“ESG performance and corporate adaptability: Evidence from listed companies in China”

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ESG PERFORMANCE AND CORPORATE ADAPTABILITY: EVIDENCE FROM LISTED COMPANIES IN CHINA

Abstract

Strengthening environmental, social, and governance (ESG) practices is a keyway for corporations to improve their adaptability and cope with uncertainty. This study explores how ESG performance affects the adaptability of listed companies in China. The study used an observation data set of 45,031 Chinese listed companies from 2009 to 2024, and the fixed effect regression model was used to reveal the positive impact of ESG performance on corporate adaptability. The benchmark regression results show that the overall ESG performance has significantly improved corporate adaptability. In-depth analysis shows a significant U-shaped relationship between environmental performance and corporate adaptability. This shows that environmental investment will initially inhibit corporate adaptability due to cost pressure, but once it exceeds a certain threshold, it will have a positive impact. At the same time, both the social and governance dimensions show a continuous linear improvement effect. Heterogeneity analysis shows that higher internal agency costs will weaken the positive impact of ESG, while higher levels of external supervision will enhance these impacts. The economic consequence test corroborates that ESG performance indirectly has a positive impact on corporate value by enhancing adaptability. The research results show that for corporates operating in a dynamic environment, ESG development should be regarded as a strategic investment, especially through long-term continuous improvement of social and governance performance to overcome the threshold of environmental management costs, which can effectively enhance the corporate resilience and corporate adaptability of corporates and ultimately enhance the corporate value.

Keywords ESG performance, adaptability, sustainability, corporate value, Chinese listed companies, agency costs, supervision levels

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INTRODUCTION

Against the background of the deep integration of the global economy and sustainable development, the principles of environment, society, and governance (ESG) are increasingly prominent, which have become key determinants of the sustainable development of corporates. ESG performance shapes a corporation's reputation and directly affects the corporation's access to policy support, financing channels, and social recognition (Bilyay-Erdogan et al., 2024), which is of great significance to the continued development of the corporate.

At the same time, enterprises operating in the environment of frequent institutional changes and violent market fluctuations rely more and more on organizational adaptability to maintain their sustainable development, that is, the ability to dynamically and effectively integrate and reorganize resources and maintain innovative vitality while responding to uncertainty (Wang & Ahmed, 2007). Existing studies have explored the origin of enterprise adaptability from the perspective of macro-level factor coordination, digital transformation and

leadership development (Xu & Xu, 2025; Sun et al., 2024; Uhl-Bien & Arena, 2018). However, a key scientific question has not been fully answered: How can ESG practices aimed at achieving sustainable value be systematically transformed into adaptability to the dynamic environment?

Although the existing literature generally recognizes the positive significance of ESG, they mainly regard ESG as a holistic concept and examine its macro impact on financial performance or risk. The three ESG dimensions – environment (E), society (S), and governance (G) – may present significantly different or even non-linear impact mechanisms, and existing research still lacks clear explanations and reliable empirical evidence. Therefore, this study is represented by China, an emerging transformation market, to explore how ESG performance affects the adaptability of enterprises, so as to supplement the research on the ESG effect and the factors affecting the adaptability.

1. LITERATURE REVIEW AND RESEARCH HYPOTHESES

ESG stands for environmental, social, and governance factors. The concept of ESG is an extension of the principle of corporate social responsibility (CSR). As CSR develops to a certain stage, external environmental factors change, and ESG is born (Shi & Shizhong, 2022). The concept of ESG originated from the report "Who Cares Who Wins" released by the United Nations in December 2004. Academic discussions on its nature and conceptual framework continue to this day. Adhering to the core principle of "making profits and doing good deeds", ESG requires corporates to examine their environmental and social impact while being responsible to shareholders and other stakeholders. It integrates corporate governance, strategy, and risk management into its assessment framework (Truant et al., 2023). This study believes that corporate ESG performance refers to the integration of environmental, social, and governance issues into their business models, thus extending to environmental and social values based on economic values. The theoretical basis is sustainable development theory and stakeholder theory. This method balances the responsibility to shareholders and responsibility to stakeholders and promotes harmonious and sustainable development between a corporation and its environment and the social environment (Nurlanova et al., 2020; Stuart et al., 2023). Therefore, the ESG performance examined in this study is a comprehensive evaluation obtained after systematically scoring and rating the effective actions taken by a company in the fields of environment, society, and governance. It specifically reflects the practical results achieved through a series of ESG investment and development activities.

