

Corporate ESG performance and green innovation: empirical evidence from Chinese listed companies

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Abstract. In the current context of China's goal of "carbon peaking and carbon neutrality," it is crucial to promote the development of a low-carbon economy through corporate green innovation. Understanding the relationship between corporate environmental, social, and governance (ESG) performance and green innovation has become a significant practical concern. This paper focuses on measuring the ESG performance of listed companies in the Shanghai and Shenzhen A-share markets from 2011 to 2021 using the China Securities ESG Rating Index. It empirically investigates the influence mechanism of ESG performance on green innovation. The research findings demonstrate that strong ESG performance by companies can significantly enhance the level of green innovation. This study explores the positive impact of ESG performance on green innovation, offering valuable insights for companies aiming to improve their ESG performance and promote the advancement of green innovation.

Keywords: ESG performance; green innovation; economic efficiency; ESG disclosure

1. Introduction

Green innovation places emphasis on achieving economic benefits while minimizing resource and energy consumption or reducing negative environmental impacts through innovative practices. It is considered a necessary path for achieving the synergistic development of ecology and the economy. In comparison to traditional innovation activities, green innovation distinguishes itself through its focus on environmental benefits. It considers not only the economic and innovative performance of corporate activities but also their environmental performance, thus striking a balance between economic development and corporate social responsibility (Wang et al., 2022)[1]. Previous research on green innovation has identified two main factors that influence the efficiency of green innovation in enterprises: internal factors within the organizations and external environmental factors. Internal factors pertain to the characteristics of the executive team, while external environmental factors include government economic policies, financial subsidy support, and the capital market (Qi et al., 2023; Cheng and Lu, 2022; Liang et al., 2022; Hu, 2022)[2–5].

China, as the world's largest emerging economy, holds the distinction of being the largest carbon emitter globally (Shao et al., 2019; Zheng et al., 2019)[6,7]. In 2020, China's CO₂ emissions reached a staggering 989.9 million tons, accounting for approximately 31% of global CO₂ emissions (W. Li et al., 2022)[8]. Given these figures, China bears a significant responsibility in reducing global emissions. However, China's traditional economic development model, which prioritized rapid growth, has led to a range of environmental pollution issues (Ren et al., 2021)[9]. Consequently, the relationship between urban economic development and ecological preservation has become a pressing concern across various sectors of society. It is widely recognized that innovation serves as the primary driving force behind development (Hausman, 2022)[10].

Moreover, green innovation serves as an effective means to address environmental pollution issues (Chien et al., 2021)[11]. Unlike traditional innovation, green innovation aims to enhance production efficiency and resource utilization, striving for a harmonious coexistence between economic development and environmental protection (Takalo et al., 2021)[12]. Therefore, green innovation plays a crucial role in realizing a win-win scenario for a low-carbon economy. Consequently, the pursuit of green innovation for the development of a low-carbon economy has become a prominent reality. Given China's current "double carbon" target, enterprises should prioritize energy conservation and emission reduction in their development strategies. Notably, green innovation exerts

a significantly positive impact on resource efficiency, fostering a virtuous cycle of regional economic development and the establishment of a resource-efficient and environmentally-friendly society.

The concept of ESG (Environmental, Social, Governance) was introduced by the United Nations Global Compact in 2004, which emphasizes the integration of environmental, social, and governance factors in investment studies and corporate evaluation criteria (Gillan et al., 2021)[13]. ESG serves as a conceptualization and extension of the concept of CSR (Corporate Social Responsibility) (Gillan et al., 2021). CSR refers to the willingness, behavior, and performance of enterprises in maximizing value creation in environmental, social, and governance aspects to enhance social welfare, guided by principles of innovation, coordination, green development, openness, and sharing (Su Chang and Chen Cheng, 2022)[14].

In terms of the impact of ESG, several studies have shown that corporate ESG performance can positively influence innovation performance through reputation effects and resource effects (Wang and Peng, 2022)[15]. By analyzing the existing ESG literature review, Qi et al. (2023) found that ESG performance can add value to firms through the path of reducing their financing costs, but not all industries and firms can produce the same effect[16]. In addition, it has been shown that good ESG performance cannot only alleviate agency problems and reduce financing constraints, but also add value by improving corporate investment efficiency and reducing corporate financial risk (Gao et al., 2021)[17]. Sheng et al. (2022), from the perspective of total factor productivity, demonstrate that improving ESG level of firms can help improve the total factor productivity of family firms in terms of technological innovation, improving information transparency, and reducing the cost of financing constraints[18]. In summary, the development of ESG level of a firm affects the firm in several dimensions, and has a positive impact on the improvement of innovation performance, the growth of firm value, and the improvement of total factor productivity.

