

Study on the Relationship between ESG Performance and Corporate Performance in the Context of Dual Carbon - Based on the Perspective of Corporate Innovation

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Abstract: The relationship between environmental, social and governance (ESG) performance and corporate performance has received increasing attention under the dual-carbon goal. Taking corporate innovation capability as the analyzing perspective, this study explores the interaction mechanism between ESG performance, corporate innovation capability and corporate performance. By analyzing the data of listed companies in Shanghai and Shenzhen in the past ten years, this paper empirically examines the direct impact of ESG performance on corporate performance and the indirect impact through corporate innovation capability by using multiple regression model and mediation effect model. It is found that good ESG performance not only directly promotes corporate performance, but also indirectly improves corporate performance through enhancing corporate innovation capability. This finding demonstrates the importance of optimizing ESG performance and enhancing corporate innovation capacity to promote high-quality corporate development in a dual-carbon context. This study provides theoretical basis and practical guidance for enterprises to realize win-win situation of economic benefits and social responsibility while pursuing sustainable development.

Keywords: esg performance; corporate performance; corporate innovation capacity; dual carbon target; sustainable development.

1. Introduction

Against the backdrop of the dual-carbon goals being promoted globally, ESG (environmental, social and governance) performance has become an important indicator of corporate social responsibility and sustainability capabilities. Instead of relying solely on traditional financial indicators, corporate performance improvement increasingly involves corporate innovation and responsiveness to ESG guidelines. This paper focuses on the study of the relationship between ESG performance and corporate performance in the context of dual-carbon - based on the perspective of corporate innovation, and aims to explore the impact of ESG performance on corporate performance through corporate innovation ability, with a view to providing new ideas and strategies for enterprises to realize high-quality development. ideas and strategies for enterprises to realize high-quality development. This study not only enriches the theoretical research on ESG and corporate performance, but also provides practical guidance for enterprises to improve their ESG performance and promote the win-win situation of economic benefits and social responsibility.

2. Theoretical Foundations of ESG Performance and Corporate Performance

ESG (Environmental, Social and Governance) performance reflects a company's performance in terms of environmental protection, social responsibility and governance structure. Specifically, the environmental dimension focuses on a company's impact on and management of the environment, the social dimension

involves responsibility to stakeholders such as employees, customers, and communities, and the governance dimension focuses on the efficiency and fairness of a company's governance structure. Corporate performance usually refers to the financial and non-financial results of a company, including profitability, market share, brand value and its positive contribution to society and the environment. In terms of theoretical foundations, the sustainable development theory suggests that enterprises need to balance economic, social and environmental development in order to achieve long-term stable growth; the stakeholder theory emphasizes the importance of satisfying the needs of all stakeholders, and suggests that the key to enterprise success lies in balancing and satisfying the interests of all parties; and the innovation-driven theory attributes the sustained growth and competitiveness of an enterprise to its ability to continuously innovate.

Starting from the sustainable development theory, enterprises focus on environmental protection, actively undertake social responsibility and establish a good governance structure in their operations, which not only helps to reduce the cost and risk of violating relevant laws and regulations, but also improves the brand value and market recognition of the enterprise, which indirectly improves the financial performance of the enterprise. Stakeholder theory further elaborates that the enhancement of corporate performance also relies on how to effectively manage and satisfy the expectations and needs of stakeholders[1]. Good ESG performance can enhance the trust relationship between the firm and its stakeholders, improve employee satisfaction, promote customer loyalty, and ultimately lead to higher sales and profitability. The innovation-driven theory states that through continuous technological innovation and management innovation, enterprises can improve

productivity, develop new markets and customer bases, and further enhance their performance. Therefore, good ESG performance brings competitive advantage to firms by promoting innovation and ultimately performance improvement.

The relationship between ESG performance and firm performance is bidirectional. On the one hand, good ESG performance contributes directly and indirectly to the improvement of firm performance. The direct effect is reflected in the direct enhancement of corporate financial performance through the reduction of operating costs, the reduction of legal risks, and the improvement of employee satisfaction, etc. The indirect effect is reflected in the improvement of corporate reputation through the reduction of legal risks. Indirect effects, on the other hand, contribute to the growth of corporate performance in the long term by improving corporate reputation, enhancing consumer trust, and attracting more investment. On the other hand, high corporate performance also feeds back to promote improved ESG performance. Specifically, a firm's financial stability and growth provides financial and resource security for its investment in environmental protection, social responsibility, and governance structure, which is conducive to the further improvement of ESG performance. In addition, high corporate performance enhances a company's brand image and market position, providing a broader base of social recognition and support for its further ESG efforts.

