Environmental, Social, and Governance (ESG)'s Impact on Business Innovation

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Abstract. The relationship between business innovation and ESG (Environmental, Social, and Governance) performance is investigated in this study. Using data from Chinese A-share listed companies from 2009 to 2023, it examines the connection between ESG standards and businesses' ability to innovate. Strong ESG performance and increased corporate innovation are found to be significantly positively correlated. This relationship holds across multiple regression specifications, confirming the reliability of the ESG-innovation link. Three key mechanisms can be identified: (1) ESG improves access to capital and resources for R&D (research and development), (2) ESG initiatives draw innovative talents to the enterprise, and (3) ESG reduces compliance risks in innovation processes. The results show the strategic value of ESG integration and suggest that businesses with robust ESG frameworks have a higher chance of long-term innovative success and steady growth. These findings show that ESG adoption should be promoted to support long-term technical progress and competitive advantage, which has significant ramifications for company management and policymaking. Future research directions could include cross-country comparisons and sector-specific analyses to further validate these findings and explore implementation challenges.

1 Introduction

Since the dawn of the 21st century, environmental issues such as resource limitations and global climate change have become increasingly prominent. Simultaneously, social contradictions including widening wealth gaps and inadequate protection of labor rights have escalated. Furthermore, the 2008 financial crisis exposed the corporate governance deficiencies. These challenges have prompted capital markets to reassess the adequacy of traditional financial metrics. As an evaluation framework integrating environmental, social, and governance (ESG) dimensions, ESG enables multidimensional assessment of enterprises' sustainable development capabilities. Consequently, since 2018, global capital has flowed massively into ESG ETF assets, reaching a scale of $644 billion by November 2024 [1]. Meanwhile, ESG investment has rapidly become mainstream among Chinese listed companies. According to the China Listed Companies ESG Action Report (2022-2023), "ESG or corporate social responsibility reports were independently released by 1,738 A-share listed firms by the end of June 2023, representing a 22.14% rise from the previous year." [2].

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ESG information disclosure has gradually shifted from voluntary to mandatory, demonstrating that ESG has become a focal point for both the market and China as a whole. Corporate innovation serves as a core driver of technological advancement and industrial upgrading, playing a vital role for both individual enterprises and the whole society. At the micro level, innovation capacity determines firms' competitiveness and growth; at the macro level, the agglomeration of innovative firms fuels sustainable economic growth. Today, corporate innovation has transcended its conventional focus on pure economic benefits, embracing broader environmental and social value dimensions. Through technological innovations-such as solar photovoltaic power generation and intelligent manufacturing processes-firms can effectively mitigate resource and environmental pressures, addressing the environmental dimension of ESG requirements. Simultaneously, inclusive innovations like affordable healthcare, educational technology, and supply chain responsibility initiatives demonstrate deep alignment with the social objectives of ESG frameworks.

Despite growing interest, academic consensus remains elusive regarding the intrinsic link between ESG performance and innovation activities: some scholars argue that corporate financial investments in ESG initiatives may potentially crowd out resources allocated to R&D endeavors [3]; conversely, alternative perspectives suggest that robust ESG performance can facilitate innovation by reducing financing costs and enhancing stakeholder trust [4], thereby providing essential resource support for corporate innovation. The next goal of this study is to look into how corporate ESG strategies affect the course of innovation.

2 Literature review

2.1 Research on ESG

The ESG principle were formally presented in 2004 with the goal of advancing the sustainable growth of the global economy and society. The three components of the ESG framework system are governance (G), society (S), and environment (E). Specifically, at the environmental level, the main emphasis is on how a business affects the environment, including waste management, resource use, energy use, and the adoption of environmentally friendly technologies. At the social level, it reflects the role a company plays in society and its contributions, such as employee welfare, consumer rights protection, and active fulfillment of social responsibilities. At the governance level, the emphasis is on the company's governance structure, decision-making mechanisms, compliance, and transparency.