The concept of ESG (Environmental, Social, and Governance) was first introduced by the United Nations Global Compact in 2004, emphasizing the inclusion of environmental, social and governance-related issues in relevant investment studies and corporate evaluation criteria. The ESG concept is a further conceptualization and extension of CSR (Gillan et al., 2021). The concept of CSR is an extension of CSR (Gillan et al., 2021). It is considered as the willingness, behavior and performance of enterprises to maximize value creation in environmental, social and governance aspects to enhance social welfare under the development guidelines of innovation, coordination, green, openness and sharing (Su Chang and Chen Cheng, 2022).

Directly related literature on the relationship between corporate ESG performance and green innovation is currently scarce. In the context of the construction of China's ESG system in the new era, the green transformation and high-quality development of enterprises need to fully consider the impact effect of corporate ESG performance on corporate value enhancement and green innovation. Xiao et al. (2022) concluded that good CSR has a significant positive impact on the improvement of corporate green innovation technology, and it mainly promotes the development of corporate green innovation through green environmental protection investment[19]. It can be seen that it is an important factor that cannot be ignored from the perspective of corporate social responsibility to enhance the green innovation ability of enterprises and achieve sustainable development. In addition, the environmental responsibility of enterprises is also significantly and positively related to the level of green technology innovation, and enterprises that actively undertake environmental responsibility are conducive to gaining access to government markets in terms of taxation and innovation subsidies, as well as to gaining favor from external investors, thus promoting green technology innovation (Sun et al., 2021)[20]. Li et al. (2022) found that for heavy polluters, disclosure of corporate ESG information has resource and governance effects, which leads to better adaptation to environmental regulations, helps companies cope with environmental uncertainty, and can have a positive moderating effect on the green transformation of companies[21]. It also has a positive moderating effect on the green transformation of enterprises. So, can the ESG performance of enterprises have an impact on the improvement of their green innovation capability? And if so, through what mechanisms will this influence be realized? A review of the existing literature reveals that most

scholars mainly explore the relationship between digital transformation and economic or financial performance of enterprises, but there is still a lack of research on non-economic performance such as ESG performance and green innovation, and there is a lack of corresponding mechanism of action.

The main contributions of this paper are twofold. Firstly, it integrates green innovation and corporate ESG performance into a unified analytical framework, thereby exploring the social spillover effects of green innovation from the perspective of corporate ESG performance. This approach expands the existing literature on corporate ESG-related studies and provides a new theoretical foundation for sustainable development in corporations. Secondly, the paper empirically tests its hypotheses using a sample of A-share listed companies in Shanghai and Shenzhen from 2011 to 2021. The empirical evidence demonstrates the positive impact of corporate ESG performance on green innovation, while also examining the underlying mechanisms and heterogeneity involved. These findings facilitate the adoption of differentiated and dynamic strategies by enterprises in their green innovation practices, allowing them to strike a balance between economic and social benefits.

2. Theoretical mechanisms and research hypotheses

With reference to existing literature studies, it is reasonable to speculate that the role of corporate ESG performance on corporate green innovation is mainly manifested in the following three aspects:

First of all, good environmental responsibility performance reflects a firm's determination and ability to adapt to the pressure of environmental regulation and realize the concept of sustainable development, which helps motivate firms to carry out green innovation activities. According to Porter's hypothesis, environmental regulation will increase the cost of environmental protection, and in order to offset the cost of environmental protection, enterprises will carry out more innovative activities to improve their productivity and profitability in the market, so as to gain an advantage in the industry competition. Green innovation has the qualities of both environmental protection and technological innovation, and can effectively reconcile economic development and environmental protection. Therefore, in fulfilling their environmental responsibilities, firms will actively engage in green innovation activities in order to adapt to the environmental regulation system and alleviate the economic pressure of environmental protection.