Corporate adaptability is a manifestation of organizational ability. From the perspective of the resource base, static characteristics will cause corporates to lose their competitive advantage in a changing environment. Therefore, Teece et al. (1997) and Kangalakova and Sabden (2017) explored the adaptability of corporations in dynamic environments in their pioneering research. Specifically, it refers to the integration, construction, and reconstruction of internal and external resources of corporates, to rapidly change the ability to gain a competitive advantage in the environment. Subsequently, scholars developed the concept of adaptability based on different theoretical perspectives. Eisenhardt and Martin (2017) proposed that adaptability is the process of corporations using resources in a dynamic environment, especially by integrating, restructuring, acquiring, and releasing resources to adapt to and even create market changes. Winter (2003) defines dynamic ability as the ability to expand, modify, or create conventional ability. Helfat et al. (2009) described the organization's adaptability to the dynamic environment as the purpose of creating, expanding, and modifying the resource base. From the perspective of knowledge, Wang and Ahmed (2007) integrate adaptability into the broader concept of organizational dynamic ability and believe that adaptability, absorption ability, and innovation ability together constitute the dynamic ability of an organization.

At present, corporations in developing countries are facing an external environment full of uncertainty, characterized by the continuous evolution

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of the market system, the frequent adjustment of policies, and the rapid change of social expectations. Their adaptability is no longer dependent solely on traditional financial resources or technological advantages, but increasingly on trust-based relationships and collaborative networks with diverse stakeholders, including governments, communities, employees, and the environment. The ESG performance of corporations is a key means of building and maintaining organic links with stakeholders (Ding et al., 2021; Liu & Yin, 2020). Stakeholder theory suggests that companies should value stakeholder groups and carefully cultivate relationships with them. Enterprises should not only focus on shareholder returns. In fact, scholars are increasingly focusing on ESG performance rather than just financial performance, which is a manifestation of stakeholder theory (Li et al., 2023). ESG is not just about investing. The ESG performance of a company will bring a reputation to itself. This reputation will enhance the confidence of stakeholders (Chen & Xie, 2022). Ultimately, the company will gain brand reputation, gain an advantage in competition, and achieve growth as a result (Kizys et al., 2021). Therefore, ESG performance can systematically strengthen the connection between corporates and key stakeholders and accumulate valuable reputation capital and social capital. These intangible assets can be transformed into stronger risk buffering capabilities, resource access capabilities, and strategic adaptability during crises. In addition, the input of corporates in ESG shows that they maintain close interaction with stakeholders, thus producing a supervisory governance effect and facilitating external supervision. For example, Dyck et al. (2019) believe that the disclosure of ESG information by listed companies can enhance the attention of institutional investors to sustainable value creation, encourage them to actively participate in environmental protection and corporate social responsibility initiatives, and restrain the short-term tendency of management, ultimately by improving corporate governance to enhance Physical adaptability.

Specifically, in terms of the environmental performance (E) of corporations, the impact of environmental investment on their adaptability is not a simple linear relationship. The resource-based concept emphasizes that the financial and management resources of corporations are limited, so they must adapt flexibly to the market environment (Mayegle & Nguidjol, 2017). Resource constraints are a common challenge for corporates in developing countries. For many corporates in these economies, due to their relatively weak technical and capital base, initial environmental management investment – such as purchasing wastewater treatment equipment, upgrading emission reduction facilities, or obtaining environmental certification – requires high upfront costs and continuous operating costs. These expenses will take up resources that could have been available for market expansion, technology research and development or working capital (Auer & Schuhmacher, 2016), thus aggravating the short-term financial burden. At the same time, management must shift attention from familiar operational tasks to complex and unfamiliar environmental management affairs, which increases the cost of organizational coordination and the burden of learning. In this case, the flexibility and resource reserves of corporates to respond to market changes or technological shocks may be weakened (Martínez-Ros & Kunapatarawong, 2019), thus temporarily inhibiting their adaptability. Especially in special cases where environmental regulations in China are sometimes sharply tightened in a short period of time, passive investment by corporates to meet compliance requirements (Lin et al., 2019) is more likely to manifest as "compliance costs", which is difficult to quickly transform into competitiveness and adaptability. However, with the continuous improvement of corporate environmental performance, its contribution to adaptability will become more and more significant. Long-term and systematic environmental investment will promote corporates to pursue technological innovation and management optimization, thus creating a deeper competitiveness (Chouaibi et al., 2022; Kangalakova et al., 2024). For example, if corporates want to reduce carbon emissions and resource consumption from the root cause, they can choose to invest in more efficient production processes and circular economy technologies. Enterprises' new technologies contribute to the implementation of environmental protection actions and improve management efficiency, making them more resilient (Habib et al., 2020). At this point, if there are fluctuations in the external environment, companies can better adapt to changes. More importantly, after imple-

menting environmental protection actions, others will perceive the company as more responsible. Governments, communities, and consumers place greater trust in responsible businesses (Siew et al., 2016). The above facts indicate that although investing in environmental protection brings costs, it also provides more opportunities for enterprises. Enterprises are therefore more adaptable (Jiang et al., 2018).

