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A Study of the Impact of ESG Performance on Enterprise Innovation

--Based on the Empirical Analysis of China's Manufacturing Industry

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ABSTRACT

In the context of the new round of global technological revolution and industrial change, manufacturing enterprises are facing problems such as key technology chokepoints and insufficient internal innovation, and ESG, as a core indicator for measuring the sustainable development capability of enterprises, can provide directional guidance for the innovative development of manufacturing enterprises. This research empirically analyses the impact and mechanism of ESG performance on corporate innovation based on the data of A-share listed manufacturing enterprises from 2019-2023. It is found that ESG performance has a positive promotion effect on corporate innovation. Heterogeneity analyses show that ESG performance of non-state-owned firms is a stronger positive contributor to corporate innovation relative to state-owned firms, and that ESG performance of non-high-tech firms is a stronger positive contributor to corporate innovation relative to high-tech firms. Therefore, we should pay attention to enterprise innovation activities, accelerate the construction of a standardised ESG rating system, and form an innovative system that enterprises pay attention to, society pays attention to, and the government supports.

KEYWORDS

ESG performance; Enterprise innovation; Manufacturing companies

1. INTRODUCTION

China's economy has entered a stage of high-quality development, and innovation is the core driving force of economic development and a distinctive feature of high-quality development. Having entered the new stage of development, enterprise innovation still faces difficulties such as insufficient investment in research and development and difficulties in financing. Therefore, improving enterprise innovation can enhance market competitiveness, promote the growth of enterprise economic benefits, and help enterprises to develop sustainably. ESG strategy is an important initiative to promote the environmental, social and corporate governance of enterprises, and as society's requirements for CSR continue to improve, enterprises need to focus not only on economic benefits, but also on their performance in various aspects such as the environment, society and governance. 2024 The Guiding Opinions of the State-owned Assets Supervision and Administration Commission of the State Council on Fulfilling the Social Responsibility of the Central Enterprises of the New Era in a High Standard pointed out to incorporate the work of ESG into the overall management of the work of social responsibility of the central enterprises in the new era. In June 2024, the State-owned Assets Supervision and Administration Commission of the State Council (SASAC) pointed out that ESG

work would be integrated into the overall management of central enterprises' social responsibility work in the new era. There is a positive correlation between economic sustainability and ESG scores, and ESG scores have become a major determinant of economic sustainability (Simone et al., 2022) [1].

Although there is a large amount of literature on ESG research at home and abroad, it mainly focuses on ESG disclosure and the impact of ESG performance on corporate performance and value, while there is less literature focusing on the impact mechanism of ESG performance on corporate innovation. At present, the analysis of the impact mechanism of ESG performance on corporate innovation focuses on all industries, and there is not much research literature on individual industries. Therefore, the research in this research focuses on manufacturing enterprises and includes environmental, social and governance elements in the analysis, which builds a new perspective for exploring the influencing factors of corporate innovation and helps to further enrich the research results of ESG development.

2. THEORETICAL ANALYSIS AND RESEARCH HYPOTHESIS

Covering the three sub-concepts of environment, society and corporate governance, ESG is an important framework for measuring the sustainability of enterprises, requiring them to pursue economic benefits while also assuming responsibility for the ecological environment, social welfare and governance transparency. When assessing the innovation capacity of an enterprise, the two aspects of innovation inputs and innovation outputs are usually considered together. In terms of innovation inputs, the main focus is on the intensity of investment in R&D funds and the percentage of R&D personnel. In terms of innovation output, the results of an enterprise's technological innovation are mainly measured by the number of patent applications.

