7.90)
N	7490	7490	7490
adj. R-sq	0.1531	0.1566	0.1654
F	676.74	463.47	211.89
Prob > F	0.0000	0.0000	0.0000

Hierarchical regression was used to verify the impact of financing constraints on the relationship between ESG performance and firm performance. First, the financing constraint of the regulating variable was added, at which time the goodness-of-fit was 0.1531, and then the cross-phase ESG*FCI of the financing constraint and ESG performance was added for stratified regression, and after adding ESG*FCI to the model, the goodness-of-fit became 0.1566 at this time, and R2 was improved, indicating that the overall fitting effect of the regression equation was better.

Table 11 is the regression result of the impact of equity concentration on the relationship between financing constraints on ESG performance and enterprise performance, ESG*FCI indicates the regulating effect of financing constraints on the relationship between ESG performance and enterprise performance, the coefficient of ESG*FCI is -0.003, which is also significant at the 1% significance level, but the coefficient of the interaction term is negative, so the positive effect of financing constraints on corporate ESG investment level on enterprise value has a weakening effect, that is, when other variables are controlled unchanged, Under the condition of high financing constraints, the positive effect of ESG investment level on enterprise value is smaller than that under financing constraints, which verifies the hypothesis H3. As mentioned above, financing constraints weaken the economic benefits of ESG investment by affecting the ESG investment behavior of enterprises and the behavior of relevant stakeholders, because the enterprises themselves and corporate investors are worried about the signals of financing constraints, and cannot find the economic benefits that enterprises can bring about in ESG investment in the short term. Therefore, it is impossible to invest resources in a timely and rapid manner into the internal and external environment of the enterprise, which in the long run will reduce the economic benefits brought to the enterprise by ESG investment for enterprises with a high degree of financing constraints, and even lead to the dilemma of operational turnover difficulties when enterprises are difficult to operate the enterprise due to the constraints of capital flow when making ESG investment, so financing constraints ultimately limit the role of ESG responsible investment in promoting corporate performance.

4.5. Robustness Test

In order to test the robustness and reliability of the regression results, the explanatory variable L. ESG and L.FCI re-enter the enterprise performance model to test whether the positive impact of ESG performance on enterprise performance, the negative impact of financing constraints on enterprise performance, and the moderating effect of financing constraints on ESG performance and corporate performance are sound (Table 12).

For the robustness test results of the research model 2, the test results of the explanatory variable ESG performance are significant at the 1% level from the significance level of the regression result variables. The sign of the coefficient is consistent with the results of the previous multiple regression test. ESG performance in the lagged period has a significant positive effect on the current year's corporate performance. The improvement of ESG performance in the previous year will promote the improvement of the current year's corporate performance. The robustness of Model 2 is further verified, indicating that the direction and significance of the effect of ESG performance on firm performance remain unchanged.

For the results of the robustness test of the research model 4. Firstly, the sign of the regression coefficients of the explanatory variables does not change and, again consistent with the results of the previous test, is significant at the 1% level. The lagged one-period financing constraint has a significant negative effect on the current year's firm performance, and the increase in the previous year's financing constraint inhibits the improvement of the current year's firm performance. The robustness for Model 4 is further verified, indicating that the direction and significance of the effect of financing constraints on firm performance does not change.

After considering the moderating effect of financing constraints, the lagged one-period ESG performance has a significant positive effect on the firm performance in the current year, and the increase in ESG performance in the previous year will promote the firm performance in the current year, and the lagged one-period financing constraints has a significant negative effect on the firm performance in the current year, and the increase in financing constraints in the previous year will inhibit the firm performance in the current year. The coefficient of the interaction term L.ESG*L.FCI is negative and passes the significance test at the 1% level, indicating the moderating effect of financing constraints.