Specifically, in terms of corporate social performance (S), corporate behavior at the social level can significantly improve their adaptability. Since the income of corporations comes from society, society has the right to require corporations to give back to society (Weiss, 2021). Corporations must make appropriate contributions to society in the economic, legal, charitable, and moral fields. Corporations in developing countries often face many practical challenges, such as institutional defects, increasing social conflicts, and volatility in the labor market. Therefore, building stable internal and external social relations is crucial for corporates to resist risks and achieve sustainable operations (Ben & Belkacem, 2022). The efforts of corporates at the social level – such as protecting the rights and interests of employees, maintaining community relations, assuming supply chain responsibilities, and improving product quality – are not just cost expenditures, but important investments in accumulating social capital and winning social recognition (Srivastava et al., 2022). Social capital theory states that trust, norms, and networks contained in social relations can create value for individuals or organizations (Demers et al., 2021). Within the corporate environment, employees' sense of belonging and loyalty can be enhanced by ensuring employee welfare, providing a safe working environment, and establishing a fair remuneration and promotion system. A stable and highly cohesive workforce is more willing to work with the company to cope with external shocks (Kotchen & Moon, 2012), so as to maintain the operation and vitality of the organization. Outside the corporate, winning the trust and support of the community, the public, and partners can help corporates gain the understanding and cooperation of these external stakeholders in the process of expansion or transformation. This helps corporations to obtain key support other than traditional financial resources (Cho et al., 2013), ultimately improving their adaptability.

Specifically, in terms of corporate governance performance (G), a company's performance in corporate governance can significantly improve its adaptability. Shleifer and Vishny (1997) found that the level of corporate governance directly determines the company's inherent ability to cope with complexity and uncertainty. Agency theory believes that a sound governance mechanism can alleviate conflicts of interest between owners and managers and ensure that management's behavior is consistent with the company's long-term goals – a key mechanism for improving adaptability (Shleifer & Vishny, 1997). On the one hand, the board of directors should effectively perform its duties, and the company should establish effective independent directors. In addition, the company should incentivize management to improve agency efficiency. These measures can ensure the scientific and rational strategic decision-making (Volpin, 2002). Ultimately, the mistakes of individual decision-makers will not have a significant impact, and the company's operations will not fall into difficulties. On the other hand, companies should attach importance to internal governance, especially information disclosure and risk control systems. A company should incorporate these matters into the management's assessment criteria. The management will therefore pay more attention to internal and external information and do their own work well. This helps assess potential shocks early to ensure that there is enough time to cope with changes (Piotroski et al., 2015). In developing countries, many corporates face problems such as equity concentration, family control, or insider control. Strengthening corporate governance can guide managers to focus on sustainable development rather than short-term financial performance, and encourage them to stick to decisions that can enhance long-term adaptability, such as R&D innovation and talent training (Cardillo et al., 2023). This creates conditions for corporates to maintain adaptability in a dynamic environment.

In summary, existing research shows that ESG is a key strategic factor in improving the adaptability of enterprises. Based on the stakeholder theory, resource foundation theory, and agent theory, the literature generally believes that ESG performance helps enterprises accumulate reputation and social capital, optimize internal and external gover-

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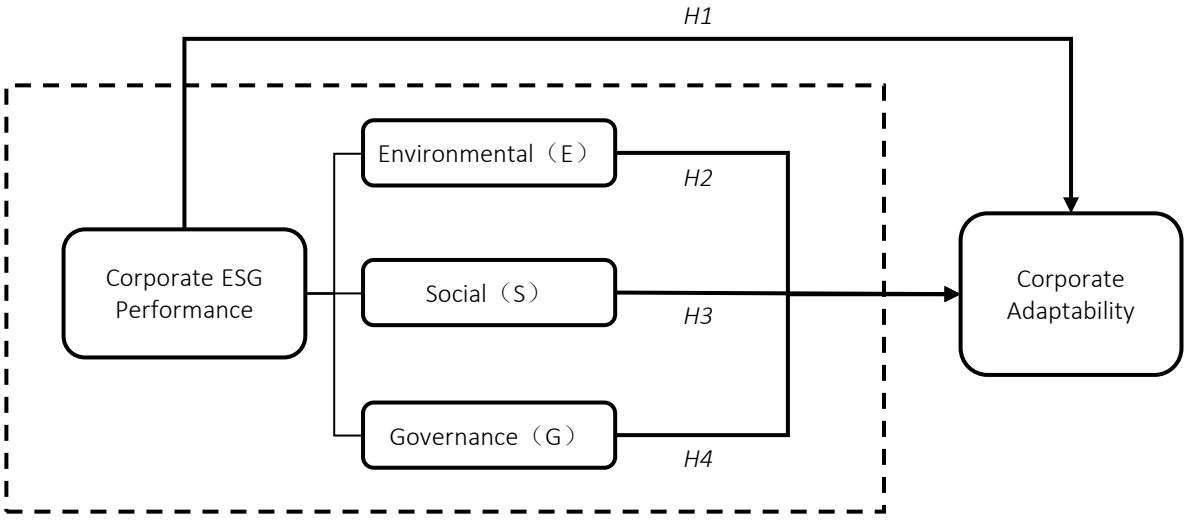

Figure 1. Research framework

nance, and thus enhance the adaptability and resilience of enterprises in a dynamic environment. However, existing studies have not reached a clear conclusion on the specific path of each ESG dimension affecting adaptability and its operating effect under different conditions. The differential influence mechanism and nonlinear relationship between these multidimensional factors have not been systematically analyzed, and empirical research in the context of China's emerging markets is still insufficient.

