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ESG performance and corporate competitiveness: the roles of green innovation, industry competition and media attention

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Abstract

Purpose – This study aims to investigate how environmental, social and governance (ESG) performance affects corporate competitiveness, the mechanisms underlying these effects and how industry competition and media attention influence the relationship between ESG performance and competitiveness.

Design/methodology/approach – Using a sample of Chinese A-share listed companies from 2010 to 2022, the authors perform three distinct analyses: first, whether ESG performance enhances competitiveness; second, whether green innovation mediates the relationship between ESG performance and competitiveness; and third, how industry competition and media attention moderate the connection between ESG performance and competitiveness.

Findings – The results demonstrate that enhanced competitiveness correlates with improved ESG performance, and ESG performance boosts competitiveness through heightened green innovation. Moreover, media attention and industry competition amplify the positive effects of ESG performance on competitiveness.

Research limitations/implications – The study’s findings may not generalize to other developing countries, owing to imprecise measurement standards for green innovation and ESG performance and insufficient exploration of interactions between the two mechanisms.

Originality/value – This study examines how ESG performance influences nonfinancial outcomes such as corporate competitiveness, expanding research beyond financial effects. It elucidates the transmission mechanism of competitiveness enhancement, providing empirical support for sustainable development

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strategies. Additionally, it explores the moderating roles of media attention and industry competition in the ESG performance-competitiveness relationship, addressing current research gaps.

Keywords ESG performance, Corporate competitiveness, Green innovation

Paper type Research paper

1. Introduction

In the 21st century, the world has been facing a severe threat of climate change and ecological setbacks (Agyei-Boapeah *et al.*, 2023; Busco *et al.*, 2024). This threat – a significant problem for sustainable development – transcends geographical boundaries. Scholars and practitioners agree that, if left unchecked, the toll on ecology, community displacement and economic growth will be catastrophic (Perkiss and Moerman, 2018). Consequently, the growing demand for sustainable development has led to the emergence of environmental, social and governance (ESG) frameworks (Li *et al.*, 2021; Rau and Yu, 2024). The United Nations study "Who Cares Wins" from 2004 introduced ESG as a comprehensive assessment instrument that encompasses ESG elements, emphasizing the interconnections and mutual reinforcement among various sustainable development goals (Khan, 2022; Chen and Xie, 2022).

In 2023, among the top 100 publicly traded companies globally by market capitalization, 64 were from the USA, with Apple and Microsoft ranking first and second, both surpassing a market value of $2tn. China had 11 companies on the list, with Tencent, valued at $456bn, ranking 11th overall. Compared to highly rated international companies, China still lagged in the number of high-rated private enterprises. Additionally, regarding industry and geographic diversification, Chinese companies were primarily concentrated in the domestic market and limited sectors, such as electronics and manufacturing. The Chinese Government has tended to favor the development of state-owned enterprises, especially through allocating resources and policy support to large infrastructure projects and key industries. This bias limits the competitiveness and growth potential of private enterprises. As a result, China remained behind in terms of high-rated, diversified and privately owned global companies, reflecting the country's relatively low overall financial competitiveness. One possible reason for this was the poor ESG performance of Chinese enterprises. According to data from CDP, only 18% of the companies in China's CSI 300 Index received an A grade, a figure significantly lower than their US and UK counterparts. For instance, 86% of companies in the S&P 500 Index and 94% in the FTSE 100 Index received similar ratings.

Against the backdrop of continuous efforts by both governments and investors to promote the ESG concept, one of the primary reasons for the existing challenges in corporate ESG performance is the ongoing debate about whether ESG can help companies enhance competitiveness and achieve sustainable development. Implementing ESG practices requires substantial resource investment and companies may encounter financial burdens in the early stages, particularly when they do not see immediate financial returns in the short term (Broadstock *et al.*, 2021; Fang *et al.*, 2023). While some studies have demonstrated that ESG improves financial performance (Khan, 2022; Chen and Xie, 2022), these findings are not consistently replicable, which causes corporate leaders to question the returns on ESG investments. Therefore, elucidating the impact of ESG performance on competitiveness remains critical to the sustainability of firms.