Table 12: Robustness test results

	Model 8	Model 9	Model 10	Model 11
L.FCI	-0.592***		-0.591***	-0.670***
	(-34.27)		(-34.24)	(-14.19)
L.ESG		0.002*	0.001	-0.004
		(1.76)	(1.15)	(-1.35)
L.ESG*L.FCI				0.001*
				(1.78)
Age	0.059***	0.033	0.059***	0.058***
	(2.92)	(1.49)	(2.95)	(2.88)
FH	0.002***	0.003***	0.002***	0.002***
	(6.67)	(6.65)	(6.62)	(6.62)
State	0.044***	0.016	0.043***	0.043***
	(3.79)	(1.28)	(3.71)	(3.71)
Size	0.836	0.137***	0.834***	0.837
	(40.12)	(27.34)	(39.96)	(39.99)
_cons	-16.574***	-3.562***	-16.618***	-16.296***
	(-38.47)	(-15.96)	(-38.43)	(-34.78)
N	5992	5992	5992	5992
adj. R-sq	0.2892	0.1502	0.2894	0.2897
F	487.12	211.54	406.18	348.73
Prob > F	0.0000	0.0000	0.0000	0.0000

Overall, in the results of the robustness test, the relationship between the explanatory and explained variables does not change, the mechanism of action of the moderating variables is consistent, and although the effects of some of the control variables occur, they are all significant at a certain significance level, and there is no change in the main effect and moderating effect for this paper's research, so the conclusions of this paper are somewhat robust.

5. Conclusion

This study takes China's manufacturing enterprises in 2016-2020 as the research sample, and determines 1498 manufacturing enterprises as the research sample after screening. The fixed-effects model was used for empirical verification, and the robustness of the results was tested. The conclusions are summarized as follows: (1) In hypothesis H1, ESG performance has a facilitating effect on the corporate performance of manufacturing enterprises in China. (2) In hypothesis H2, they are significantly negatively related in the correlation analysis, i.e., the increase of financing constraints inhibits the improvement of corporate performance. (3) In hypothesis H3, the regression coefficient of the cross-sectional term between financing constraints and ESG performance is found to be -0.002 and significant, indicating that financing constraints have a negative moderating effect on the positive relationship between ESG performance and corporate performance.

In this regard, this study makes the following suggestions. Industrial enterprises should focus on practicing ESG concept, improving production environment. Thus, improving corporate value, and continuously enhancing their sustainable development capability and potential.

First, choose a reasonable corporate financing method. Increase financing channels to alleviate the financing constraints faced by enterprises. Flexibly adopt various financing methods, and find convenient financing channels in accordance with the guidelines of government policies.

Second, improve ESG management system and strengthen internal control. Consider incorporating ESA management into the annual risk internal control management and corporate governance of listed industrial enterprises. Standardize and institutionalize ESG management from all aspects of corporate management responsibility mechanism, establish a sound management mechanism, and better play its role of enhancing corporate value.

Third, establish ESG information database to improve competitive advantage in the industry. Classify and manage different business chains of the company. Then make full use of big data technology to continuously track policy and regulatory trends, as well as collect ESA data from the same industry for benchmarking analysis to identify deficiencies and prevent risks.

References

[1] Yuting H., Yonghong Z. (2023) ESG performance, financing constraints and high-quality innovation of coal enterprises under the goal of "dual carbon". Mining Research and Development, 43(02):194-201.
[2] Jinglin L., Zhen Y., Junling Y. (2023) Does ESG performance help reduce corporate debt financing costs? Enterprise Economics, 42(02):89-99.
[3] Qi B., Luyuan X. (2023) Privatization, Financing Constraints and Enterprise Business Performance: An Empirical Study Based on the Comparison before and After Financial Crisis. North China Finance, (01):11-23.
[4] Wenzhi Z. (2023) Digital transformation, financing constraints and enterprise performance. Shopping Mall Modernization, (01):85-87.
[5] Lingfang C., Hainan Y. (2022) ESG performance, financing constraints and corporate performance. Friends of Accounting, (22):24-30.
[6] Minhui X., Yi Y. (2022) The heterogeneous impact of financialization of non-financial enterprises on firm performance: An empirical study based on the perspective of financing constraints. China Collective Economy, (30):103-105.
[7] Kangmin W. (2022) Research on the impact of ESG performance on the performance of listed enterprises. Contemporary Manager, (03):39-54.
[8] Wenbin F., Chen W., Xiao X. (2022) Does corporate ESG reduce financing constraints? - Mediation effect based on

information asymmetry. Journal of Guizhou University of Business, 35(03):35-47.
[9] Meiyi Z. (2022) Financing constraints, internal control information disclosure and corporate performance. International Business Accounting, (12):9-13.
[10] Li C. (2022) Research on the impact of ESG performance on corporate financial performance. Wuhan University of Light Industry.
[11] Lixue B. (2022) The impact of corporate ESG on financing efficiency. Shanghai Overseas Chinese University.