

Impact of ESG Performance of Manufacturing Companies on their Export Trade

Qingyang Li

School of Economics, Jinan University, Guangzhou, China

20202200@stu.hebmu.edu.cn

Abstract. China's manufacturing sector occupies an important position in the international market and is at a critical stage of development. Manufacturing companies can use ESG to achieve their green transformation and sustainable development. It is important to study the impact of ESG performance on the export of manufacturing companies. This paper examines the impact of ESG performance on the export trade of manufacturing companies using a sample of Chinese A-share listed companies in Shanghai and Shenzhen during the period of 2012-2021. It is found that ESG performance has a significant positive impact on the export trade of manufacturing companies. It is further found that ESG performance can help manufacturing firms export through two paths: alleviating financing constraints and reducing operating costs; the positive impact of ESG performance on exports is more significant among non-state-owned firms and firms from eastern China. This study has important practical significance for the development of import and export enterprises.

Keywords: ESG performance, manufacturing firms, export trade.

1. Introduction

China's manufacturing industry has strong competitive advantages and influence in the global market, providing strong support for effective external suppression and epidemic shocks, and making an important contribution to China's stable economic growth. However, due to the existence of trade barriers such as tariffs and quotas, the cost of manufacturing exports has increased in recent years, with a high proportion of high-input, high-pollution and low-value-added exports, leading to a decline in their competitiveness in the international market. In order to steadily promote the development of China's manufacturing industry, in addition to the overall promotion of industrial structure upgrading at the industry-wide level, it is also necessary for companies in the industry to proactively adjust their business strategies and look for new paths of development.

Focusing only on a single indicator, such as technology level, innovation awareness or social factors, is not a good way to help the manufacturing industry improve its performance in export trade. The comprehensive dimension of environmental, social and governance (ESG) provides a decision-making basis and development paradigm for the green transformation of the global economy and the promotion of high-quality development of various industries, and considering how to help China's manufacturing industry continue to take the lead in the international trade market from the perspective of ESG has an important theoretical and practical value for the promotion of high-quality development of the manufacturing industry.

Relevant studies around corporate ESG performance and its economic consequences have shown that good corporate ESG performance can alleviate financing constraints, reduce operational risks, and significantly enhance corporate book value and market value on corporate financial performance [1-3]. In addition, ESG performance can enhance the crisis response ability of enterprises through four paths: increasing the competitive advantage of products in the market, reducing the cost of financing, and improving corporate reputation and risk resistance, which in turn enhances the resilience of enterprises [4]. However, at present, there is no adequate answer on how ESG performance integrally affects manufacturing firms' exports and its mechanism of action. Existing studies have shown that environmental regulations can optimize the export product structure of enterprises, promote the quality of export products, and thus enhance their market access and

competitiveness [5, 6]. In addition, increased awareness of environmental performance prompts enterprises to actively participate in sustainable development-related work, which can further strengthen their compliance and competitiveness in global supply chains [7]. For supply chain-strong demand industries, ESG performance is also critical for maintaining supply chain stability and compliance, and strengthening corporate governance can often improve supply chain productivity.

Overall, ESG performance has a significant impact on the export trade of companies in the manufacturing sector. Good ESG practices are not only closely related to the economic interests of firms, but also crucial for enhancing their competitiveness and compliance in the global market. However, most of the existing studies are based on single factors such as export price, financial reporting quality, supply chain productivity, etc., and lack a comprehensive examination in the context of the system and an in-depth exploration of the association between ESG and manufacturing export trade. This study aims to explore in detail the specific impact of ESG performance on the corporate export activities of manufacturing firms and how ESG dimensions play a role in the international trade practices of manufacturing firms, which in turn contributes to a sustainable global trade environment. The possible marginal contributions of this paper are as follows: firstly, it discusses the relationship between ESG performance and export trade using ESG performance as a relevant variable, enriching the relevant research on the factors influencing the performance of corporate export trade. This paper provides a reference basis for the comprehensive governance of the manufacturing industry, which has a strong practical application value. Second, the study focuses on how ESG management affects corporate performance, investment and market acceptance, and explores the association between ESG principles and international trade, bridging the gap in the discussion in this area. Third, it digs deeper into the role mechanism and implementation path of ESG performance to enhance export trade. Fourth, this study updates the established research data and adopts more precise indicators to define the variables, which provides a more rigorous empirical basis for understanding the dynamic relationship between ESG performance and export trade.