Therefore, this study aims to systematically examine the impact of overall ESG performance and its three constituent dimensions (environment, society, and governance) on the adaptability of listed companies in China, and reveal their potential mechanisms, boundary conditions, and deeper economic consequences.

Therefore, after an extensive literature review, this study puts forward and investigates the following research hypotheses (see Figure 1 for the diagrams of these hypotheses):

H1: *The corporate ESG performance has a significant positive impact on its adaptability.*

H2: *There is a U-type relationship between the corporate environmental (E) performance and its adaptability, that is, the initial performance shows an inhibitory effect and then turns into a promoting effect.*

H3: *The corporate social (S) performance has a significant positive impact on its adaptability.*

H4: *The corporate governance (G) performance has a significant positive impact on its adaptability.*

2. METHOD

2.1. Data collection and sample

This study takes China's A-share listed companies from 2009 to 2024 as a research sample to explore the relationship between ESG performance and corporate adaptability. The selected variables mainly come from the following databases: ESG data from the CNRDS database, and other financial data from the Wind Financial Terminal database and CSMA database. The initial sample was screened as follows: (1) exclude financial industry data; (2) exclude samples with missing values; (3) exclude ST and *ST corporates. Finally, 45,031 observations were obtained. In addition, in order to minimize the impact of extreme abnormal values, the continuous variable is truncated, and the truncated range is up and down 1%.

2.2. Variable declaration

2.2.1. *Independent variable*

The independent variable in this article is ESG performance. The Huazheng ESG rating system

is adopted, as it reflects the development logic of the ESG framework and is tailored to the characteristics of China's capital market. The system includes 3 main indicators, 14 secondary indicators, 26 third-level indicators, and more than 130 basic data indicators, fully covering the ESG evaluation of all A-share listed companies and thousands of bond issuers. The ESG score has a higher information content and can more accurately portray the ESG performance. Therefore, this study follows the approach of Tan et al. (2022) and uses the Huazheng ESG comprehensive score to measure the ESG performance of corporations. The score ranges from 0 to 100.

2.2.2. *Dependent variable*

The dependent variable is corporate adaptability. Building on the idea discussed by Yang et al. (2020), this study uses the variation coefficients of the three major expenditure items of R&D, capital, and advertising in the fiscal year of the sample corporation to measure the flexibility of resource allocation and to evaluate the adaptability of the corporation. In this paper, adaptability is reflected through the volatility of corporates' inputs in R&D, capital investment, and advertising. Specifically, I calculate the coefficient of variation for these indicators, that is, the standard deviation divided by the mean. To make the direction of the indicator easier to interpret, the value is multiplied by –1. After this adjustment, a larger coefficient represents higher adaptability.

Calculate the standard deviation of the three expenditures:

$$\sigma = \sqrt{\frac{\left(E_{rd} - X\right)^2 + \left(E_{ad} - X\right)^2 + \left(E_{cap} - X\right)^2}{3}}. \quad (1)$$

Calculate the coefficient of variation (CV):

$$CV = \frac{\sigma}{X}. \quad (2)$$

2.2.3. *Controls*

Based on existing research (Zhang & Liu, 2023; Broadstock et al., 2021), this study controls for the following variables: (1) Firm Size, (2) Asset Turnover, (3) Loss Status, (4) Cash Flow Ratio, (5) Revenue Growth Rate, (6) Number of Directors, (7) Proportion of Independent Director, (8) Capital Occupancy by Major Shareholders. Additionally, this study controls for industry and year fixed effects. The specific measurement methods for each variable are shown in Table 1.