Since ESG originates from corporate Social Responsibility (CSR), these two terms are often used interchangeably. Therefore, the literature review needs to include relevant CSR literature. Besides, ESG originated from developed regions such as North America and Europe, and these countries have relatively mature ESG practices. Thus, research on ESG is abundant. Through analyzing existing studies, most scholars currently mainly focus their analysis of ESG performance on financial indicators, corporate value, philanthropy, company employees, and directors [5]. Specifically, it can be summarized into two aspects: enterprises and stakeholders.

At the enterprise level, ESG significantly impairs company financial performance, according to Zhan's study of Western European corporations [6]. Koh et al. believed that good CSR performance can serve as a critical insurance mechanism, which can help companies to prevent relevant corporate risks [7]. Dell'Erba and Ferrarini studied the relationship between executive remuneration and ESG in Europe and showed two controversial conclusions: the pessimistic perspective argues that executive compensation mechanisms may exacerbate agency problems; whereas the optimistic view posits that corporate executives will integrate

ESG strategies into core decision-making processes [8].

At the stakeholder level, Dai et al. studied US companies and found that good ESG performance may promote CEOs of enterprises to engage in more philanthropic behaviors [9]. In their study of Chinese listed businesses, Zhang et al. showed that corporate ESG practices may raise employee satisfaction and that the more educated people are, the greater the favorable effect [10].

The measurement indicators for ESG are not yet complete and unified. The Sustainability Reporting Guidelines, released by the Global Reporting Initiative (GRI), provide pertinent indicators for social and environmental aspects. Two standards, IFRS S1 and IFRS S2, were recently released by the International Sustainability Standards Board (ISSB). These standards mainly deal with general reporting obligations and disclosures pertaining to climate change. The European Sustainability Reporting Standards (ESRS), on the other hand, encompass all three aspects of ESG but they are still lacking two cross-cutting standards and ten topical standards. Overall, ESG assessment methods predominantly rely on composite scoring methods. The FTSE4 Good Series, Bloomberg ESG Index, Sino-Securities Index ESG Ratings, and MSCI ESG Indices are all globally significant ESG rating agencies. These ESG indicators are also used in the majority of scholarly papers for evaluations pertaining to ESG.

2.2 Research on corporate innovation

In 1912, economist Joseph Schumpeter initially proposed the idea of "corporate innovation" in his book, The Theory of Economic Development. The "father of modern management," Peter Drucker, introduced innovation into the management sector around the 1950s. Corporate innovation refers to a company's ability to systematically plan and implement innovation activities. These activities are not limited to technological innovation; they may also encompass management innovation, design innovation, and business model innovation. Because it has an impact on a company's competitive advantage as well as the long-term viability of the economy and society as a whole. Therefore, corporate innovation has garnered extensive attention, with numerous scholars dedicating themselves to exploring the dimensions through which corporate innovation can be promoted. Overall, the impact of independent directors on corporate innovation can be broadly categorized into three main aspects: corporate governance, production factors, and external influences.

In terms of corporate governance, according to the Li et al. study, independent directors can improve a company's capacity for innovation. This effect is particularly pronounced when independent directors possess technical expertise that is relevant to the firm's business operations, often driving the firm to engage in deeper and more targeted innovation within related technological fields [11]. Zhang and Tang, in their study of Chinese listed companies, revealed that private enterprises exhibit greater innovativeness [12]. According to Pham et al. (2018), organizations with high levels of liquid assets have a tendency to invest more in research and development (R&D) activities, which leads to the accumulation of more patent outcomes. This suggests that these firms have greater corporate innovation capabilities [13]. In terms of external factors, the study by Elmawazini et al. analyzed two distinct environments: under R&D competition conditions, stringent competition policies and robust intellectual property protection maximize corporate innovation; whereas in R&D cooperation settings, strict competition policies coupled with weak intellectual property protection paradoxically yield stronger innovation performance [14].

Currently, the measurement of corporate innovation mainly focuses on three dimensions: inputs, outputs and comprehensive evaluation method. From an input standpoint, R&D spending or R&D intensity—that is, R&D spending as a percentage of total assets—are frequently used to describe business innovation. From an output perspective, most scholars define innovation based on the number of patents applied for or granted. From a comprehensive perspective, some studies assess corporate innovation by considering the conversion efficiency between inputs and outputs.