2. Theoretical Analysis and Research Hypotheses

Theoretically, the impact of ESG performance on manufacturing export trade may have some uncertainty. On the one hand, based on the principal-agent and stakeholder theory, ESG performance can enhance the quality of information disclosure, promote green innovation, transformation and upgrading of the manufacturing industry, and help enterprises open up the international market. On the other hand, enhancing the ESG performance of manufacturing industry means that enterprises face financial pressure from high costs, which may inhibit their development. Given that ESG performance may have contradictory dual effects on the export trade of manufacturing enterprises, this study intends to propose hypotheses from both positive and negative sides.

2.1. ESG Performance of Manufacturing Firms is Positively Correlated with Export Trade Volume

On the one hand, based on principal-agent and stakeholder theory, good ESG performance can enhance the quality of information disclosure and strengthen the credibility of corporate financial statements. Moreover, there is a strong positive correlation between environmental information disclosure, social information disclosure and corporate governance disclosure and the high-quality development of enterprises. ESG performance can show the sustainable development potential of enterprises, and the reputational value it builds can win the trust of international investors and enhance the "immunity" of enterprises in the face of export trade. At the same time, the current international environment in the frequent occurrence of shock events, research shows that, when there is an exogenous shock, ESG level on the expected return of the portfolio is positively correlated with the degree of impact, ESG performance has the role of mitigating sudden shocks, the social capital will be more inclined to inflow of ESG performance of good enterprises [8]. Therefore, good ESG

performance can reduce corporate financing constraints and weaken the negative impact of capital shortage on export trade by attracting investment.

On the other hand, ESG performance and media attention can significantly enhance corporate green innovation, and ESG performance and media attention will not only lead to the enhancement of strategic green innovation, but also promote substantive green innovation, promote the transformation and upgrading of China's manufacturing industry, solve the problems of narrow profit margins and lack of differentiation of traditional manufacturing products, and further optimise the products from R&D to realize intellectualization, automation and digitalization. technological innovation, in order to improve the added value of products and market competitiveness.

In summary, research hypothesis H1 is proposed:

H1: All other things being equal, the better the ESG performance, the larger the export size of manufacturing firms.

2.2. Negative Correlation Between ESG Performance and Export Trade Volume of Manufacturing Enterprises

The introduction of ESG assessment criteria marks a significant shift in the investment assessment model, shifting the focus of socially responsible investment to "prioritize companies that rank high on the ESG quasi-assessment scale". This shift in strategy has prompted companies and capital markets to place greater emphasis on environmental protection, social responsibility and corporate governance in their day-to-day business decisions. However, it also means that enterprises face high costs, which may lead to blindly relying on environmental protection associations to pay high dues, spending money on face-saving projects such as purchasing non-essential environmental protection equipment, wasting money or ignoring their own interests, resulting in ESG bleaching and greening behaviors, which in turn weaken the performance of export trade. At the same time, China's manufacturing industry petrochemicals and chemicals, iron and steel, non-ferrous metals, building materials and other heavy industries account for a disproportionately high proportion of the total manufacturing industry, the development of such industries naturally depends on the consumption of environmental resources, ESG ratings are generally low. If the global market places too much emphasis on ESG performance and reduces investment or trading in lower-ranked companies, it may inhibit the development of China's manufacturing sector.

In summary, research hypothesis H2 is proposed:

H2: All other things being equal, the better the ESG performance, the smaller the export size of manufacturing firms.

3. Research Design

3.1. Sample Selection and Data Sources

In this study, Chinese A-share listed manufacturing firms in Shanghai and Shenzhen are selected to investigate the impact of firms' ESG performance on their export scale. Due to the limitation of ESG performance and firms' export data, this paper chooses 2012-2021 as the sample period. In order to ensure the completeness and representativeness of the data, the data were screened with reference to existing literature: samples of listed companies with missing values were excluded; samples of companies that were ST or *ST during the sample period were excluded. After the above screening, a total of 13,649 pieces of enterprise-annual data were collected. Considering the applicable period and coverage of each indicator, this paper chooses the CSI ESG rating data as the proxy variable for enterprise ESG performance, the Yihuo database (<http://www.yihuodata.com/>) export data as the measure of enterprise export performance, and the rest of the financial indicators of listed companies as control variables are all sourced from the CSMAR database. The software used in the collation, calculation and regression of all the data in this paper is Stata17.0. The description of variables is shown in Table 1. In order to avoid the influence of extreme values, all continuous variables in this paper have been subjected to the shrinking of the upper and lower 1%.