From an environmental perspective, resource dependence theory and signalling theory suggest that, in an era when society attaches more importance to green development, enterprises tend to take the initiative to assume environmental responsibility in order to better meet the policy needs of green development and to send altruistic signals to the outside world by building an environmentally friendly image; accelerate the promotion of digital transformation and upgrading of enterprises, optimise the production and operation processes; and continue to explore the green productioncutting-edge technologies, innovate green products and services, etc., to enhance the efficiency of pollution control and resource utilisation (Xie & Zhu, 2021) [2]. Good ESG performance can release more positive signals by enhancing the degree of market attention, which in turn increases the market value of enterprises (He & He, 2024) [3]. From a social perspective, in the process of focusing on the unity of enterprise value and social value, their investment decisions will tend to be in favour of long-term interests and sustainable development, which will inevitably serve to attract more and higher-quality resources and services, and thus promote the effective development of innovative activities (Yao & Jiang,2023) [4]. From the perspective of corporate governance, a complete corporate governance mechanism can greatly enhance the transparency of corporate governance, and correct its deliberate risk avoidance management defence tendency to ensure that as far as possible to allocate resources to science and technology innovation activities closely related to the future development of the enterprise, to enhance the level of enterprise innovation (Ma X, 2022) [5].

With the promotion of the global sustainability development trend, many countries and regions have introduced policies and regulations to encourage enterprises to improve their ESG performance, to regulate and constrain their ESG behaviour, and to provide policy incentives for corporate innovation. Both Hu et al. (2024) [6] and Shi et al. (2024) [7] use a double fixed-effects model to show that good ESG performance enhances firms' innovation and green effects. Xie et al. (2024) [8] show that ESG performance has a dual driving effect on innovation input sustainability and innovation output sustainability, and Wu et al. (2024) [9] show that ESG performance significantly improves firms'

innovation output and R & D investment capacity, and promotes firms' innovation by improving firms' financial performance and expanding internationalisation.

Based on this, the hypothesis of this research is formulated: good ESG performance promotes corporate innovation.

3. RESEARCH DESIGN

3.1. Data Sources

This research selects the annual data of A-share listed manufacturing companies from 2019-2023, aiming to explore the relationship between ESG performance and innovation of manufacturing companies. The financial data and corporate innovation data designed in this research mainly come from CSMAR and CNRDS databases, and the ESG rating data come from CSI ESG rating system. For the consideration of the reliability of inter-industry data comparisons, this research excludes T-type samples such as abnormal trading, ST or *ST; all continuous variables are subjected to an upward and downward 1% shrinkage, and 1,680 sample observations are finally screened out.

3.2. Selection of Variables

3.2.1. Dependent variable (enterprise innovation)

The number of patents filed by an enterprise can reflect more intuitively the enterprise's innovation output level. Although the number of inventions, the number of utility models and the number of appearances can all be used as evaluation criteria for assessing the innovation ability of an enterprise, since the number of inventions can more powerfully prove an enterprise's innovation ability in the field of core technology, has stronger originality and authority, and is a direct manifestation of an enterprise's strength in innovation and research and development, this research draws on the practice of scholars such as Liu (2024) [10] and other scholars, and selects the number of patents that a manufacturing enterprise has applied for.number of inventions plus one and take the natural logarithm as a measure of enterprise innovation.

3.2.2. Independent Variable (ESG Rating)

Launched by CSI, the CSI ESG Rating is the earliest ESG rating service system for domestic listed companies, and is the result of a comprehensive assessment of corporate performance in environmental, social and corporate governance. It is able to quantify corporate ESG performance through a multi-dimensional indicator system, measure corporate sustainable development capability, guide investors' decision-making, and promote enterprises to improve their ESG performance, thus enhancing their overall value and competitiveness. In this research, the 2019-2023 CSI ESG rating year-end data is selected as the standard for scoring, and is assessed according to the 9 grades in descending order of C, CC, CCC, B, BB, BBB, A, AA, AAA, and AAA in order of assigning the value of 1-9 as the ESG performance of the enterprise.