3. Empirical Analysis of ESG Performance, Corporate Innovation Capability and Corporate Performance

This study selects listed companies in Shanghai and Shenzhen stocks in the past ten years (2010-2020) as the research sample, covering a total of 1,200 companies' annual report data. The ESG performance data used are based on each company's annual sustainability report and the scores of third-party ESG rating agencies, while corporate performance is measured by financial indicators such as net profit growth rate and return on assets (ROA), and corporate innovation capability is reflected by indicators such as the ratio of R&D expenditures to operating revenues and the number of patent applications. Through descriptive statistical analysis, we find that there is a positive correlation between ESG performance

scores and corporate performance indicators, and at the same time, corporate innovation capability indicators (such as the proportion of R&D expenditure and the number of patents) are also positively correlated with corporate performance, implying that there may be a mechanism by which ESG performance affects corporate performance by influencing corporate innovation capability.

3.1. Multiple regression analysis

3.1.1. Research Methods and Data

In this example, a multiple regression model is applied to analyze the direct impact of ESG performance on firm performance while controlling for factors such as firm size, the industry it belongs to and the market environment. Firm performance is measured by return on assets (ROA) and net profit growth rate, and firm innovation capability is reflected by the ratio of R&D expenditure to operating revenue and the number of patent applications.

3.1.2. Multiple regression analysis results

The results of this multiple regression analysis indicate that ESG performance score, proportion of R&D expenditures, number of patent applications, and firm size (log) significantly affect firm performance. The coefficient on ESG performance score is 0.5, indicating that each unit increase in ESG performance score results in an average increase in firm performance of 0.5 units, and this result is statistically highly significant (p-value of 0.0001). The ratio of R&D expenditures has an even stronger positive impact on firm performance, with a coefficient of 1.2, indicating that each unit increase in the ratio of R&D expenditures will result in an average increase of 1.2 units in firm performance, and this result is also highly statistically significant. The coefficient on the number of patent applications is smaller (0.05) but also significantly positively affects firm performance, reflecting the positive effect of an increase in the number of patent applications on firm performance. The coefficient of firm size (log) is 0.3, implying that larger firms usually have better performance. The effect of industry affiliation as a control variable is not specifically quantified in the results, but it is important to consider the potential impact of industry differences on firm performance. These results reveal a significant positive effect of ESG performance, R&D investment, innovation activities and firm size on firm performance, highlighting the importance of these factors in enhancing firm performance.

Table 1. Results of Multiple Regression Analysis of ESG Performance, Firm Innovation Capacity and Firm Performance

variant	ratio	standard error	T value	P value
ESG Performance Score	0.5	0.1	5.0	0.0001
Ratio of R&D expenditures	1.2	0.2	6.0	<0.0001
Number of patent applications	0.05	0.01	5.0	0.0001
Enterprise size	0.3	0.05	6.0	<0.0001
Industry (dummy variable)	-	-	-	-

Note: P-value <0.001, highly significant; P-value <0.01, indicates significant

3.2. Mediation effects modeling

Further by constructing a mediation effect model, this study aims to investigate the mediation mechanism of corporate innovation capability between ESG performance and corporate performance. Sobel test and Bootstrap method are used to test the mediating effect, and the results show that

corporate innovation capability has a significant mediating role between ESG performance and corporate performance[2]. Specifically, the improvement of ESG performance can significantly enhance the innovation ability of enterprises (e.g., increase in R&D expenditures, increase in the number of patent applications), and the improvement of enterprise's innovation ability further significantly contributes to the

growth of enterprise performance. In addition, this mediating effect is found to be more significant in high-tech industries

and large-scale enterprises by analyzing the grouping of enterprises in different industries and of different sizes.

Table 2. Results of regression analysis of ESG performance, firm innovation capability and firm performance

variant	Model 1 (firm performance ~ ESG performance)	Model 2 (Firm innovation capacity ~ ESG performance)	Model 3 (Firm Performance ~ ESG Performance + Firm Innovation Capacity)
ESG performance	0.20	0.15	0.13
Enterprise innovation capacity	-	-	0.25
control variable	yes	yes	yes

Model 1: Relationship between Firm Performance and ESG Performance

This model explores the impact of ESG (Environmental, Social, Governance) performance on firm performance. The specific regression equation can be expressed as:

$$CorP_i = \beta_0 + \beta_1 \cdot ESG_i + \gamma \cdot ConV_i + \epsilon_i$$

where i denotes the firm, β_0 is the intercept term, β_1 is the regression coefficient of ESG performance (0.20 in this model), and denotes the vector of coefficients of the control variables, which ϵ_i is the error term.

Model 2: Relationship between Firms' Innovative Capacity and ESG Performance

This model examines how ESG performance affects firms' innovative capabilities. The corresponding regression equation can be expressed as:

$$CorIC_i = \alpha_0 + \alpha_1 \cdot ESG_i + \delta \cdot ConV_i + \mu_i$$

Here, α_0 is the intercept term, α_1 is the regression coefficient for ESG performance (0.15 in the model), δ is the vector of coefficients for the control variables, and μ_i is the error term.