2.3. Model settings

To examine how ESG performance relates to corporate adaptability, this study references the research of Liu et al. (2024) and constructs the following econometric model:

$$\begin{aligned} Adaptability_{i,t} &= \alpha_0 + \alpha_1 ESG_{i,t} \\ &+ \alpha_2 Controls_{i,t} + \sum Ind + \sum Year + \varepsilon_{i,t}. \end{aligned} \quad (3)$$

Given that ESG components may exert differing impacts on corporate adaptability, this study constructs the following verification model:

Table 1. Variable definition

Type	Name	Symbol	Definition
Dependent variable	Corporate adaptability	Adaptability	The specific content is as defined above.
Independent variable	ESG performance	ESG	Huazheng ESG Comprehensive Score
Control variables	Firm size	Size	Natural logarithm of total assets
	Asset turnover	ATO	Sales Revenue / Total Assets
	Loss status	Loss	Net profit for the year < 0 is treated as 1; otherwise, it is treated as 0
	Cash flow ratio	Cashflow	Net Cash Flow from Operating Activities / Total Assets
	Revenue growth rate	Growth	Operating Revenue Growth Rate B
	Number of directors	Board	The natural logarithm of the number of board members
	Proportion of independent directors	Indep	Number of Independent Directors/Directors
	Capital occupancy by major shareholders	Occupy	Other Receivables/Total Assets
	Year	Year	Year Fixed Effect
	Ind	Ind	Industry Fixed Effects

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$$Adaptability_{i,t} = \beta_0 + \beta_1 E_{i,t} + \beta_2 E_{i,t}^2 + \beta_3 Controls_{i,t} + \sum Ind + \sum Year + \varepsilon_{i,t}, \quad (4)$$

where i and t represent the company and year, respectively, $Controls_{i,t}$ represents the control variables of company i in the t period, α_0 and β_0 represent coefficients, and $\varepsilon_{i,t}$ is random error terms.

3. RESULTS

3.1. Descriptive statistics of variables

Table 2 lists descriptive statistics of key variables based on 45,031 samples. Regarding corporate adaptability, the mean is –1.0815, and the standard deviation is 0.309, indicating its distribution is relatively concentrated. The average value of the comprehensive ESG score is 73.1079, and the standard deviation is 4.885, indicating the overall ESG performance is at a medium-high level. The distribution characteristics of the other variables are consistent with existing literature, indicating the sample has a certain representativeness, and the data quality is reliable.

3.2. Baseline regression results

According to the previously established regression model, the model contains a two-way fixed effect. According to formula (3), the estimated results are shown in Table 3.

Table 3. Model benchmark regression results

Variables	(1)	(2)	(3)
	Adaptability	Adaptability	Adaptability
ESG	0.005***	0.003***	0.003***
	(10.287)	(6.311)	(7.016)
Size			–0.008***
			(–3.670)
ATO			0.018**
			(2.547)
Loss			–0.001
			(–0.318)
Cashflow			0.165***
			(6.351)
Growth			–0.006*
			(–1.948)
Board			–0.007
			(–0.440)
Indep			0.000
			(0.525)
Occupy			0.222**
			(2.545)
Ind	NO	YES	YES
Year	NO	YES	YES
Constant	–1.481***	–1.277***	–1.132***
	(–38.209)	(–41.099)	(–18.530)
Observations	45,031	45,031	45,031
R^2	0.008	0.438	0.441

Note: Values in parentheses represent the robust standard error for clustering. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively. The same applies to subsequent sections.

Table 3 shows the core regression results. Column (1) only enters the performance, and its coefficient is positive and significant at the 1% level. Column (2) further controls for the fixed effect of industry and year, and the ESG coefficient is still signifi-

Table 2. Summary statistics

Variable Name	Obs	Mean	SD	Min	Median	Max
Adaptability	45031	–1.0815	0.309	–1.41	–1.13	–0.29
ESG	45031	73.1079	4.885	57.62	73.33	83.88
ESG_E	45031	60.7890	7.108	45.76	60.62	80.44
ESG_S	45031	74.4462	8.925	47.22	75.22	100.00
ESG_G	45031	79.1322	6.670	53.81	80.52	91.00
Size	45031	22.1546	1.307	19.70	21.96	26.23
ATO	45031	0.6378	0.432	0.07	0.54	2.57
Loss	45031	0.1548	0.362	0.00	0.00	1.00
Cashflow	45031	0.0461	0.071	–0.17	0.05	0.25
Growth	45031	0.1546	0.402	–0.59	0.10	2.49
Board	45031	2.1164	0.198	1.61	2.20	2.64
Indep	45031	37.6569	5.330	33.33	36.36	57.14
Occupy	45031	0.0149	0.024	0.00	0.01	0.15

cantly positive. On this basis, Column (3) includes control variables at the company level. ESG is still significant at the significance level of 1%, and the fit further improvs to 0.441. The overall results show that ESG continues to have a positive impact on corporate adaptability, effectively verifying the research hypothesis 1.