3.2.3. Control variables

Drawing on the research of scholars such as Xie (2024) [8], this research sets control variables in terms of the company's financial position and the level of internal governance as SIZE, LEV, ROA, FR, BOARD, CR. Dummy variable includes PROVINCE, IND and YEAR. The variables are defined as shown in Table 1:

Table 1. List of variable definitions

Variable type	variable name	variable symbol	Variable Definition
dependent variable	Enterprise Innovation	INVIA	LN (Number of inventions filed by enterprises+1)
independent variable	ESG performance	ESG	CSI ESG year-end rating data from low to high assigned 1~9
control variables	Enterprise size	SIZE	LN (total assets)
	Asset-liability ratio	LEV	Total assets/total liabilities
	Net return on total assets	ROA	Net profit/total assets
	Fixed asset ratio	FR	Fixed assets/total assets
	Board size	BOARD	LN (Total number of board members)
	cash ratio	CR	Cash and cash equivalents/current liabilities
	Province dummy variable	Province	Numeric dummy variable indicating province
	Industry dummy variables	IND	Numeric dummy variable indicating industry
	Year dummy variable	Year	Numeric dummy variable for year

3.3. Model Setting

In order to explore the relationship between the impact of ESG performance on corporate innovation, this research constructs the following benchmark regression model, drawing on scholars such as Liu (2024) [10] and Ba (2024) [11].

$$\mathrm{INVIA}_{i,t} = \beta_0 + \beta_1 ESG_{i,t} + \sum Controls_{i,t} + \sum Province + \sum IND + \sum Year + \varepsilon_{i,t} \quad (1)$$

Where i denotes the firm's identification, t denotes the year, ESG is the independent variable and denotes the level of the firm's ESG performance. INVIA is the dependent variable and denotes the firm's innovation and the control variable is Controls. The model incorporates region, industry and year fixed effects. The region fixed effect is denoted by Province, which involves a total of 25 provinces; the industry fixed effect is denoted by IND, which involves a total of 34 industries; and the year fixed effect is denoted by Year, which spans 2019-2023 to eliminate the effects of regional static differences, industry differences, and time trends.

4. EMPIRICAL RESULTS AND ANALYSES

4.1. Descriptive Statistics

Table 2 demonstrates the descriptive statistics of the variables. The maximum value of the independent variable ESG is 7 and the minimum value is 1. The mean value shows 4.446 and the standard deviation is at the level of 1.183, indicating that the ESG scores of A-share manufacturing companies are relatively stable. The maximum value of the dependent variable INVIA is 6.950, the minimum value is 0, the mean value shows 2.802, and the standard deviation is at the level of 1.700, reflecting that there are relatively significant differences in the innovation level of different manufacturing enterprises.

Table 2. Variable descriptive statistics results

Variable	Obs	Mean	Std. Dev.	Min	Max
INVIA	1,680	2.802	1.700	0	6.950
ESG	1,680	4.446	1.183	1	7
SIZE	1,680	23.13	1.280	20.24	26.23
FR	1,680	0.239	0.147	0.0162	0.657
LEV	1,680	0.462	0.180	0.0656	0.859
ROA	1,680	0.0359	0.0563	-0.146	0.209
BOARD	1,680	2.157	0.184	1.609	2.708
CR	1,680	0.546	0.690	0.0323	4.863

4.2. Correlation Analysis

In Table 3, the correlation analysis of the relationship of all variables shows that the correlation coefficient between corporate ESG and corporate innovation (INVIA) is 0.282 and passes the test at 1% significant level, which indicates that the better the performance of corporate ESG, the higher the level of corporate innovation, and the preliminary verification of the hypothesis is valid. Meanwhile, Table 3 shows that the correlation coefficients between enterprise size (SIZE), gearing ratio (LEV), board size (BOARD) and enterprise innovation (INVIA) are 0.574, 0.291, 0.144, respectively, and they all pass the test at 1% significant level, which indicates that enterprise size, gearing ratio, and board size are significantly and positively correlated with enterprise innovation, which it indicates that the higher its proportion, the higher the innovation level of the enterprise. On the other hand, the correlation coefficients of fixed assets ratio (FR), cash ratio (CR) and enterprise innovation (INVIA) are -0.137 and -0.145 respectively, which are negatively correlated, indicating that the higher the ratio of fixed assets and cash ratio of an enterprise, the lower the innovation level of the enterprise may be.