Table 1. Description of variables

Typology	Notation	Instructions
Explained variable	EXP	Enterprise exports, in natural logarithms
Explanated variable	ESG	Huazheng ESG
	Size	Firm size, natural logarithm of total assets
	Lev	Gearing ratio, liabilities/total assets
	ROA	Return on assets, net profit/total assets
	Growth	Sales revenue growth rate
	Board	Board size, total number of board members, in natural logarithms
control variable	Indep	Ratio of independent directors, number of independent directors/total number of board members
	Dual	Two positions in one, if the chairman of the board of directors and general manager of the same person to serve as the value of 1 otherwise 0
	TOP1	Shareholding ratio of the largest shareholder
	SOE	State-owned enterprises are assigned a value of 1, otherwise 0
	ListAge	Age of business establishment, in natural logarithms

3.2. Model Setting and Variable Selection

In studying the impact of ESG performance of manufacturing enterprises on their export scale, considering that the export behaviour of enterprises may be affected by both their own characteristics and the external environment, the model constructed in this study is as follows:

$$EXP_{i,t} = a_0 + a_1 ESG_{i,t} + a_i Controls_{i,t} + \sum Year + u_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where subscripts *i* and *t* denote sample individuals and years, respectively. The explanatory variable is the export scale (*EXP*), which is measured by the export amount of enterprises. The CSI ESG indicator system covers many years of data, covers rich evaluation indicators, and fits the actual situation of the domestic market. Therefore, the ESG performance (*ESG*) as an explanatory variable is chosen to be measured by the CSI ESG composite score, which has strong interpretability and academic credibility. *Control* is a control variable, referring to the study of Chen, Fang et al., and the control variables selected in this paper include: enterprise size (*Size*), gearing ratio (*Lev*), return on assets (*ROA*), growth rate of sales revenue (*Growth*), board size (*Board*), proportion of sole directors (*Indep*), two positions in one (*Dual*), proportion of shares held by the first largest shareholder (*TOP1*), whether it is a state-owned enterprise (*SOE*), and the age of the enterprise's establishment (*ListAge*) [9, 10].

4. Empirical Results Analyses

4.1. Descriptive Statistics

Table 2 presents the descriptive statistics of this study. It shows that the export performance variable *EXP* has a mean value of 14.629, with significant inter-company differences and a standard deviation of 8.280. The ESG performance statistics of manufacturing companies show that it has a mean value of 72.837, with a standard deviation of 5.253. The mean value of *Size* is 21.998, the mean value of *Lev* is 0.384, the mean value of Return on Assets is 0.046, and the mean value of Growth in sales revenue is 0.173, implying that manufacturing companies are generally facing operational pressure. The mean value of Sales Revenue Growth is 0.173, implying that manufacturing firms are generally under operating pressure. Board size *Board* average value of 2.106, the proportion of sole director *Indep* average value of 37.619%, the board of directors structure at the normal level, but the

average value of the two positions in one Dual amounted to 32.6%, the average value of the proportion of the first major shareholders in the TOP1 amounted to 33.195%, which can be seen that a certain proportion of manufacturing enterprises exist "one person dictates" and other issues. This shows that a certain proportion of manufacturing enterprises have problems such as "one-person dictatorship".

Table 2. Descriptive statistics

	Brochure	Average value	Standard deviation	Minimum value	Maximum values
EXP	13649	14.629	8.280	0.000	23.721
ESG	13649	72.837	5.253	57.200	83.820
Size	13649	21.998	1.115	20.011	25.440
Lev	13649	0.384	0.188	0.059	0.853
ROA	13649	0.046	0.063	-0.191	0.212
Growth	13649	0.173	0.345	-0.467	1.860
Board	13649	2.106	0.190	1.609	2.565
Indep	13649	37.619	5.339	33.330	57.140
Dual	13649	0.326	0.469	0.000	1.000
TOP1	13649	33.195	13.610	10.013	69.363
SOE	13649	0.270	0.444	0.000	1.000
ListAge	13649	2.025	0.799	0.000	3.296

4.2. Correlation Analysis

The correlation coefficients between the main variables are presented in Table 3. The correlation coefficient between ESG ratings and manufacturing firms' exports EXP is 0.095 and is significant at the 1% level, indicating that there is a significant positive correlation between ESG ratings and firms' green innovations, which preliminarily verifies hypothesis H1.