Strong ESG performance helps to deepen cooperation and communication among stakeholders, providing crucial support for companies to engage in innovative activities. However, from an economic perspective, ESG practices incur substantial costs, which may divert funding from green innovation (GI). Therefore, studying how ESG performance influences corporate competitiveness through GI is critically important. Moreover, media attention to environmental issues creates environmental pressure on companies, affecting their environmental behaviors (Zhou *et al.*, 2024a). The intensity of industry competition can also influence customers' sensitivity to a company's ESG performance. Thus, external factors, such as media attention and industry competition, significantly impact ESG performance (Zhou *et al.*, 2024b). However, existing literature has not clearly explained how external pressures affect the relationship between a company's ESG performance and its competitiveness (Martins, 2022; Chai *et al.*, 2023; Csillag *et al.*, 2022).

We propose the following research questions in light of the above discussion:

RQ1. How does ESG performance affect corporate competitiveness? and these contextualizing follow-up questions: (a) How does green innovation explain this effect? and (b) How does external pressure clarify this effect?

To address these issues, this study analyzes a sample of 1,371 listed companies in China's A-shares from 2010 to 2022, with a total sample size of 11,867, to explore how ESG performance affects corporate competitiveness and the mediating and moderating effects between them. The study finds that improved ESG performance links to enhanced corporate competitiveness, with GI serving as a potential influencing mechanism. Furthermore, this study identifies two situational characteristics that enhance the role of ESG performance on competitiveness based on external pressures: industry competition and media attention.

This study makes significant contributions in several key areas. First, it explores how corporate ESG performance affects competitiveness, advancing the study of ESG performance's financial effects. Most prior research has focused on enhancing ESG performance (Gao *et al.*, 2024; Zhang *et al.*, 2024; Sun *et al.*, 2024; Hossain *et al.*, 2024) and its effects on financial performance (Khan, 2022; Chen and Xie, 2022; Xiao *et al.*, 2024a; Niblock, 2024; Hussain *et al.*, 2024), debt financing costs (Gigante and Manglaviti, 2022), stock liquidity (Wang *et al.*, 2023) and stock price crash risk (Feng *et al.*, 2022). In contrast, the influence of ESG performance on nonfinancial outcomes has received comparatively little research, such as corporate competitiveness. Second, after establishing ESG performance's favorable effect on competitiveness, this study examines GI, a relatively understudied mediating variable. It examines the connection between competitiveness and ESG performance, clarifying how the competitiveness enhancement effect transmits. It confirms the full mediation pathway of "ESG Performance—Green Innovation—Competitiveness," further expanding research on ESG performance's influence on competitiveness. This provides empirical evidence for advancing sustainable development strategies. Finally, the study explores the boundary conditions affecting how ESG performance influences competitiveness. Prior research has not examined the variables mediating the connection between competitiveness and ESG performance. This paper addresses this research gap by proposing two situational factors from an external environment perspective – industry competition and media attention – to comprehend the complex interactions between these variables.

The sections of this study are organized as follows. Section 2 provides a theoretical foundation and hypotheses. Section 3 presents the research design. Section 4 discusses the empirical methods and major conclusions. Section 5 presents the mechanism analysis. Finally, Section 6 presents the research results and policy recommendations.

2. Theoretical and hypotheses development

2.1 Environmental, social and governance performance and corporate competitiveness

Research on the impact of ESG performance on corporate competitiveness has been steadily intensifying, yet the findings remain inconclusive. Some scholars assert that ESG performance can mitigate financing constraints (Wong *et al.*, 2021), enhance market image (Song, 2024) and foster technological innovation (Li *et al.*, 2023), thereby strengthening corporate competitiveness. However, other studies indicate that ESG performance may increase operational costs and the likelihood of resource misallocation (Friedman, 1970; Chintrakarn *et al.*, 2017), which could impede market expansion and ultimately diminish corporate competitiveness. Therefore, more research is necessary to understand more fully the impact of corporate ESG performance on competitiveness.