Indeed, actively engaging in environmental management not only helps companies showcase their unique competitive advantages in the face of resource and environmental pressures but also facilitates the establishment of a virtuous cycle between economic development and environmental protection. Wang et al. (2021) discovered that as environmental protection continues to be promoted at the national level, stakeholders' demand for the level of corporate green innovation increases^[22]. When companies perceive external pressure, they proactively promote green innovation activities to enhance their green technological innovation capabilities, thereby developing a distinct competitive advantage.

Furthermore, active environmental responsibility by companies facilitates recognition and support from the government, which has implemented various policies to encourage environmental management, including tax incentives, government subsidies, and green credit. Strengthened environmental regulations further encourage companies to proactively assume environmental responsibilities, enabling them to gain social legitimacy, acquire resources and information conducive to innovation, [23] and enjoy corresponding policy incentives. These factors promote companies to actively engage in green innovation, thereby enhancing their overall competitiveness (Wang and Sun, 2022).

Additionally, the continuous and effective environmental management efforts of companies send a positive signal to the external environment, demonstrating their active commitment to environmental protection. This helps companies establish a favorable reputation and cultivate a corporate green culture, which, in turn, facilitates stakeholder support and fosters positive social relationships. As a result, companies are better positioned to promote the development of their green technological innovation activities.

Secondly, enterprises' active social responsibility helps them gain the recognition of stakeholders and becomes the driving force of their green innovation. According to stakeholder relevance theory and information transmission theory, good social responsibility performance of enterprises helps enterprises to balance the needs and expectations of various stakeholders and release positive signals of corporate social reputation, thus gaining the recognition and support of stakeholders (Fatima & Elbanna, 2023)[24]. The good relationship network established with stakeholders helps to share knowledge and information, which provides new inspiration for corporate green innovation and thus becomes a driving force for corporate green innovation. Active disclosure of information related to corporate social responsibility also helps to improve the transparency of corporate development and helps relevant stakeholders to understand the operations of the company, which facilitates the establishment of long-lasting relationships and increases investor confidence.

On the one hand, as a kind of non-financial information, the disclosure of ESG information by enterprises can improve the information environment, reduce the information asymmetry between banks and enterprises, help banks understand the business situation more clearly and effectively reduce credit risks, and also help enterprises alleviate financing constraints and provide sufficient financial support for green innovation. Moreover, ESG information disclosure can bridge the information gap between enterprises and investors, helping investors to more comprehensively assess the operation and development of enterprises. On the other hand, green innovation, as a new type of innovation activity, requires more intellectual capital from enterprises and requires knowledge resources from external stakeholders in the process of conducting innovation activities. In addition, the disclosure of CSR information can alleviate the problem of information asymmetry between enterprises and stakeholders, which can effectively attract stakeholders, reduce the risk of adverse selection, and then obtain better green innovation resources and development environment, and promote the R&D of green technology innovation of enterprises (Xue et al., 2023).[25]. Meanwhile, Xiao et al. (2021) found that the fulfillment of social responsibility by enterprises mainly promotes the improvement of green innovation in two aspects, namely, promoting green product and process innovation and alleviating the double externalities in the green innovation process.[26]. In addition, the fulfillment of social responsibility by enterprises can also reduce the uncertainty of enterprise operation to a certain extent by alleviating information asymmetry and reducing the cost of enterprise financing, thus enhancing the ability to cope with risks in the process of green innovation.

Finally, corporate governance can alleviate the principal-agent problem and promote operators' investment in green R&D and technological innovation through incentive mechanisms to generate long-term economic benefits. According to the principal-agent theory, the disclosure of ESG information and a good incentive mechanism can effectively reduce the cost of supervision and constraint for principals to collect information and avoid the loss of interests due to the deviation of decision making between operators and principals. Good corporate governance helps principals to monitor management, urge management to make decisions with long-term development in mind, and coordinate green innovation behavior at the strategic level and governance mechanism level, thus producing a governance effect on green innovation performance (Li et al., 2022).[21]. In addition, good corporate governance capability will enhance the technological innovation level of enterprises.