Table 3. Correlation analysis

	EXP	ESG	Size	Lev	ROA	Growth	Board	Indep	Dual	TOP1	SOE	ListAge
EXP	1.000											
ESG	0.095***	1.000										
Size	0.232***	0.154***	1.000									
Lev	0.178***	-0.116***	0.473***	1.000								
ROA	-0.001	0.272***	0.030***	-0.372***	1.000							
Growth	0.059***	0.007	0.063***	0.032***	0.302***	1.000						
Board	0.022**	0.031***	0.248***	0.119***	0.011	-0.019**	1.000					
Indep	0.034***	0.067***	-0.035***	-0.009	-0.015*	0.009	-0.575***	1.000				
Dual	0.017*	-0.027***	-0.152***	-0.103***	0.035***	0.042***	-0.187***	0.117***	1.000			
TOP1	-0.013	0.106***	0.079***	-0.041***	0.161***	-0.002	-0.023***	0.050***	0.013	1.000		
SOE	-0.022***	0.055***	0.312***	0.247***	-0.097***	-0.093***	0.256***	-0.065***	-0.289***	0.110***	1.000	
ListAge	0.000	-0.125***	0.447***	0.348***	-0.220***	-0.094***	0.167***	-0.060***	-0.239***	-0.136***	0.475***	1.000

Note: ***, **, * indicate significant at the 1 per cent, 5 per cent and 10 per cent levels, respectively.

4.3. Baseline Regression Analysis

This paper makes empirical regression results for the research hypotheses as shown in Table 4. For the hypothesis study of the impact of ESG performance on the export volume of manufacturing enterprises, the results in column (1) show that ESG performance is positively correlated with manufacturing enterprise EXP and has a significant promotion effect, every unit of ESG performance, manufacturing enterprise EXP performance can be improved by 0.046, the result is significant at 1% conditions. After the introduction of series variables, the promotion effect of ESG performance on manufacturing firms' EXP remains significant. While gearing ratio and the proportion of shares held by the first largest shareholder are negatively related to firms' export volume, the performance of these variables is basically consistent with theoretical expectations.

Table 4. Benchmark regression results

	(1) EXP	(2) EXP	(3) EXP	(4) EXP
ESG	0.046*** (5.419)	0.032*** (3.758)	0.031*** (3.708)	0.031*** (3.712)
Size		1.636*** (17.981)	1.625*** (17.773)	1.619*** (17.472)
Lev		0.319 (0.892)	0.314 (0.880)	0.278 (0.765)
ROA		-0.534 (-0.738)	-0.327 (-0.451)	-0.282 (-0.388)
Growth		0.110 (1.120)	0.121 (1.225)	0.124 (1.259)
Board			0.913** (2.480)	0.885** (2.394)
Indep			0.051*** (4.493)	0.051*** (4.474)
Dual			0.147 (1.416)	0.157 (1.510)
TOP1			-0.029*** (-4.989)	-0.028*** (-4.786)
SOE				0.312 (1.373)
ListAge				0.040 (0.263)
_cons	10.279*** (16.268)	-23.709*** (-12.231)	-26.266*** (-12.089)	-26.249*** (-12.080)
corporations	YES	YES	YES	YES
vintages	YES	YES	YES	YES
Obs.	13649	13649	13649	13649
R-squared	0.028	0.060	0.064	0.064

Note: (1)-(4) show the results of regressions introducing different series of variables, with standard errors in parentheses, and ***, **, and * denote significance at the 1 per cent, 5 per cent, and 10 per cent levels, respectively.

Distinguishing the impact of the three core components of ESG-environmental (E), social (S), and governance (G)-can provide a more refined analysis. This study further examines the impact of ESG subcomponents on manufacturing firms' exports based on the validation of the impact of ESG performance on export performance, and the results are shown in Table 5.

Regression analyses using a fixed effects model show that environmental governance (E), social responsibility (S) and corporate governance (G) have varying degrees of significance on export performance after controlling for a range of other firm-specific influences. Environmental governance score (E) is positively and statistically significant (coefficient of 0.023, $p < 0.01$) associated with firms' export performance. This suggests that improving the quality of environmental governance and meeting the demand for sustainable products in the international market has a positive impact on firms' export performance. The social responsibility (S) variable is also significantly positive at the 1 per cent level (coefficient of 0.016), which suggests that a firm's good performance in social responsibility enhances its ability to export and has the potential to access more social capital, all of which contribute to export performance. However, the coefficient of corporate governance (G) is positive but not statistically significant. This may imply that the direct effect of corporate governance structure on firms' export performance is more limited in manufacturing export markets, or that the relationship between corporate governance and export performance is diluted by other variables.