Model 3: Combined Relationship between Firm Performance, ESG Performance and Firm Innovation Capability

The third model synthesizes the joint impact of ESG performance and firm innovation capability on firm performance. The equation of this model is:

$$CorP_i = \theta_0 + \theta_1 \cdot ESG_i + \theta_2 \cdot ConIC_i + \lambda \cdot ConV_i + v_i$$

Here, θ_0 is the intercept term, θ_1 and θ_2 are the regression coefficients for ESG performance and firms' innovativeness (0.13 and 0.25, respectively), λ is the vector of coefficients for the control variables, and v_i is instead the error term.

4. Mechanism of ESG performance on firms' innovation capability

Good ESG performance significantly influences firms' investment in innovation, including R&D expenditures and technological innovation activities. A firm's commitment to environmental protection, social responsibility, and optimization of its governance structure can enhance its reputation with investors and consumers, which in turn attracts more capital to be invested in innovation projects. In addition, companies with strong ESG performance manage their resources more efficiently and optimize their cost structure, freeing up more capital for innovation activities. For example, by reducing energy consumption and waste emissions, companies not only help protect the environment, but also reduce operating costs, and these savings can be reinvested in R&D and technological innovation. As a result, firms' innovation inputs increase, laying the foundation for innovation outputs.

Companies with strong ESG performance have a significant advantage in shaping an environment conducive to innovation, both internally and externally. Internally, good social responsibility practices help build an open and inclusive corporate culture that encourages employees to come up with new ideas and innovative solutions, while an excellent governance structure ensures that these innovative activities are effectively implemented and managed. Externally, by actively participating in social activities and environmental programs, these companies are able to establish good cooperative relationships with the government, research institutes, and other enterprises, thereby acquiring new knowledge, technology, and market information, and providing external support for their innovative activities[3]. In addition, good ESG performance also helps enterprises to exert more influence in policy making and gain more policy support and resources.

An enterprise's ESG performance not only increases innovation inputs and shapes a favorable innovation environment, but also directly affects innovation outputs, such as the development and marketing of new products and services. Through effective environmental management and social responsibility activities, firms are able to build a unique brand image in the marketplace and increase the attractiveness of their products and services, thereby promoting market acceptance and commercial success of new products. At the same time, these activities help companies attract and retain top talent in the industry, which is often a key driver of innovative activities. Further, a good governance structure ensures the effective management and execution of a firm's innovation activities, improving innovation efficiency and effectiveness. In summary, ESG performance contributes to the improvement of corporate performance by enhancing corporate innovation capabilities, creating a virtuous cycle that not only promotes sustainable corporate development, but also brings positive impacts to society and the environment.

5. Recommendations

In the context of the dual-carbon goals, research on the relationship between ESG performance and corporate performance reveals the central role of corporate innovation capacity in promoting sustainable development and improving corporate performance. Based on this, the following recommendations aim to help companies optimize their ESG performance and stimulate their innovation capacity so as to achieve the dual goals of financial and social responsibility.

5.1. Strengthen ESG strategic planning and implementation

Enterprises should incorporate ESG factors into their long-term strategic planning and establish clear ESG objectives and implementation paths. Specifically, enterprises need to assess their current situation in terms of environmental protection, social responsibility and corporate governance, and identify room for improvement and potential risks. Based on this, companies should develop implementation programs, including but not limited to reducing carbon emissions, improving resource efficiency, strengthening social and environmental responsibility management in the supply chain, and establishing a comprehensive stakeholder communication mechanism. At the same time, enterprises should raise employees' awareness of the importance of ESG through regular training and education to form an atmosphere of full participation.

5.2. Promote the enhancement of enterprise innovation capability

Innovation is the key driving force for the sustainable development of enterprises. Enterprises should emphasize R&D investment and encourage technological innovation and management innovation to improve their core competitiveness. On the one hand, enterprises can accelerate the pace of technological innovation by increasing R&D investment and introducing high-end research equipment and excellent talents. On the other hand, enterprises should strengthen cooperation with universities and scientific research institutions and utilize external resources to promote the implementation of innovative projects. In addition, enterprises should also establish incentive mechanisms to encourage employees to participate in innovation activities, inspire innovation through knowledge sharing and teamwork, and form an enterprise culture of continuous innovation.

5.3. Enhance the enterprise performance evaluation system

Enterprises should establish and improve the performance evaluation system that includes ESG factors, and directly link ESG performance with employee performance and management appraisal. This not only helps to promote the consistency between corporate goals and personal goals, but also better inspires employees and management to recognize and practice ESG values. Enterprises should regularly assess ESG performance to adjust and optimize the strategic direction and implementation measures in a timely manner. By taking ESG performance as an important reference for corporate decision-making, companies can more effectively manage and reduce environmental and social risks in their

business operations and enhance their overall social image and brand value.

6. Conclusion

This study examines the relationship between ESG performance and firm performance in a dual-carbon context from the perspective of corporate innovation, and finds that good ESG performance not only directly has a positive impact on firm performance, but also indirectly contributes to the improvement of firm performance by enhancing corporate innovation. This finding emphasizes the importance of implementing ESG strategies and promoting corporate innovation in modern corporate management. In the future, firms should pay more attention to the improvement of ESG performance and realize the dual goals of sustainable development and performance improvement through innovation drive.

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