Based on stakeholder theory, firms establish explicit or implicit contractual relationships with their stakeholders. Exemplary ESG performance enables firms to fulfill stakeholder expectations, thereby securing a competitive advantage in the product market. For instance, investments in environmental protection can elicit support from environmental advocates (Gillan *et al.*, 2021; Fatemi *et al.*, 2018). Strategic participation in targeted poverty alleviation, fulfilling social responsibilities and providing adequate employee welfare will strengthen a firm's reputation and attractiveness in the product market (Kao *et al.*, 2018; Chen and Xie, 2022). Furthermore, robust governance standards can avert adverse effects on the firm's product market stemming from financial misconduct or executive malfeasance (Cui *et al.*, 2022; He *et al.*, 2022; Peng and Smith, 2024).

Additionally, according to the theory of competitive advantage, to maintain competitiveness, a firm must use resources that competitors find difficult to replicate – resources that exhibit value, scarcity, inimitability and irreplaceability (Barney, 1991). Superior ESG performance constitutes an effective differentiation strategy. By distinguishing itself from competitors, a firm can attract environmentally conscious employees and ethically minded customers, facilitating product market expansion (Rahat and Nguyen, 2024; Chen *et al.*, 2023), cultivating a positive reputation and brand image (Murè *et al.*, 2021) and ultimately strengthening its competitive advantage.

Finally, according to signaling theory, robust ESG performance can convey to the market that a company possesses adequate funding and sound financial health. This helps minimize information asymmetries between the company and its external stakeholders and attracts conscientious investors in the capital market, thereby alleviating the company's financing constraints (Su *et al.*, 2024). Diminished financing constraints reduce the company's investment expenditures and enhance its investment capacity, enabling the company to achieve optimal investment scale. This, consequently, augments the company's value and bargaining power as a buyer within the supply chain, culminating in a competitive advantage (Xiao *et al.*, 2024b). Thus, the following hypothesis is proposed:

H1. ESG performance is significantly and positively related to competitiveness.

2.2 Mediating role of green innovation

According to stakeholder theory, firms must attentively consider their stakeholders' interests throughout production and operational processes. By engaging with stakeholders, firms can create new opportunities for value enhancement (Freeman, 2023). Improving ESG performance can win stakeholders' support and trust, thereby providing firms with more resources and opportunities, which are vital for fostering GI. Specifically, companies excelling in ESG practices can attract top talent (De la Fuente *et al.*, 2022; Zafar *et al.*, 2025), which enhances employee alignment, increases job motivation and improves internal trust and collaboration efficiency. This enhancement raises the company's overall human capital level and generates a "human capital effect" that boosts GI (Tsang *et al.*, 2021). Additionally, by demonstrating a commitment to green and sustainable development through ESG performance, companies can signal their dedication to the market, build a stronger social image, enhance reputation capital and lower external funding costs (Eliwa *et al.*, 2021). This leads to increased investment from investors (Ahuja *et al.*, 2008). Furthermore, governments expect companies to operate more responsibly and ethically (Zhou *et al.*, 2023).

Strong ESG performance increases a company's likelihood of receiving governmental incentives, subsidies and credit support for innovation (Kamran *et al.*, 2023). Therefore, actively engaging in ESG practices not only meets stakeholder expectations but also fosters GI, resulting in a win–win outcome. There are three key ways that GI affects competitiveness: first, based on signaling theory, firms with high levels of GI can signal their social responsibility commitment, helping build a strong green image and garnering support from stakeholders and government agencies. This support enhances the firm's market competitiveness. Second, implementing GI can establish effective barriers against external imitation, thereby strengthening the firm's green reputation and market image. GI represents an intangible strategic capability that is valuable, rare, difficult to imitate and organizationally exploitable (Barney, 1991; Vachon and Klassen, 2006; Shi *et al.*, 2023; Chan *et al.*, 2016). These characteristics enable managers to leverage GI to create lasting advantages and continuously adapt to changing external environments (Hall *et al.*, 2019).