Table 5. Further tests: explanatory variables sub-indicators

	(1) EXP	(2) EXP	(3) EXP
E	0.023*** (3.098)		
S		0.016*** (3.170)	
G			0.009 (1.602)
Size	1.641*** (17.790)	1.626*** (17.544)	1.655*** (17.965)
Lev	0.175 (0.485)	0.150 (0.415)	0.255 (0.698)
ROA	-0.046 (-0.063)	-0.224 (-0.308)	-0.134 (-0.184)
Growth	0.119 (1.204)	0.120 (1.213)	0.112 (1.135)
Board	0.907** (2.455)	0.864** (2.337)	0.909** (2.459)
Indep	0.053*** (4.682)	0.052*** (4.624)	0.052*** (4.560)
Dual	0.156 (1.503)	0.157 (1.509)	0.154 (1.481)
TOP1	-0.028*** (-4.738)	-0.028*** (-4.735)	-0.028*** (-4.723)
SOE	0.306 (1.342)	0.319 (1.401)	0.317 (1.392)
ListAge	-0.019 (-0.124)	-0.002 (-0.011)	0.031 (0.205)
_cons	-25.776*** (-11.926)	-25.121*** (-11.708)	-25.524*** (-11.735)
corporations	YES	YES	YES
vintages	YES	YES	YES
Obs.	13649	13649	13649
R-squared	0.064	0.064	0.063

Note: (1)~(3) show the regression results of different variable sub-indicators, standard errors in parentheses, ***, **, * denote significant at 1%, 5%, 10% level respectively.

4.4. Robustness Tests

In order to avoid the effects of bidirectional causation and sample selection bias, this section uses transformed sample time span and lagged explanatory variables to conduct endogeneity tests and robustness tests.

4.4.1 Transforming the sample time span

To avoid sample selection bias, this paper will transform the sample time span to assess the robustness of the model to changes in different time scales. Since 2015, China has gradually entered a period of economic new normal, so the selection will be 2015-2021 sample re-regression. The regression results are shown in Table 6, and the ESG performance is still significant, indicating that the main model of this paper is solid and the research conclusions still hold after changing the sample selection.

Table 6. Robustness tests: changing the study period to 2015-2021

	(1) EXP	(2) EXP	(3) EXP
ESG	0.042*** (4.869)	0.024*** (2.865)	0.024*** (2.847)
Size		1.577*** (14.563)	1.561*** (14.337)
Lev		0.087 (0.215)	0.114 (0.283)
ROA		0.103 (0.146)	0.255 (0.360)
Growth		0.113 (1.161)	0.129 (1.327)
Board			0.557 (1.399)
Indep			0.021* (1.732)
Dual			0.269** (2.477)
TOP1			-0.024*** (-3.382)
SOE			
ListAge			
_cons	11.016*** (17.573)	-21.994*** (-9.536)	-22.875*** (-8.902)
corporations	YES	YES	YES
vintages	YES	YES	YES
Obs.	10541	10541	10541
R-squared	0.022 (1)	0.051 (2)	0.054 (3)
	EXP	EXP	EXP
ESG	0.042*** (4.869)	0.024*** (2.865)	0.024*** (2.847)

Note: (1)-(3) show the results of regressions introducing different series of variables, with standard errors in parentheses, and ***, **, and * denote significance at the 1 per cent, 5 per cent, and 10 per cent levels, respectively.

4.4.2 Lag test

ESG performance, as one of the tools of comprehensive corporate governance, has a long-term utility, and the current ESG rating performance is likely to have an impact on the later long term development. Therefore its impact on the export performance of manufacturing companies may have a lag. At the same time, in order to mitigate the two-way causal effect, this paper regresses the explanatory variables on the explanatory variables after lagging ESG performance by one period. The regression results are shown in Table 7, ESG remains significantly positive at the 1% level, consistent with the previous conclusion, indicating that ESG ratings have a persistent and long round impact on the enhancement of manufacturing enterprises.

Table 7. Robustness tests: considering lagged effects

	(1) EXP	(2) EXP	(3) EXP	(4) EXP
ESG	0.042*** (4.869)	0.024*** (2.865)	0.024*** (2.847)	0.024*** (2.838)
Size		1.577*** (14.563)	1.561*** (14.337)	1.565*** (14.060)
Lev		0.087 (0.215)	0.114 (0.283)	0.101 (0.251)
ROA		0.103 (0.146)	0.255 (0.360)	0.266 (0.375)
Growth		0.113 (1.161)	0.129 (1.327)	0.134 (1.373)
Board			0.557 (1.399)	0.517 (1.295)
Indep			0.021* (1.732)	0.021* (1.685)
Dual			0.269** (2.477)	0.278** (2.558)
TOP1			-0.024*** (-3.382)	-0.023*** (-3.278)
SOE				0.312 (1.304)
ListAge				-0.012 (-0.069)
_cons	11.016*** (17.573)	-21.994*** (-9.536)	-22.875*** (-8.902)	-22.932*** (-8.913)
corporations	YES	YES	YES	YES
vintages	YES	YES	YES	YES
Obs.	10541	10541	10541	10541
R-squared	0.022	0.051	0.054	0.054

Note: (1)~(4) show the results of regressions with different series of variables introduced one period after the lag of ESG performance, with standard errors in parentheses, and ***, **, and * denote significance at the 1 per cent, 5 per cent, and 10 per cent levels, respectively.