Table 3. Pairwise correlations

	INVIA	ESG	SIZE	FR	LEV	ROA	BOARD	CR
INVIA	1							
ESG	0.282***	1						
SIZE	0.574***	0.358***	1					
FR	-0.137***	0.0360	0.064***	1				
LEV	0.291***	-0.0350	0.352***	0.050**	1			
ROA	0.00800	0.272***	0.164***	-0.0300	-0.350***	1		
BOARD	0.144***	0.0370	0.218***	-0.0270	0.086***	0.0140	1	
CR	-0.145***	0.0220	-0.192***	-0.249***	-0.598***	0.264***	-0.077***	1
***p<0.01, **p<0.05, *p<0.10.								

4.3. Benchmark Regression Analyses

In Table 4, a full-sample benchmark regression analysis is performed on the data, controlling for fixed effects of region, industry and year. The results in the table show that ESG performance is positively and significantly correlated with firm innovation, with the coefficient of ESG being 0.165 and passing the test of significance at the 1 per cent level, indicating that for every unit increase in a firm's ESG performance, the level of innovation in firms (INVIA) improves by 0.165 units on average, controlling for other variables, suggesting that good ESG performance can promote innovation in firms. This may be due to the fact that well-performing ESG firms are more likely to attract diversified and high-quality resources, for example, in terms of capital, higher rated ESG firms are more likely

to obtain capital investment from long-term investors, and thus are able to obtain more funds to invest in product research and development and innovation; in terms of talent, firms with higher ESG ratings are more focused on corporate responsibility and employee welfare, and good corporate governance is more attractive to innovative talents, which can increase the level of corporate innovation. In terms of talent, enterprises with higher ESG ratings pay more attention to corporate responsibility and employee welfare, and good corporate governance is more attractive to innovative talents, which can improve the level of innovation and talent support; in terms of policy support, the government can provide more tax incentives, green subsidies and other policy support to enterprises with higher ESG ratings, so that they can use more funds for product innovation and research and development. The benchmark regression verifies the hypothesis proposed in this research that good ESG performance can promote corporate innovation.

Table 4. Benchmark regression results

	(1)
VARIABLES	INVIA
ESG	0.165***
	(6.16)
SIZE	0.685***
	(24.44)
FR	-1.255***
	(-4.78)
LEV	0.314
	(1.39)
ROA	-1.361**
	(-2.38)
BOARD	0.151
	(0.96)
CR	-0.040
	(-0.75)
Constant	-13.866***
	(-22.11)
Observations	1,680
Adjusted R-squared	0.608
Province	YES
IND	YES
Year	YES
***p<0.01, **p<0.05, *p<0.10, T-value in parentheses.	

4.4. Endogeneity Test

Considering that firms with higher levels of corporate innovation may perform better in terms of ESG, there may be a reverse causality between the independent and dependent variables. Therefore, this research draws on the research of scholars such as Zhang (2025) [12] and adopts the instrumental variable method to control the endogeneity problem of the model. In this research, the independent variable ESG performance lagged by one period is used as an instrumental variable, and the instrumental variable and the ESG performance of manufacturing firms are correlated, indicating that the correlation hypothesis is satisfied. The instrumental variables are not affected by the patent applications of manufacturing enterprises in the current year, indicating that the exogeneity assumption is satisfied. This research uses two-stage least squares method to test the relationship between ESG performance and corporate innovation, and the results are shown in Table 5: in the first stage regression as shown in column (1), the ESG regression coefficient of the lagged one period is

0.510 and is significantly positive at the 1% significance level, which indicates that the lagged one period of ESG performance is strongly correlated with the ESG performance of manufacturing enterprises in the current year, and therefore the instrumental. The selection of variables meets the correlation requirement; in the second stage as shown in column (2), the regression coefficient of ESG is 0.256 and is significantly positive at 1% significance level, indicating that good ESG performance can promote corporate innovation. In order to justify the selected instrumental variables, the Kleibergen-Paap rk LM statistic is 13.807 (p=0.0002) indicating that there are no unidentifiable instrumental variables, and the Kleibergen-Paap rk Wald F statistic is 375.872 greater than the Stock-Yogo weak ID test at the 10 per cent. The critical value at the 10% level (10% maximal IV size =16.38) indicates that there are no weak instrumental variables, so the choice of instrumental variables is justified.