GI helps companies identify new market opportunities and improve resource utilization efficiency, thereby reducing production costs or offering differentiated products. For example, reducing pollution and limiting hazardous waste can enhance green efficiency, lower disposal costs, improve regulatory compliance and better respond to external environmental pressures from customers, ultimately boosting competitive advantages. When firms pursue innovation, they benefit from "first-mover advantages," such as price premiums, enhanced brand recognition and entry into new markets (Chen *et al.*, 2006). Consequently, adopting GI practices within the organizational value chain is essential and organizations should integrate environmental management into their strategic planning to build and maintain competitive advantage. Existing literature supports the view that GI enhances firms' competitive edge (Dangelico, 2016; Fernando and Wah, 2017; Green *et al.*, 2012; Tang *et al.*, 2018; Chavez *et al.*, 2016). Hence, the following hypothesis has been established:

H2. ESG performance enhances competitiveness by driving improvements in green innovation.

2.3 Moderating role of industry competition

From the perspective of industry competition, intense market rivalry leads to product homogenization within the same industry. When products become highly similar, consumers tend to prefer purchasing from companies with distinctive product features and strong brand recognition (Martins, 2022). In response, companies are compelled to refine their organizational structures and modify their branding strategies to implement differentiation tactics and secure competitive advantages (Olszak and Kowalska, 2023; Xing *et al.*, 2024). As competition intensifies, firms face greater challenges in maintaining market share, experiencing reduced profit margins and difficulty acquiring resources and customers (Liang *et al.*, 2024). Furthermore, fierce industry competition heightens customers' sensitivity to corporate ESG performance.

Companies are inclined to provide more information and proactively undertake social responsibilities to reduce information asymmetry, enabling customers to assess their ESG performance more objectively, thereby enhancing their reputation and securing competitive advantages (Alves and Meneses, 2024). In monopolistic markets, where firms hold significant market share, and there are fewer choices for consumers, companies may focus more on their economic interests, often disregarding stakeholder feedback, leading to higher rates of noncompliance (Chen and Xie, 2022). In contrast, in highly competitive markets, stakeholder decisions significantly impact firms. Negative ESG performance could result in revenue losses, higher transaction costs and company boycotts. Thus, in a highly competitive market, firms are motivated to pay greater attention to stakeholder interests, strengthen self-regulation and enhance their ESG performance to reduce transaction costs and improve market competitiveness. Based on these findings, this hypothesis is proposed:

H3. The relationship between ESG performance and competitiveness is significantly and positively moderated by industry competition.

2.4 Moderating role of media attention

Based on information asymmetry theory, an information barrier exists between stakeholders and firms. The media, as a third-party authority, plays a crucial role in information dissemination and external supervision. This reduces regulatory gaps, decreases information asymmetry and creates an environment where companies can gain competitive advantages (Tian *et al.*, 2025). The media has an effective moderating role in how ESG performance influences company competitiveness.

First, according to the media's information function hypothesis, media coverage of corporate ESG information enables rapid dissemination of ESG performance across multiple platforms (Chai *et al.*, 2023). This enhanced exposure broadens the audience and strengthens positive interactions between companies and their stakeholders (He *et al.*, 2024). For example, effective ESG information communication not only addresses information asymmetry between companies and investors but also helps ease financing constraints (Lin and Guan, 2024; Ji *et al.*, 2023). It also reduces the informational gap between companies and their upstream and downstream partners, lowering transaction costs associated with information search (Kölbel *et al.*, 2017) and minimizing adverse selection risks (He *et al.*, 2024). Consequently, media coverage helps mitigate how potential delays in information transmission affect corporate competitiveness and enhances ESG performance's contribution to competitive advantage.