4.5. Heterogeneity Test

4.5.1 Heterogeneity analysis based on the nature of property rights

Differences in ownership structures may lead to significant differences in corporate governance practices, social responsibility and environmental policies. Specifically, SOEs may be subject to more government regulations and public scrutiny, which may force them to adhere more strictly to ESG standards. In contrast, non-SOEs may be more subject to market forces and shareholder expectations, which may lead them to adopt different ESG approaches. To examine whether ESG performance is differentially affected by ownership, manufacturing firms are further differentiated into SOEs and non-SOEs and tested, and the regression results are shown in Table 8.

It is found that among state-owned enterprises, the positive effect of ESG performance on exports is statistically significant at the 5 per cent significance level (coefficient of 0.040). For non-state-owned firms, the positive effect is even more significant, with a coefficient of 0.053 and significant at the 1 per cent level of significance. This suggests that non-state firms may have a more significant effect on increasing exports in terms of enhancing ESG performance. When a range of control variables are introduced, the export-boosting effect of ESG performance of non-state-owned firms remains significant (coefficient of 0.037, $p < 0.01$), while the corresponding coefficient for state-

owned firms decreases and is no longer significant, underlining the fact that there is a significant difference in the impact of ESG performance on export growth across firms with different ownership properties.

In summary, ESG plays a more important role in the export enhancement of non-state firms, which may indicate that improvements in ESG performance of non-state firms can be more effectively translated into export business growth.

Table 8. Heterogeneity test: heterogeneity in the nature of property rights

	(1) EXP	(2) EXP	(3) EXP	(4) EXP
	state enterprise	non-state enterprise	state enterprise	non-state enterprise
ESG	0.040** (2.092)	0.053*** (5.645)	0.009 (0.462)	0.037*** (3.952)
Size			2.255*** (11.411)	1.484*** (14.012)
Lev			0.810 (0.988)	-0.051 (-0.128)
ROA			1.444 (0.826)	-0.546 (-0.695)
Growth			0.246 (1.166)	0.104 (0.948)
Board			1.130 (1.391)	0.926** (2.232)
Indep			0.075*** (3.451)	0.044*** (3.336)
Dual			-0.037 (-0.149)	0.161 (1.423)
TOP1			-0.043*** (-3.552)	-0.021*** (-2.995)
SOE				
ListAge			-0.944** (-1.969)	0.146 (0.847)
_cons	10.982*** (7.781)	9.540*** (13.550)	-38.510*** (-8.064)	-23.532*** (-9.530)
corporations	YES	YES	YES	YES
vintages	YES	YES	YES	YES
Obs.	3689	9960	3689	9960
R-squared	0.015	0.040	0.068	0.071

Note: (1)-(4) denote the results of regressions with different property rights, with standard errors in parentheses, and ***, ** and * denote significant at the 1 per cent, 5 per cent and 10 per cent levels, respectively.

4.5.2 Heterogeneity analysis based on regional distribution

A single national strategy will struggle to realise the full potential of ESG investments and should be analysed in the context of region-specific economic, cultural and policy environments. Eastern regions with higher levels of economic development and more frequent international trade may be more able to translate their ESG performance into improved export performance and higher economic returns. Conversely, the central and western regions may be more focused on local markets and other development factors, and the returns on ESG investments may not be as significant as in the eastern region. This study further examines whether this effect differs significantly across regions by

conducting regression analyses on samples from eastern, central and western China separately, and the regression results are shown in Table 9.

Specifically, the relationship between ESG and export performance of enterprises in the eastern region is the most significant (coefficient of 0.045, $p < 0.01$). Accordingly, it can be seen that the social responsibility investment of enterprises in the eastern region may be an important factor in enhancing their competitiveness in the international market. The ESG coefficient in the central region (coefficient of 0.044, $P < 0.05$) is similar to that in the east, but the ESG coefficient in the western region is not only numerically lower, but also statistically insignificant, which suggests that the positive effect of ESG on export performance is not obvious in the western region. After adding a series of control variables, the significance of ESG in the eastern region is still maintained (coefficient of 0.031, $p < 0.01$), while the significance in the central and western regions decreases, further validating the moderating role of regions in the relationship between ESG and export performance.