Table 5. Endogeneity test

	(1)	(2)
	first	second
VARIABLES	ESG	INVIA
L_ESG	0.510***	
	(0.0263)	
ESG		0.256***
		(0.0773)
Controls	YES	YES
Province	YES	YES
IND	YES	YES
Year	YES	YES
Kleibergen-Paap rk LM statistic		13.807*** (0.0002)
Kleibergen-Paap rk Wald F statistic		375.872*** (16.38)
Observations	1,342	1,342
***p<0.01, **p<0.05, *p<0.10, robust standard errors in parentheses.		

4.5. Robustness Tests

4.5.1. Changing the sample period

As 2019-2020 may be affected by various factors such as climate change and policy pressure, new crown epidemic, etc., which impede firms' ESG ratings as well as firms' innovations from outside the firms, in order to exclude as much as possible unconventional factors outside the firms, this research intends to focus on a shorter sample period and compress the analysis period to 2021-2023 and conduct the robustness test. As can be seen in column 6(1) of Table 6, the robustness of the adjusted sample range indicates that the coefficient of corporate ESG is 0.196 and passes the 1% significant level test, indicating that for every unit increase in the ESG performance of a firm, the level of innovation (INVIA) of the firm increases by an average of 0.196 units, which suggests that higher rated ESG performance still enhances the level of innovation of the firm, proving that the results of the baseline regression have arobustness.

4.5.2. Replacing the dependent variable

In order to ensure the robustness of the results of the benchmarking study, this research replaces the criteria for the assessment of the dependent variable, enterprise innovation, and re-measures it so as to try to avoid bias in the results due to the way in which the metric is measured. Drawing on the research of Yang Zhen (2025) [13] and other scholars, this research takes the total number of applications for invention patents, utility models and appearance patents in accordance with the

weights of 3:2:1 and takes the natural logarithm after adding one to recalculate the total number of enterprise patents as the embodiment of enterprise innovation, so as to get the new enterprise innovation (INVIA2) to bring into the model (1) to reassess. The regression results, as shown in column (2) of Table 6, show that the coefficient of corporate ESG is 0.108 and is significantly positive at the 1% level of significance, indicating that for every unit increase in corporate ESG, the level of corporate innovation (INVIA2) increases by 0.108 units on average. The results show that ESG performance still has a significant positive promotional effect on firm innovation (INVIA2), indicating that the results of the benchmark regression are still robust.

4.5.3. Replacement of independent variable

This research draws on the research of Yang Zhen (2025) [13] and other scholars to further replace the independent variables by changing the assignment of the CSI ESG ratings, assigning a value of 2 when the CSI ESG ratings of manufacturing firms result in A, AA, and AAA, assigning a value of 1 when the CSI ESG ratings result in B, BB, and BBB, and assigning a value of 0 when the CSI ESG ratings result in C, CC, and CCC and naming it asESG2, as the dependent variable. After re-estimation, the regression results are shown in column (3) of Table 6, the coefficient of ESG2 is 0.312 and remains significant at the 1% level, indicating that for every unit increase in firms' ESG, the level of firms' innovation (INVIA) increases by 0.312 units on average, and firms' ESG2 still has a positive and significant effect on firms' innovation, suggesting that the baseline findings remain robust.

4.5.4. Lagged one-period dependent variable

Since there may be a certain lagged effect of ESG performance of manufacturing firms on firm innovation, this research lags the dependent variable firm innovation (INVIA) by one period. After re-estimation, the regression results are shown in column (4) of Table 6, the coefficient of ESG performance is 0.104 and is significant at the 1% level, indicating that for every unit of enterprise enhancement, the level of enterprise innovation (INVIA) will be increased by 0.104 units on average, which indicates that good ESG performance can promote enterprise innovation, indicating that the benchmark regression analysis passes the robustness test.