Additionally, based on media effective supervision theory, when firms commit violations or false disclosures, media coverage draws public attention, especially from stakeholders, which can affect firm reputation (He and Li, 2024) and trigger stock price volatility (Burke *et al.*, 2019; Naumer and Yurtoglu, 2022). According to pressure theory, under such circumstances, business managers will likely invest more in ESG activities to maximize competitiveness benefits. Thus, this study proposes the following hypothesis:

H4. The relationship between ESG performance and competitiveness is significantly and positively moderated by media attention.

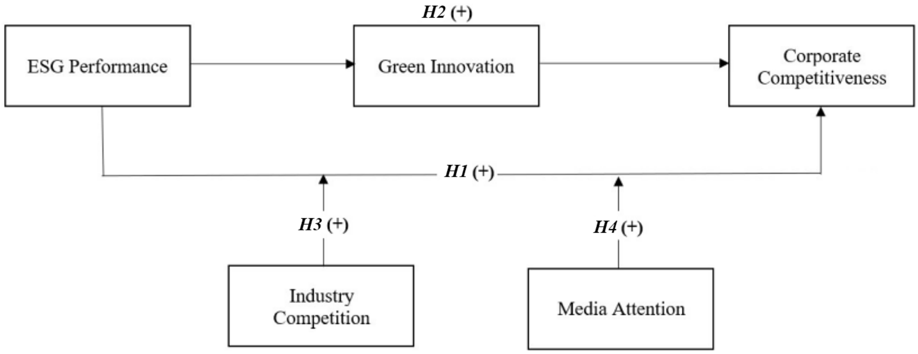
The research framework is shown in Figure 1.

3. Methodology and data

3.1 Data collection and processing

This study analyzed listed companies in China's A-share market from 2010 to 2022. The data processing included:

- excluding samples with missing critical variable data to avoid errors;
- excluding firms receiving special treatment (ST, *ST) and financial firms; and



Source(s): Authors' own work

Figure 1. Research framework

- winsorizing all continuous variables at the 1% level to eliminate extreme outliers.

After screening, the study obtained 11,867 observations from 1,371 firms.

Data were collected from three sources:

- ESG performance data from the Bloomberg database;
- green patent data from the Chinese Research Data Services Platform, which characterized firms' GI; and
- remaining variables from the CSMAR database.

3.2 Variable measurement

3.2.1 Dependent variable. Corporate competitiveness (COM): The product market represents the primary arena for business competition, and a firm's competitive advantage directly influences its standing in other markets. Therefore, "competitiveness" refers specifically to competitive advantage within the product market. Drawing upon Gupta and Krishnamurti (2021), Cheng *et al.* (2014) and Fresard (2010), this study uses the gross margin of core business activities to measure product market competitive advantage. The gross margin effectively reflects a firm's profitability and market competitiveness. This figure can calculate the company's "monopoly rent" in the product market. A higher gross margin indicates stronger monopoly pricing power (Chod and Lyandres, 2023), making it a reliable measure of competitive advantage. Since a company's competitive advantage is compared to industry peers, this study adjusts the indicator by comparing it to the industry average yearly to ensure relevance and comparability. The differential between the company's gross margin and the industry average indicates the firm's competitive advantage. A larger value signifies a more pronounced advantage. The regression coefficients will be small because the independent variable measures ESG performance using scores from 0 to 100, while COM ranges from −1.05 to 0.78. To enhance readability, the dependent variables are multiplied by 100.

3.2.2 Independent variable. ESG performance (ESG): In current literature, many studies use ESG scores from independent rating agencies, while some scholars have developed their own evaluation methods. Given the subjective nature and limited coverage of self-constructed systems, this study uses ESG scores from third-party agencies. As ESG rating systems in China are relatively new while international systems are more established, this study uses Bloomberg's composite ESG score (DasGupta, 2022; Fazzini and Dal Maso, 2016; Hammami and Hendijani Zadeh, 2020; Liu *et al.*, 2024a; Mohd Daud *et al.*, 2024).