3 The Influence Pathways of ESG on Corporate Innovation

3.1 Direct impact pathway

Optimizing corporate resource allocation, bolstering talent acquisition, and improving corporate risk management competence are three ways that ESG performance can promote business innovation capability.

First, from the perspective of resource allocation, according to stakeholder theory, the survival and development of enterprises depend on numerous stakeholders, among which investors are one of the most important parts. As investors increasingly focus on ESG-related issues, firms with superior ESG performance are more likely to gain their favor [15], thereby attracting more capital inflows. As a result, they have more financial resources and materials to invest in R&D activities. Moreover, strong environmental management capabilities, social value integration capabilities, and corporate governance capabilities can help enterprises reduce compliance costs, environmental costs, and other expenses. Therefore, enterprises can save costs and allocate more resources to R&D.

Second, from the perspective of talent attraction, according to signaling theory, good ESG performance helps enterprises convey a positive employer image to the outside world. This attracts high-caliber individuals who possess both innovative capabilities and a sense of social responsibility, thereby strengthening the firm's overall innovation capacity. Additionally, employees are more satisfied when an organization performs better in terms of ESG [10]. Based on the social exchange theory in organizations, employees with higher satisfaction tend to have better work engagement and are able to propose more innovative solutions, driving the enterprise's innovation activities.

Last but not least, a company's capacity to recognize and control possible risks is improved by strong ESG performance [16], which fosters innovation by making the environment more stable and encouraging. Risk management theory states that successful risk management can increase business productivity and success rates. For example, enterprises fully consider ESG factors during the R&D process, thereby avoiding R&D failures caused by violations of relevant laws, regulations, or social ethical standards, and thus improving the success rate of innovation.

3.2 Research Methods

3.2.1 Data Sources

The initial investigation sample for this study is mostly selected from A-share main board listed businesses on the Shanghai and Shenzhen Stock Exchanges between 2009 and 2023. The author excluded financial institutions, ST/*ST firms, and samples with excessive missing values. After these screening procedures, a final dataset of 41,832 firm-year observations is obtained. Considering the large implement winsorization at the 1% level to mitigate outlier effects. The data sources include: (1) CSMAR database, (2) Sino-Securities Index ESG Ratings. Excel 2021 and Stata 18 are used for data processing and model estimation.

3.2.1 Empirical Model Setting

This paper specifies Regression Model (1) to examine whether ESG performance can influence corporate innovation.

$$Inn_{it}=\alpha_0+\alpha_1\,Inn_{it}+\alpha_i\,Inn_{it}+\varepsilon_{it} \tag{1}$$

In Model (1): The dependent variable is corporate innovation (Inn); the independent variable is firm ESG performance (ESG); 'Control' refers to all control variables, including book-to-market ratio (Btm), total assets (Asset), debt-to-asset ratio (Dta), revenue growth rate (Growth), total asset turnover ratio (Rta), shareholding ratio of the largest shareholder (Top), cash ratio (Cfr), proportion of independent directors (Indep), state-owned enterprise (Soe), CEO-chair duality (Dual), industry (Ind), year (Year).

3.2.3 Variables

Dependent variable: corporate innovation (Inn). In order to gauge organizations' capacity for innovation, this study tallies the number of patent applications they have received, including invention, utility model, and design patents. Independent variable: ESG performance (ESG). Considering this study focuses on Chinese listed companies, and the localized advantage of the Sino-Securities ESG Index, this study uses its scores to measure ESG performance. Control variables: Based on Feng Lingbing's (2025) research method and comprehensively considering the influencing factors of corporate innovation, this paper selects a total of 12 control variables, including book-to-market ratio, total assets and debt-to-asset ratio [17].

Table 1 displays the descriptions and precise measurements of the variables listed above.