Table 6. Robustness analysis

	(1)	(2)	(3)	(4)
VARIABLES	INVIA	INVIA2	INVIA	F.INVIA
ESG	0.196***	0.108***		0.104***
	(5.49)	(5.00)		(3.54)
ESG2			0.312***	
			(4.53)	
Controls	YES	YES	YES	YES
Constant	-13.768***	-12.189***	-13.931***	-14.630***
	(-17.29)	(-24.10)	(-21.97)	(-20.60)
Observations	1,008	1,680	1,680	1,344
Adjusted R-squared	0.620	0.634	0.603	0.612
Province	YES	YES	YES	YES
IND	YES	YES	YES	YES
Year	YES	YES	YES	YES
***p<0.01, **p<0.05, *p<0.10, T-value in parentheses. F.INVIA indicates that lagging the dependent variable by one period.				

4.6. Heterogeneity Analysis

In order to further verify the difference of corporate innovation effect of ESG performance among different enterprises, the nature of enterprise property rights and whether it is a high-tech enterprise are specifically selected to carry out the heterogeneity analysis.

4.6.1. Heterogeneity analysis of state-owned enterprises and non-state-owned enterprises

From the perspective of property rights heterogeneity, this research draws on the research of scholars such as Zhao & Jiang (2025) [14] and distinguishes between two types of samples, state-owned and non-state-owned enterprises, for regression. From the statistical results in Table 7, (1) the ESG ratings of column state-owned enterprises have a positive promotion effect on corporate innovation (INVIA); (2) the ESG enterprises of column non-state-owned enterprises can significantly promote the level of corporate innovation (INVIA), meanwhile, the ESG coefficient of state-owned enterprises is 0.112 and passes the 1 per cent significant level test, while the ESG coefficient of non-state-owned enterprises is 0.143 and passes the 1 per cent significant level test, indicating that non-state-owned firms ESG is more sensitive to the impact of corporate innovation.This is due to the fact that state-owned enterprises need to undertake more functions compared to non-state-owned enterprises, and state-owned enterprises bear more policy tasks and social responsibilities, such as in ensuring national energy security and maintaining social stability, which may distract resources and energy in ESG innovation, while non-state-owned enterprises are more likely to be driven by interests and thus focus more on improving ESG performance to enhance the competitiveness of the enterprise and market. Secondly, although SOEs are not as successful in terms of reputationSecond, although SOEs have more advantages in terms of reputation, capital and policies, in the field of ESG innovation, non-SOEs are better at using market mechanisms to obtain resources, such as by cooperating with social capital and venture capital institutions to raise more funds for ESG innovation projects.In addition, the incentive mechanism of state-owned enterprises may be more traditional, and the incentives for innovation may be lower than that of non-state-owned enterprises, while the remuneration and promotion of employees are often related to the overall performance and stability of the enterprise's operation, but ESG innovation projects have higher risks and uncertainties, so non-state-owned enterprises can stimulate the innovation ability of employees in a more flexible incentive way. Therefore, ESG ratings have a smaller impact on innovation enhancement for SOEs and a more significant impact for non-SOEs.

Table 7. Heterogeneity analysis of state-owned and non-state-owned firms

	(1)	(2)
VARIABLES	INVIA(state-owned)	INVIA(non-state-owned)
ESG	0.112***	0.143***
	(3.07)	(3.49)
Controls	YES	YES
Constant	-13.109***	-15.607***
	(-15.00)	(-15.20)
Observations	1,005	674
Adjusted R-squared	0.630	0.648
Province	YES	YES
IND	YES	YES
Year	YES	YES
***p<0.01, **p<0.05, *p<0.10, T-value in parentheses.		