3.2.3 Mediating variable. GI: GI outputs can be quantified precisely through green patent data. Since patent grants often show significant lag, green patent applications more accurately reflect current-year innovation performance. Following Kong *et al.* (2022), Hu and Hong (2023) and Zhou *et al.* (2024a), GI capability is measured by counting green patent applications filed by publicly traded corporations. Because more samples have zero applications, direct deletion would cause significant sample selectivity error. Therefore, we add one before taking the logarithm of green patent applications. Adding 1 addresses cases with zero applications, while logarithmic transformation avoids missing values and preserves innovation differences.

3.2.4 Moderating variables

- *Industry competition (HHI)*: This study uses the Herfindahl index (HI) to measure industry competition levels (Geng *et al.*, 2024). HI represents the sum of squares of each firm's percentage of total industry revenue. A lower HI indicates higher industry competition (Bucciarelli *et al.*, 2025). This paper introduces a dummy variable, HHI, following Geng *et al.*'s (2024) method. When a firm's HI for the year exceeds the median, HHI equals 0 and vice versa.
- *Media attention (Med)*: This study measures media attention through the annual frequency of corporate appearances in newspaper and internet headlines (Ren *et al.*, 2023a). Higher headline counts indicate increased media attention. Following Geng *et al.*'s (2024) method, the dummy variable Med equals 0 if the firm's annual media coverage frequency falls below the median, and vice versa.

3.2.5 Control variables. A company's ESG investment varies with its size; thus, firm size (Size) affects competitiveness (Wang and Yang, 2023). Financial leverage (Lev) influences financial risk, affecting company operations and competitiveness (Ren *et al.*, 2023b). Growth ability (Grow) impacts market share, which influences competitiveness (Jiang *et al.*, 2022). Company age (Age) represents the growth stage while founding time affects the market position, significantly impacting competitiveness (Zhou *et al.*, 2022). Competitiveness may also depend on equity concentration (Top1), fixed asset ratio (Far) and net cashflow from operations (Cfo) (Postiglione *et al.*, 2024). Consequently, this study includes Size, Lev, Grow, Top1, Far, Cfo and Age as control variables. Table 1 shows these variables' calculation methods.

3.3 Model specification

The following model was created to investigate how ESG performance affects competitiveness:

$$COM_{i,t} = \alpha_0 + \alpha_1 ESG_{i,t} + \alpha_2 Control_{i,t} + \delta_i + \sigma_t + \varepsilon_{i,t} \quad (1)$$

where i, t denote firms and years, respectively; ESG denotes ESG performance; COM denotes corporate competitiveness; the random variable α_0 denotes the unobservable individual heterogeneity; $\mathcal{E}_{i,t}$ is the perturbation term that varies with individuals and time; δ_i represents the fixed effect of firm i; and σ_t indicates the fixed effect of year t.

In equations (2) and (3), we examine the mediating effect of GI as a mediator:

Table 1. Variable definition table

Variables	Definition
COM	Difference between the gross margin of the enterprise's main business and the industry average
ESG	ESG score based on Bloomberg
GI	Ln (1 + total number of green patent applications filed by the firm in the year)
HHI	A dummy variable: 0 if the firm's HI is higher than the median in the current year and 1 otherwise
Med	A dummy variable: 0 if the firm's total media coverage for the year is lower than the median and 1 otherwise
Size	Ln (total assets)
Lev	Total liability/total assets
Grow	Ratio of the difference between total operating income of the current year and total operating income of the previous year
Top1	The greatest shareholder's share count divided by the total share capital
Far	Fixed assets/ total assets
Cfo	Net cash flow from operating activities/total assets
Age	The number of years since the initial public offering