On the one hand, the incentive constraint mechanism alleviates principal-agent conflicts and avoids incentive misalignment and related moral risks. A good incentive mechanism motivates management to focus on the long-term development of the company, increase green R&D investment, and generate long-term innovation benefits. On the other hand, a higher level of corporate governance will alleviate the agency problems arising from the separation of powers. Shareholders will urge operators to carry out technological innovation activities in order to maximize their own interests. In addition, under the supervision of the board of directors, operators will reduce self-interested behavior and thus make scientific decisions that are conducive to economic efficiency improvement and environmental protection. Long et al. (2023) also confirmed that good corporate ESG performance can promote corporate green technology innovation in terms of both internal oversight and enhanced information transparency by analyzing data of A-share listed companies in Shanghai and Shenzhen

in China from 2010 to 2020[19] Based on the above analysis, this paper proposes the following hypotheses. Based on the above analysis, this paper proposes the following hypotheses:

Good ESG performance of companies can significantly improve the level of green innovation.

3. Indicator construction, data sources and identification strategies

3.1 Indicator Construction

3.1.1. Dependent variable

In this paper, we refer to existing studies (Rezende et al., 2019; Song, D.Y. et al., 2022)[27,28]), we obtained the patent classification number information of all A-share listed companies from CNRDS and matched them with the patent classification numbers in the Green Patent List published by the World Intellectual Property Organization (WIPO) to obtain the number of green invention-type patents and green utility model patents filed by listed companies, and tested them using their logarithmically processed data (*grp*).

3.1.2. Independent variable selection

Drawing on Hu, J. et al. (2022)[29] and Hongjun Xie et al. (2022)[30] 's method, we use the ESG data of enterprises provided by Huazheng. This ESG has the characteristics of high update frequency (quarterly update), wide coverage (covering all A-share listed companies) and high data availability (Linlin Wang et al., 2022).[31] . The CSI ESG index system is based on the index scores, and the final nine grades of C~AAA ratings are obtained. To facilitate the empirical analysis, the nine ratings from C to AAA are assigned 1 to 9, respectively.

3.2 Model Design

$$grp_{it} = \alpha_0 + \alpha_1 ESG_{it} + \alpha_2 Z_{it} + \mu_i + \delta_t + \varepsilon_{it} \quad (1)$$

Where ESG_{it} is the ESG performance score of firm i in period t and grp_{it} is the level of green innovation of firm i in period t . To address the interference of endogeneity problems caused by omitted variables, this paper refers to the existing literature (Bing Sun et al., 2022; Jie Hu et al., 2022)[29,32]), the following control variables are introduced (Z_{it}). Specifically, firm *size* (*size*), measured as the logarithm of firm's total assets; firm *age* (*age*), measured as the logarithm of firm's years of establishment; firm *growth* capacity (*growth*), measured as the growth rate of firm's total assets; firm *duality* rate (*duality*), measured as the concurrent appointment of firm's chairman and general manager; *board* size (*board*), measured as the The board size is measured by the logarithm of the number of board members, and the concentration of equity (*top3*) is measured by the shareholding ratio of the top 3 shareholders. Meanwhile, the model is designed to avoid individual heterogeneity in the within-group regressions, thus including μ_i to denote the individual fixed effect that city i does not change over time, and δ_t to denote the time fixed effect. Further, the random error term $\varepsilon_{i,t}$ is clustered to the firm level in this paper to address the systematic heteroskedasticity of the model.

3.3 Data sources and descriptive statistics

This paper selects listed companies in Shanghai and Shenzhen A-shares from 2011-2021 as the research object and screens them according to the following steps: (1) exclude financial listed companies; (2) exclude samples with missing financial data or insolvency; (3) exclude samples that are marked ST or *ST in the current year. Firm-level cluster regressions are performed on the samples to eliminate the interference of differences between data groups and to reasonably control the effect of heteroskedasticity. The financial data used in the study were derived from the CSMAR database.

Table 1 presents the descriptive statistics of the main variables. The table shows that the mean value of corporate ESG performance (*ESG*) is 6.513, with a minimum value of 3 and a maximum

value of 9. The overall value is large, indicating that the overall ESG performance of listed companies in China is good, but the standard deviation is 1.125, indicating that the level of corporate ESG performance varies among different listed companies and there are still significant differences. The mean value of green rating items (*grp*) is 0.8, which is relatively small, indicating that green innovation in China is still at a low level stage and needs to continue to develop: at the same time, the minimum value is 0, the maximum value is 6.787, and the standard deviation is 1.061, indicating that there is a large gap between the green innovation levels of different enterprises. In terms of enterprise *size*, *age* and *growth*, the standard deviations of the three indicators are 1.531, 0.417 and 29.973 respectively, indicating that there are significant differences among different listed companies, especially in terms of their growth ability.