4.6.2. Heterogeneity analysis of high-tech enterprises and non-high-tech enterprises

From the perspective of whether it is a high-tech enterprise or not, this research draws on the research of Guo (2024) [15] and other scholars to distinguish between two types of samples, high-tech enterprises and non-high-tech enterprises, for regression. From the statistical results in Table 8, (1) the ESG ratings of high-tech enterprises in the column have a positive promotion effect on corporate innovation (INVIA); (2) the ESG enterprises of non-high-tech enterprises in the column can significantly promote the level of corporate innovation (INVIA), while the ESG coefficient of high-tech enterprises is 0.126 and passes the test at the 1% significance level, while the ESG coefficient of non-high-tech enterprises is 0.217 and passes the 1% significant level test, indicating that non-high-

tech enterprise ESG is more sensitive to the impact of corporate innovation. This may be due to the fact that compared with high-tech enterprises, non-high-tech enterprises usually face stronger resource constraints, such as financing difficulties, lack of advanced production technology and machinery and equipment, while good ESG performance can attract relevant investors to invest in non-high-tech enterprises to provide innovation support, and at the same time, it also prompts the enterprises to pay more attention to the concept of ESG, and continue to promote the enterprises to carry out technological innovation.In addition, due to the relative abundance of resources in high-tech enterprises, ESG performance has less room to enhance the level of corporate innovation than non-high-tech enterprises.

Table 8. Heterogeneity analysis of high-tech and non-high-tech enterprises

	(1)	(2)
VARIABLES	INVIA (high-tech)	INVIA (non-high-tech)
ESG	0.126***	0.217***
	(3.49)	(5.01)
Controls	YES	YES
Constant	-13.196***	-14.259***
	(-14.62)	(-15.13)
Observations	885	792
Adjusted R-squared	0.565	0.660
Province	YES	YES
IND	YES	YES
Year	YES	YES
***p<0.01, **p<0.05, *p<0.10, T-value in parentheses.		

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions of the Study

This research takes the Shanghai A-share manufacturing listed companies in 2019-2023 as the research object, and empirically analyses the impact of ESG ratings on corporate innovation through benchmark regression analysis and robustness tests, and finally draws the following conclusions: (1) Good ESG performance has a positive promotion effect on corporate innovation, and through a series of robustness tests, it shows that ESG performance is getting more and more attention from investors and enterprises. (2) The impact of ESG performance on corporate innovation is more significant in non-state-owned enterprises. (3) The influence of ESG performance on corporate innovation development is more significant in non-high-tech enterprises.

5.2. Policy Recommendations

5.2.1. Enterprise level

Enterprises should build a sound ESG system, take the initiative to improve ESG performance and promote digital transformation. Enterprises should establish a sound ESG incentive mechanism on the basis of strengthening ESG concepts, and accelerate the transformation and application of scientific and technological innovation achievements through financial subsidies and technical support. On the environmental front, they should actively respond to the national strategic plan of carbon peaking and carbon neutrality, focus on the development and research of green technologies, and carry out R&D and innovation of green products. In the social aspect, enterprises should actively fulfil their social responsibilities, strengthen product quality and service, and assume product responsibility. In terms of corporate governance, they should establish a sound, efficient and transparent corporate governance system, optimise the structure and size of the board of directors,

and enhance the effectiveness of supervisors, in order to provide a more stable innovation environment for enterprises, so as to be able to attract long-term capital investment and research and development. Digital transformation can help enterprises refine the management of each link in a timely and efficient manner through digital technology, capture customer demand more accurately and quickly, develop innovative products and services that are more relevant to the market, improve operational transparency, stimulate employees' motivation to innovate and internal communication mechanisms, and enhance the level of innovation of the enterprise.

5.2.2. Government level

Formulate and improve relevant policies and regulations, unify ESG disclosure and evaluation standards, and implement preferential policies. The supervision as well as guidance on corporate ESG performance should be increased, and the auditing and sampling of corporate ESG reports should be strengthened to avoid divergent ESG ratings due to inconsistencies in the evaluation standards of different organisations, which would raise the cost for investors and lead to weakening of the public's trust in the ESG performance of corporations. Encourage enterprises to participate in environmental protection and assume social responsibility by providing incentives such as tax relief policy subsidies, green subsidies and environmental protection incentives to manufacturing enterprises.

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