Table 1. Variables measurements

Variable Type	Variable Name	Symbol	Definition and Measurement
Dependent Variable	Corporate Innovation	Inn	Natural logarithm of (1+total patent applications)
Independent Variable	ESG Performance	ESG	An extensive index for assessing the governance, social, and environmental aspects
Control Variables	Book-to-Market Ratio	Btm	Total assets/ market value
	Total Assets	Asset	Natural logarithm of total assets
	Debt-to-Asset Ratio	Dta	Total liabilities / total assets
	Revenue Growth Rate	Growth	[(Current year's revenue - Previous year's revenue) / Previous year's revenue] × 100%

Variable Type	Variable Name	Symbol	Definition and Measurement
	Total Asset Turnover Ratio	Rta	Operating income / Average total assets [Average total assets = (Ending balance assets + Beginning balance assets) / 2]
	Shareholding Ratio of the Largest Shareholder	Top	Proportion of shares held by the largest shareholder
	Cash Ratio	Cfr	(Cash + Cash equivalents) / Current liabilities
	Proportion of Independent Directors	Indep	Number of independent directors / Total board members
	State-Owned Enterprise	Soe	1 if state-controlled, 0 otherwise
	CEO-Chair Duality	Dual	1 if CEO and chairman are the same person, 0 otherwise
	Industry Effect	Ind	Industry dummy variable
	Year Effect	Year	Year dummy variable

3.3 Results

This study estimates Model (1) through multiple linear regression, with the results presented in Table 2. The regression coefficient of ESG is 0.0205, which is significantly correlated with corporate innovation at the 1% significance level. This validates the findings from earlier investigations by indicating that improved ESG performance boosts business innovation capabilities.

Table 2. The results of the impact of ESG on corporate innovation

Variables	Model（1） Inn
ESG	0.0205*** (19.03)
Btm	0.2265*** (-14.15)
Asset	0.2903***

	(101.02)
Data	-0.1945 *** (-11.34)
Growth	-0.0434 *** (-6.21)
Rta	0.1181*** (15.54)
Top	0.0001 (0.47)
Cfr	-0.0255*** (-13.25)
Independ	-0.0013 *** (-2.81)
Soe	0.0204 *** (3.30)
Dual	0.0254*** (4.53)
Ind	YES
Year	YES
observations	41,832
R-squared	0.5411
Root MSE	0.4953

Note: *** indicates $p < 0.01$, ** indicates $p < 0.05$, * indicates $p < 0.1$; the values in parentheses are t - values.

4 Conclusion

This study shows a strong and direct relationship between business innovation and ESG practices, confirming that the two have a major positive influence. This implies that enterprises can foster overall innovation by enhancing their ESG performance, thereby providing a novel strategic perspective for sustainable corporate development. Furthermore, ESG enhances corporate innovation capabilities through three primary mechanisms. First, businesses with high ESG performance draw in more capital, which means they may invest more in research. Second, these businesses are in a better position to draw in creative talent. Additionally, companies who have better ESG policies are better able to reduce compliance risks during R&D, which raises the success rates of innovations.

The study makes the following suggestions for business practices and future advancement in light of these findings: First, companies should create cross-departmental ESG innovation task forces to incorporate ESG concepts into their innovation strategy. This makes it easier to systematically integrate environmental, social, and governance goals into research and development procedures, resulting in the establishment of a synergistic relationship between innovation and ESG. Second, companies need to refine their talent cultivation systems by creating competitive green positions and sustainable development programs to attract and nurture interdisciplinary innovators who possess both technical expertise and ESG awareness. Third, enterprises should strengthen their ESG risk management frameworks by embedding environmental compliance, social ethics, and governance standards into the entire innovation project evaluation process, thereby enhancing innovation success rates. Lastly, in order to create ESG innovation discussion channels, businesses should actively engage with stakeholders, such as communities, employees, and investors. These platforms will enable collective identification of innovation opportunities, shared access to innovation outcomes, and the formation of an ecosystem for sustainable innovation.

Future research could extend the boundaries of ESG-innovation relationships across multiple dimensions. Regarding heterogeneity analysis, investigations may delve deeper into how ESG influences innovation across varying industries and firm sizes. Furthermore, while extant literature predominantly emphasizes the positive effects of ESG, a significant proportion of companies remain hesitant to implement comprehensive ESG systems. Consequently, future studies should identify multidimensional barriers impeding ESG adoption within corporate contexts.

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