Table 4. Partial regression results

Variables	(1)	(2)	(3)
	Adaptability	Adaptability	Adaptability
ESG_E	–0.012***		
	(–3.644)		
ESG_E²	0.000***		
	(3.353)		
ESG_S		0.002***	
		(7.853)	
ESG_G			0.001***
			(3.606)
Controls	YES	YES	YES
Ind	YES	YES	YES
Year	YES	YES	YES
Constant	–0.625***	–1.065***	–1.058***
	(–5.419)	(–18.387)	(–17.513)
Observations	45,031	45,031	45,031
R^2	0.440	0.442	0.440

Table 4 further reports the estimates for environment (E), society (S), and governance (G) to corporate adaptability. For the environmental dimension, the coefficients on the linear and squared terms display opposite signs: the linear term is negative and significant at the 1% level, whereas the squared term is positive and also significant at the same level. This pattern indicates a U-shaped association between environmental performance and adaptability. Regarding the other two dimensions, both the social (S) score and the governance(G) score yield positive coefficients, and each is significant at the 1% threshold. These results suggest that improvements in social and governance performance are linked to higher adaptability in a roughly linear manner. Therefore, assumptions 2, 3, and 4 are effectively verified.

3.3. Endogeneity and robustness tests

To verify the robustness of the regression results, this study adopts the following methods to test for endogeneity and robustness.

3.3.1. Lag model testing

To solve the potential inverse causality problem, this study will lag behind ESG performance (L. ESG) and introduce the main regression model as proxy variables. The estimated results are presented in columns (1) to (4) of Table 5. These results indicate that lagged ESG performance (L.ESG) still significantly promotes corporate adaptability. This performance validates the previous conclusion. Therefore, the conclusion of this study is not affected by the reverse causality problem. The conclusion of this study is robust.

Table 5. Test results for lagging models

Variables	(1)	(2)	(3)	(4)
	Adaptability	Adaptability	Adaptability	Adaptability
L.ESG	0.003***			
	(5.913)			
L.E		–0.014***		
		(–3.818)		
L.E²		0.000***		
		(3.605)		
L.S			0.002***	
			(7.991)	
L.G				0.001**
				(2.292)
Controls	Yes	Yes	Yes	Yes
Ind	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Constant	–1.074***	–0.503***	–1.026***	–0.988***
	(–15.949)	(–3.844)	(–16.134)	(–14.817)
Observations	39,198	39,198	39,198	39,198
R^2	0.418	0.418	0.419	0.417

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3.3.2. Change the measurement method of the dependent variable

Column (1) of Table 6 shows the empirical results after replacing the core dependent variables. The relationship between ESG performance and organizational resilience is positive and significant, confirming that there is a positive correlation between firm ESG performance and corporate adaptability. This shows the robustness of the main regression results.

3.3.3. Modifying the measurement method for independent variables

This study further examines the robustness of the independent variables' measurement approach. Drawing on the method of Xie and Lyu (2022), the results of Huazheng ESG rating were adopted. The regression results in column (2) of Table 6 show that the direction and significance of the coefficients of the core explanatory variables are highly consistent with the main test results, which further supports the conclusions' robustness.

3.3.4. Provincial fixed effects control

To reduce the estimated deviation that may be caused by the omission of variables, this study incorporates the provincial fixed effect based on the original control variable. The empirical results are shown in column (3) of Table 6. The ESG coefficient remains significant. This result demonstrates the robustness of the conclusion.

Table 6. Results of robustness tests

Variables	(1)	(2)	(3)
	Resilience	Adaptability	Adaptability
ESG	0.000***		0.002***
	(5.660)		(5.583)
ESG_rating		0.011***	
		(5.642)	
Controls	Yes	Yes	Yes
Ind	Yes	Yes	Yes
Year	Yes	Yes	Yes
Province	NO	No	Yes
Constant	0.777***	–0.960***	–1.107***
	(172.437)	(–16.460)	(–17.598)
Observations	42,763	42,763	42,763
R^2	0.742	0.445	0.453

3.4. Heterogeneity analysis

The regulatory effect deserves attention in this study. This study aims to explore the regulatory effects of different internal and external environments. This kind of discussion can help companies better understand the impact of ESG.

3.4.1. Analysis of the modulating effects of internal conditions

In this study, the agent cost (AC) is selected as the adjustment variable. As shown in column (1) of Table 7, the empirical results show that the coefficient of the ESG*AC interaction terms is negative at the significance level of 1%. This shows that in groups with high agency costs, the role of ESG in improving corporate adaptability is significantly weakened. Theoretically, under the framework of dual power separation, the internal operating environment of a corporation largely depends on management decision-making. Managers' agency efficiency reflects the degree of diligence in their work (Sdiq & Abdullah, 2022), which is a key factor affecting the effectiveness of ESG practices. When the management's agency efficiency is low, executives may prioritize short-term private interests over long-term corporate value, thus weakening the implementation of long-term strategic activities such as ESG (Tayeh et al., 2023). Therefore, in companies with high agency costs, management may only regard ESG as compliance spending or public relations activities, rather than a real strategic tool to improve corporate adaptability, thus limiting its positive impact. Therefore, in companies with effective internal governance and low agency costs, the role of ESG in promoting corporate adaptability can be given fuller play.