Summing up the above analyses, there is obvious regional heterogeneity in the role of ESG performance in enhancing firms' exports in the context of China's regional economy. In particular, this effect is more significant in the eastern provinces and regions. Therefore, regional characteristics should be regarded as an important consideration when firms make ESG investment decisions.

Table 9. Heterogeneity test: based on regional distributional heterogeneity

	(1) EXP eastern part	(2) EXP central section	(3) EXP western part	(4) EXP eastern part	(5) EXP central section	(6) EXP western part
ESG	0.045*** (4.634)	0.044** (2.023)	0.031 (1.155)	0.031*** (3.215)	0.030 (1.363)	0.004 (0.159)
Size				1.529*** (14.803)	1.883*** (6.914)	2.387*** (7.768)
Lev				0.255 (0.611)	0.681 (0.682)	-0.070 (-0.065)
ROA				-0.331 (-0.402)	-0.937 (-0.476)	-0.431 (-0.184)
Growth				0.134 (1.182)	-0.164 (-0.642)	0.313 (1.036)
Board				0.505 (1.174)	0.357 (0.398)	3.431*** (2.925)
Indep				0.037*** (2.798)	0.022 (0.732)	0.141*** (4.117)
Dual				0.106 (0.911)	0.151 (0.525)	0.519 (1.509)
TOP1				-0.025*** (-3.713)	-0.035** (-2.055)	-0.042** (-2.434)
SOE				0.063 (0.238)	0.381 (0.690)	1.441** (2.044)
ListAge				-0.055 (-0.325)	0.635 (1.496)	0.561 (1.070)
_cons	11.223*** (15.473)	8.607*** (5.298)	8.661*** (4.348)	-21.867*** (-8.980)	-32.396*** (-5.349)	-53.866*** (-7.272)
corporations	YES	YES	YES	YES	YES	YES
vintages	YES	YES	YES	YES	YES	YES
Obs.	9773	2168	1708	9773	2168	1708
R-squared	0.026	0.029	0.046	0.061	0.065	0.114

Note: (1)-(6) show the regression results for different regions, with standard errors in parentheses, and ***, **, and * indicate significant at the 1 per cent, 5 per cent, and 10 per cent levels, respectively.

4.6. Impact Mechanism Test

It has been verified above that there is a significant positive contribution of ESG performance to the export activities of manufacturing firms. Further, based on the theoretical analyses above, this

study intends to reveal its intrinsic mechanism of action through the two perspectives of operating costs and financing constraints. The model adopted in this section is:

$$Mfee_{i,t}/SAS_{i,t} = b_0 + b_1ESG_{i,t} + b_iControls_{i,t} + \sum Year + u_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$EXP_{i,t} = c_0 + c_1ESG_{i,t} + c_2Mfee_{i,t}/SAS_{i,t} + c_iControls_{i,t} + \sum Year + u_{i,t} + \varepsilon_{i,t} \quad (3)$$

Where subscripts i and t denote sample individuals and years, respectively. The explanatory variable operating cost Mfee is the sum of selling and administrative expenses, divided by operating revenue. Financing constraints use SA index. This paper makes empirical regression results for the mechanism of action as shown in Table 10.

Table 10. Impact mechanism test

	Business cost		Financing constraints	
	(1)	(2)	(3)	(4)
	Mfee	EXP	SAS	EXP
ESG	-0.001*** (-6.010)	0.030*** (3.590)	-0.000*** (-4.236)	0.030*** (3.568)
Mfee		-1.739** (-1.990)		
SAS				-2.775*** (-3.604)
Size	-0.012*** (-11.653)	1.601*** (17.119)	0.010*** (9.304)	1.648*** (17.728)
Lev	-0.017*** (-4.411)	0.247 (0.681)	0.028*** (6.331)	0.355 (0.978)
ROA	-0.234*** (-30.009)	-0.687 (-0.910)	0.043*** (4.891)	-0.162 (-0.223)
Growth	-0.019*** (-17.858)	0.091 (0.910)	0.004*** (3.214)	0.135 (1.368)
Board	0.007* (1.709)	0.896** (2.424)	0.025*** (5.553)	0.954*** (2.579)
Indep	0.000** (1.972)	0.051*** (4.510)	0.000 (0.872)	0.051*** (4.505)
Dual	-0.001 (-0.684)	0.156 (1.496)	-0.000 (-0.395)	0.156 (1.497)
TOP1	-0.000* (-1.666)	-0.028*** (-4.816)	-0.000 (-1.590)	-0.028*** (-4.841)
SOE	-0.004 (-1.546)	0.306 (1.344)	0.000 (0.092)	0.313 (1.377)
ListAge	-0.009*** (-5.744)	0.023 (0.151)	0.060*** (32.571)	0.206 (1.303)
_cons	0.408*** (17.473)	-25.573*** (-11.593)	3.253*** (123.216)	-17.221*** (-5.194)
corporations	YES	YES	YES	YES
vintages	YES	YES	YES	YES
Obs.	13648	13648	13649	13649
R-squared	0.352	0.064	0.897	0.065

Note: Standard errors in parentheses, ***, **, * indicate significant at 1%, 5%, 10% level respectively.