Table 1. Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
<i>ESG</i>	31820	6.513	1.125	3.000	9.000
<i>grp</i>	24886	0.800	1.061	0.000	6.787
<i>size</i>	36813	22.169	1.531	15.573	31.186
<i>age</i>	40519	2.766	0.417	0.000	4.143
<i>growth</i>	30304	0.576	28.973	-0.972	4719.612
<i>duality</i>	36247	0.314	0.553	0.000	33.515
<i>board</i>	35908	2.130	0.209	0.000	3.045

4. Empirical Analysis

4.1 Baseline return

In the regression analysis, multiple linear regression models are used to examine the relationship between corporate ESG performance and the level of corporate green innovation. The results are presented in Table 2, where the coefficients of ESG are reported. Each regression model in Table 2 includes additional control variables to account for potential confounding factors.

The regression results consistently show that the coefficients of ESG are significantly positive at the 1% level. This indicates that good ESG performance of enterprises has a substantial and positive impact on the level of green innovation. The findings support the hypothesis proposed in this paper, highlighting the important role of corporate ESG performance in promoting green innovation. These results suggest that enterprises with better ESG performance are more likely to engage in green innovation activities, leading to a higher level of green innovation. This implies that by improving their ESG performance, companies can enhance their commitment to environmental and social responsibility and drive the development of sustainable and eco-friendly innovations. Overall, the regression analysis provides empirical evidence that supports the hypothesis of this paper, demonstrating the positive relationship between corporate ESG performance and the level of corporate green innovation.

Table 2. Baseline regression.

	(1)	(2)	(3)	(4)	(5)	(6)
<i>ESG</i>	0.0379*** (0.0057)	0.0253*** (0.0056)	0.0257*** (0.0056)	0.0256*** (0.0056)	0.0245*** (0.0057)	0.0243*** (0.0057)
<i>size</i>		0.2110*** (0.0092)	0.2102*** (0.0092)	0.2127*** (0.0093)	0.2208*** (0.0094)	0.2205*** (0.0095)
<i>age</i>			0.0868 (0.0546)	0.0812 (0.0546)	0.0721 (0.0553)	0.0722 (0.0553)
<i>growth</i>				0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)
<i>board</i>				-0.0519 (0.0388)	-0.0574 (0.0389)	-0.0531 (0.0391)
<i>top3</i>					-0.0004 (0.0007)	-0.0004 (0.0007)
<i>duality</i>						-0.0223* (0.0118)
<i>_cons</i>	0.5522*** (0.0374)	-4.0738*** (0.2044)	-4.3034*** (0.2502)	-4.2318*** (0.2589)	-4.3554*** (0.2634)	-4.3512*** (0.2639)
<i>Firm FE</i>	YES	YES	YES	YES	YES	YES
<i>Year FE</i>	YES	YES	YES	YES	YES	YES
<i>Industry FE</i>	YES	YES	YES	YES	YES	YES
<i>N</i>	24432	24427	24427	24408	24388	24309
<i>adj. R²</i>	0.6973	0.7047	0.7047	0.7047	0.7047	0.7048

Note: ***, **, and * indicate significant at the 1%, 5%, and 10% levels, respectively, and data in parentheses are robust standard errors. Same below.

4.2 Robustness analysis

4.2.1. Changing the way ESG is measured

This paper uses data from Bloomberg ESG as a new explanatory variable (ESG2), and the results are shown in columns (1) and (2) of Table 3. The regression coefficients of ESG in the table are 0.2181 and 0.1552, and both are significant at the 1% level. The results again validate the hypothesis.

4.2.2. OLS Returns

The regression analysis was performed by OLS regression model and the results are shown in columns (3) and (4) of Table 3. It can be found that the only explanatory variable in column (3) is ESG with a coefficient of 0.0997, and column (4) controls for other factors that may affect the level of corporate green innovation (grp) based on the third column with an ESG coefficient of 0.0379. In general, corporate ESG performance positively affects corporate green innovation capability and passes the 1% significance test.

4.2.3. Double clustering robust standard error

Considering the intrinsic correlation between different firms, our double clustering adjustment of standard errors in individual and time can overcome the effect of problems such as autocorrelation and heteroskedasticity on statistical inference (Tao Zhang and Li Junchao, 2023).[33] . The results are shown in column (5) of Table 3. The coefficients of the core explanatory variables remain significantly positive, in line with the benchmark results.