3.4.2. Analysis of the modulating effects of external conditions

The shareholding ratio of institutional investors (INST) is selected as a proxy variable of the external environment. As shown in column (2) of Table 7, the coefficient of the interactive item ESG*INST is significantly positive at the significance level of 1%, indicating that the shareholding ratio of institutional investors (INST) amplifies the positive impact of ESG on corporate adaptability. As a professional external supervisory force, institutional

investors can impose external constraints on corporates (Ting et al., 2008). Institutional investors usually have strong information interpretation and analysis capabilities (Helwege et al., 2012), which enables them to identify and amplify the positive impact of ESG performance. This continues to motivate corporates to carry out substantial information disclosure and performance improvement. In addition, external supervision pressure reduces the possibility of management carrying out symbolic ESG behaviors such as "greening", thus more effectively transforming ESG advantages into sustainable adaptability.

Table 7. Heterogeneity analysis results

Variables	(1)	(2)
	Adaptability	Adaptability
ESG	0.004***	0.003***
	(9.099)	(7.037)
AgC	–0.000***	
	(–8.207)	
ESG*AgC	–0.000***	
	(–8.200)	
INST		–0.011
		(–1.044)
ESG*INST		0.005***
		(3.207)
Ind	Yes	Yes
Year	Yes	Yes
Constant	–1.213***	–1.132***
	(–19.337)	(–18.038)
Observations	44,246	44,970
R^2	0.442	0.442

3.4.3. Economic consequence test

Prior research suggests that strong ESG performance can enhance corporate adaptability. Will this positive impact also extend to corporate value? To explore this important economic significance, this study develops the following model based on the framework proposed by Qiu et al. (2025):

$$TobinQ_{i,t} = \gamma_0 + \gamma_1 Adaptability_{i,t} + \gamma_2 ESG_{i,t} + \gamma_3 ESG \cdot Adaptability_{i,t} + \gamma_4 Controls_{i,t} + \sum Ind + \sum Year + \varepsilon_{i,t} \quad (5)$$

Corporate value is the main economic achievement of enterprise operation. Tobin's Q value is often used to reflect a company's value. This study chooses to further investigate the impact of adaptability on Tobin's Q value. In addition, this study also examines the moderating effect of ESG. Table 8 shows the results of the regression analysis. The positive impact of adaptability on corporate value is strongly supported, as shown in column (1) of Table 8 (coefficient = 0.095, $p < 0.01$). Furthermore, the moderating effect of ESG is also supported. The interaction term between ESG and adaptability is positive and significant at the 1% level, indicating that ESG performance enhances the role of adaptability in improving corporate value. Similar results were obtained by examining the three dimensions of environment (E), society (S), and governance (G) separately. These results are presented in columns (2) to (4) of Table 8. ESG performance can help companies gain trust. Long-term investors attach great importance to this. Their recognition enhances enterprise value.

Table 8. Regional heterogeneity differences

Variables	(1)	(2)	(3)	(4)
	TobinQ	TobinQ	TobinQ	TobinQ
Adaptability	0.176**	0.137*	0.144*	0.197***
	(2.379)	(1.823)	(1.819)	(2.713)
ESG	–0.023***			
	(–4.337)			
ESG_E		–0.014***		
		(–4.653)		
ESG_S			–0.010***	
			(–3.413)	
ESG_G				–0.008**
				(–2.406)
ESG*Adaptability	0.095***			
	(5.500)			
ESG_E*Adaptability		0.038***		
		(3.599)		
ESG_S*Adaptability			0.034***	
			(3.467)	
ESG_G*Adaptability				0.053***
				(6.641)
Controls	YES	YES	YES	YES
Ind	YES	YES	YES	YES
Year	YES	YES	YES	YES
Constant	12.883***	12.090***	12.216***	12.301***
	(14.764)	(16.705)	(15.692)	(16.571)
Observations	45,031	45,031	45,031	45,031
R^2	0.078	0.076	0.076	0.076

4. DISCUSSION

This study reveals the key role played by enterprise ESG performance in shaping organizational adaptability. The research results confirm that the enterprise's overall ESG performance significantly and positively affects adaptability. This is

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consistent with the core principles of the stakeholder theory and the concept of resource foundation. Yue's ESG performance means effective control of environmental, social, and governance risks, thus enhancing the trust of stakeholders and cultivating unique resilience resources for enterprises (Chen & Xie, 2022; Wang et al., 2024). This is consistent with the results of research samples from different countries around the world, which agree that ESG practices are a key driver to improve long-term competitiveness and financial performance (Pujiyono et al., 2025). In a dynamic market and economic environment, organizations must deeply integrate ESG into their business models, not just formalities, to effectively transform these practices into adaptability to cope with uncertainty (Huang et al., 2025).