High operating costs are one of the reasons limiting the development of Chinese manufacturing enterprises, and ESG construction is conducive to enterprises avoiding exogenous crises and strengthening internal management and resource application efficiency in order to reduce operating costs. Financing constraints are an important factor limiting the export of enterprises. ESG

construction helps listed companies gain the trust of upstream and downstream enterprises and financial institutions, and improve their financing ability to overcome the pressure of export costs and promote exports. The constraints of operating costs and financing constraints on corporate exports have been generally verified, so this paper only reports the impact of ESG performance on operating costs and financing constraints of manufacturing companies. The regression results are shown in the table below, ESG and financing constraints are negatively correlated, and manufacturing enterprises can alleviate their financing constraints through good ESG performance, and in this way enhance their export volume.

5. Conclusion

This study finds that: (1) ESG rating performance is positively and significantly related to manufacturing firms' export volume; (2) the environmental governance (E) and social responsibility (S) components of ESG performance have a significant impact on manufacturing firms' export volume, and the relationship between corporate governance (G) and export volume may be downplayed by other factors; (3) by varying the time horizon and lag, it is shown that ESG performance is significantly affected by a series of robustness tests, the above conclusions still hold. The heterogeneity test reveals that the facilitating effect of ESG performance is more significant for non-state-owned firms, or firms in the eastern region; (4) The mechanism of ESG performance on the export volume of manufacturing enterprises is: good ESG performance can reduce the operating stale cost of manufacturing enterprises and ease the financing pressure of manufacturing enterprises in order to expand the export volume of manufacturing enterprises.

Against the backdrop of the reality that ESG performance is gradually gaining importance in the capital market, this paper puts forward the following practical suggestions for increasing the export quota of manufacturing companies and improving their ability to cope with complex situations:

(1) Proactive participation in ESG construction. Since the ESG system is still in its infancy in China and no disclosure norms have been set up, manufacturing companies should set up ESG objectives and indicators, establish a performance evaluation system, and monitor and evaluate their performance in environmental, social and governance aspects. They should also consider ESG factors in their business decisions, incorporate them into their strategic planning and risk management processes, actively participate in synergistic social development, actively participate in investing in green technologies and renewable energy, reduce negative impacts on the environment, support social welfare activities and projects, and enhance the connection between the enterprise and society.

(2) Ease financing difficulties and constraints through ESG. In order to strengthen the ability to face exogenous shocks, the capital market tends to tilt its resources to enterprises with good ESG performance, and manufacturing enterprises should take this opportunity to strengthen their financing ability and ease the pressure on capital. At the same time, they should actively use ESG performance feedback to adjust problems in corporate governance and social responsibility, reduce costs and improve capital utilisation efficiency. Pollution-intensive enterprises in the manufacturing industry should take this opportunity to eliminate the negative image dilemma of environmental protection and social responsibility that they have been facing for a long time, actively converge with the ESG assessment standards, seize the export opportunities, and expand the sales channels to alleviate the dilemma of social responsibility while fixing the costs at the same time.

(3) Strengthen governance structure and transparency. Enterprises should publicly disclose their ESG performance data and reports, show shareholders and stakeholders their social responsibility and sustainable development achievements, and timely disclose positive information such as green R&D, energy-saving programmer, active tax payment and social relief, as well as negative information such as environmental pollution, energy consumption, and major environmental protection violations, and pay attention to the quality and safety of the products of the enterprise, customer complaints, and other negative news of a social nature. Response. Establishing a sound corporate governance structure and improving the efficiency and transparency of the company's internal management.

This study identifies the positive correlation of ESG performance on manufacturing firms' trade, introduces a more precise series of variables to explore the path of its implementation, and provides a more rigorous empirical basis for understanding the dynamic relationship between ESG performance and export trade. At the same time, this study has certain limitations. Among them, the role of financing constraints path performance in the influence mechanism is weak compared with the same type of research, on which new research can be carried out; this study only considers the case of China, different countries have different ESG impacts on the export manufacturing industry due to different national conditions, new research should be carried out in different countries.

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