4.2.4. Tailoring

Considering the possible measurement errors in the raw data, we applied tailoring to the data. The largest and smallest 5% of sample data for green innovation and corporate ESG were removed sequentially. The results of the re-estimated model are shown in column (6) of Table 3. After the

tailoring process, the coefficients of the core explanatory variables remain significantly positive throughout the range. The results further demonstrate the reliability of the benchmark model.

Table 3. Robustness tests.

	(1)	(2)	(3)	(4)	(5)	(6)
	grp	grp	grp	grp	grp	grp_w
<i>ESG2</i>	0.2181*** (0.0520)	0.1552*** (0.0518)				
<i>ESG</i>			0.0997*** (0.0064)	-0.0379*** (0.0059)	0.0243** (0.0088)	
<i>ESG_w</i>						0.1349** (0.0533)
<i>size</i>		0.2383*** (0.0174)		0.3579*** (0.0066)	0.2205*** (0.0266)	0.1932*** (0.0161)
<i>age</i>		-0.1294 (0.0962)		-0.0459*** (0.0177)	0.0722 (0.1236)	-0.2570*** (0.0892)
<i>growth</i>		0.0008 (0.0005)		-0.0002 (0.0001)	0.0001** (0.0000)	0.0007 (0.0005)
<i>board</i>		0.0263 (0.0654)		-0.3014*** (0.0342)	-0.0531 (0.0546)	0.0174 (0.0606)
<i>top3</i>		-0.0012 (0.0012)		-0.0058*** (0.0004)	-0.0004 (0.0015)	-0.0010 (0.0011)
<i>duality</i>		-0.0453** (0.0220)		0.0783*** (0.0136)	-0.0223 (0.0140)	-0.0433** (0.0204)
<i>_cons</i>	0.3123* (0.1727)	-4.6520*** (0.4957)	0.1473*** (0.0407)	-5.9843*** (0.1348)	-4.3512*** (0.5857)	-3.2384*** (0.4654)
<i>Firm FE</i>	YES	YES	YES	YES	YES	YES
<i>Year FE</i>	YES	YES	YES	YES	YES	YES
<i>Industry FE</i>	YES	YES	YES	YES	YES	YES
<i>N</i>	9848	9794	24794	24671	24309	9794
<i>adj. R²</i>	0.7503	0.7560	0.0114	0.1767	0.7037	0.7155

5. Conclusion and Insights

This paper investigates the relationship between corporate ESG performance and the level of corporate green innovation using a sample of A-share listed companies in Shanghai and Shenzhen from 2011-2021. The empirical findings indicate that good ESG performance significantly enhances the level of green innovation in companies. These results have important implications for both companies and stakeholders.

For companies, it is crucial to recognize the importance of improving their green innovation capability as a means to achieve sustainable development and meet the requirements of the "double carbon" target. Enhancing ESG performance can positively impact green innovation, and therefore, companies should focus on improving their social and environmental responsibility to further promote green innovation. Moreover, companies should prioritize ESG information disclosure to demonstrate their commitment to sustainable development, reduce information asymmetry, and foster stakeholder engagement, ultimately driving the improvement of their green innovation level.

For investors, it is essential to pay attention to the content and quality of corporate ESG information disclosure. Evaluating both financial and non-financial indicators, including ESG performance, can lead to better investment decisions and risk mitigation. By considering ESG performance and investing in green innovation projects, investors can support companies in generating social spillover effects and achieving long-term sustainable development.

For the government, there is a need to establish an effective rating system and information disclosure framework for corporate ESG performance that aligns with China's context. Legislation should be improved to provide a solid foundation for promoting ESG practices. The government can

incentivize companies with good ESG performance through tax benefits, subsidies, and loan concessions to encourage green innovation activities. Conversely, penalties such as increased tax levies and loan interest rates can be imposed on companies with poor ESG performance to motivate them to improve. A robust information disclosure system implemented by the government will help stakeholders monitor ESG performance, promote green innovation, and facilitate the high-quality development of companies.

In conclusion, this study emphasizes the positive impact of corporate ESG performance on green innovation and provides valuable insights for companies, investors, and the government in fostering sustainable development, enhancing stakeholder value, and achieving a harmonious balance between social, economic, and environmental objectives.

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