However, after examining the impact of various dimensions of ESG, it is found that there are differences in their impact on enterprise adaptability, especially the U-shaped relationship between environmental performance (E) and enterprise adaptability. Although this conclusion differs from existing studies, it is partly in line with the traditional view. Resource constraint theory shows that in the early stage of ESG strategy implementation, environmental investment may constitute a "compliance cost" because it will occupy the resources of the core operation of the enterprise (Jiang et al., 2018), thus limiting operational flexibility in the short term, which is consistent with the initial decline stage of the U-type relationship. With the gradual improvement of enterprise environmental performance, such investment will promote green innovation and process reinventing, and become the core source of enterprise competitiveness. Chouaibi et al. (2022) Research in the United Kingdom and Germany found that green innovation fully mediates the relationship between ESG practice and financial performance, which is consistent with the upward stage of the U-shaped curve. Enterprise environmental investment conveys positive intentions to the outside world, thus attracting more social resources. However, this is a gradual process. Enterprises must recognize the complexity of environmental management, maintain strategic patience, and continue to accumulate environmental investment to produce resilience effects (Wang & Yao, 2025).

Social performance (S) has a promoting effect on the adaptability of enterprises. The investment of enterprises at the social level means improving their responsibilities to stakeholders such as employees and communities, thus directly accumulating valuable trust capital and social capital. Ben and Belkacem (2022) pointed out that there is a significant positive correlation between corporate social responsibility participation and financial performance. Srivastava et al. (2022) emphasized that in a crisis, the stakeholder participation promoted by commitment to social responsibility can help enterprises obtain more favorable debt financing. This helps to reduce negative effects and enhance adaptability. This is consistent with the findings of this study and vividly shows the value of social capital in building enterprise adaptability. Enterprises should comprehensively and sincerely improve their social performance to establish a stable foundation for adaptation.

At the same time, improved corporate governance performance (G) can optimize the decision-making mechanism and improve transparency, thus reducing agency costs and enhancing the adaptability of enterprises (Lehn, 2021). The combination of sound corporate governance and appropriate internal strategies can effectively mitigate the negative impact of environmental, social, and governance (ESG) disputes (Elamer & Boulhaga, 2024), thus enhancing the resilience and adaptability of enterprises. This is crucial for enterprises to resist external non-economic shocks and maintain strategic adaptability. Therefore, continuous improvement of corporate governance performance (G) is the cornerstone of internal cohesion and strategic stability, enabling enterprises to maintain their adaptability in uncertainty.

Regarding the regulatory role of internal and external factors, the results of this study are consistent with the existing research views. On the one hand, when the cost of internal agency rises, management may use its authority for personal gain, causing strategic investment (including ESG initiatives) to deviate from the goal of maximizing shareholder value, thus weakening the positive impact of ESG (Tayeh et al., 2023). On the other hand, institutional investors play a supervisory role; their active participation in enterprise operations can significantly enhance the positive role of ESG (Zhang et al., 2025).

This study further confirms that ESG performance indirectly improves the value of the enterprise by enhancing organizational adaptability. This finding is consistent with the general view in the literature that ESG can enhance the value of enterprises (Wong et al., 2021; Han & Wu, 2024), and also clarifies its potential mechanism.

In summary, the research results support the following view: enterprise ESG performance, especially in social responsibility and corporate governance, helps to improve the dynamic adaptability of the organization, thus promoting long-term value growth. There is a threshold effect on investment in environmental protection, that is, the initial investment will consume resources, and strategic benefits can only be achieved through continuous long-term investment. At the same time, it is crucial to alleviate internal agent conflicts and introduce institutional investors to ensure that ESG investment effectively improves adaptability. These findings reinforce the arguments of stakeholder theory and resource-based theory on the ability of ESG to accumulate strategic resources, and comprehensively analyze its operating mechanism, regulatory effects, and economic consequences.

CONCLUSION

This study aims to explore the relationship between enterprise ESG performance and organizational adaptability. The research sample contains 45,031 observations of listed companies in China from 2009 to 2024. The use of multivariate regression analysis containing fixed effects of years and industries shows that overall ESG performance can improve organizational adaptability. The impact of environmental (E) performance shows an inverted U-shaped curve, while the social (S) and governance (G) dimensions show a positive effect. All the hypotheses have been verified, and the research objectives have been achieved. To test the robustness of the results, this study adopts methods such as delayed variable regression and variable substitution, and the results are consistent.

The research findings indicate that companies should view ESG as a strategic investment rather than a cost. Enterprises should attach importance to undertaking social and internal governance, which will enhance their adaptability. Enterprises should also strengthen environmental protection, especially focusing on overcoming the pressure brought by initial investment. Adaptability can enhance corporate value, which is an important result of ESG's active investment. For enterprises, they should actively introduce institutional investors and accept their supervision. This external supervision will enhance the positive effects of ESG performance.

In future research, efforts should be made to expand the sample size. Obtaining more data from countries and industries for research will help enhance the generalizability of conclusions. In addition, future research can also explore other mediating and moderating variables, such as management characteristics and policy conditions. These studies can further enhance academic understanding of ESG performance and help companies improve their adaptability.

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