Source(s): Authors' own work

$$GI_{i,t} = \beta_0 + \beta_1 ESG_{i,t} + \beta_2 Control_{i,t} + \delta_i + \sigma_t + \varepsilon_{i,t} \tag{2}$$

$$COM_{i,t} = \gamma_0 + \gamma_1 ESG_{i,t} + \gamma_2 GI_{i,t} + \gamma_3 Control_{i,t} + \delta_i + \sigma_t + \varepsilon_{i,t} \tag{3}$$

In equations (4), we explore the potential moderating effects. The interaction term between ESG and moderator was introduced in this study:

$$\begin{aligned} COM_{i,t} = {} & \lambda_0 + \lambda_1 ESG_{i,t} + \lambda_2 ESG_{i,t} * Moderator_{i,t} + \lambda_3 Moderator_{i,t} \\ & + \lambda_4 Control_{i,t} + \delta_i + \sigma_t + \varepsilon_{i,t} \end{aligned} \tag{4}$$

4. Empirical results and discussion

4.1 Summary statistics

Table 2 provides an overview of the descriptive statistics for each variable that was acquired through statistical software analysis. The results indicate that the mean ESG score is 29.11, with a median of 28.20. With 71.18 as the maximum and 6.198 as the minimum value, the sample companies' ESG performance varies significantly. The mean competitiveness score is −2.523, with substantial variation between the maximum and minimum values, suggesting that most companies exhibit insufficient and highly uneven competitiveness. The other variables' descriptive statistics align with the results of earlier studies.

4.2 Baseline results

Table 3 shows the regression results of ESG performance on competitiveness. With or without considering control factors, the findings demonstrate a positive and statistically significant association between ESG and COM. These findings support the results of Serafeim and Yoon (2022), which suggest that strong ESG performance might send

Table 2. Descriptive statistics

Variables	Obs	Mean	P50	SD	Min	Max
ESG	11,867	29.11	28.20	9.675	6.198	71.18
COM	11,867	−2.523	−1.502	21.495	−105.149	78.297
GI	11,867	0.451	0	0.942	0	6.848
HHI	11,867	0.498	0	0.500	0	1
Med	11,867	0.501	1	0.500	0	1
Size	11,867	23.21	23.09	1.364	18.43	28.64
Lev	11,867	0.482	0.495	0.200	0.00800	0.997
Far	11.867	0.230	0.187	0.180	0	0.954
Grow	11,867	0.178	0.118	0.371	−0.484	2.238
Top1	11,867	37.15	35.73	16.33	3.390	89.99
Cfo	11,867	0.0590	0.0550	0.0750	−0.662	0.726
Age	11,867	2.472	2.639	0.682	0	3.466

Source(s): Authors’ own work

Table 3. Baseline results

Variables	(1)	(2)
ESG	0.0846*** (2.999)	0.0533* (1.937)
Size		0.2758 (0.503)
Lev		−17.1243*** (−8.964)
Far		−5.2402** (−2.039)
Grow		1.1935*** (3.086)
Top1		0.0118 (0.411)
Cfo		18.5655*** (6.623)
Age		−0.0223 (−0.025)
Constant	−0.7611 (−1.049)	1.0651 (0.091)
Firm	YES	YES
Year	YES	YES
Observations	11,867	11,867
R-squared	0.027	0.077

Note(s): *, ** and ***indicate significant at the 10, 5 and 1% levels, respectively
Source(s): Authors’ own work

encouraging market signals, attracting employees and customers who are more concerned with environmental and business ethics, thereby helping firms expand their markets. Previous studies have also indicated that ESG implementation costs, which shareholders must bear, may lead to improper resource allocation and higher costs (Chen and Xie, 2022; Wong *et al.*, 2021; Ionescu *et al.*, 2019). However, our study concludes that ESG performance creates greater value for shareholders and enhances corporate competitiveness, thus confirming *H1*.

4.3 Endogeneity tests

To address bidirectional causality and omitted variable issues, this study adopts methods from Chen *et al.* (2024) and Liu *et al.* (2024b), using instrumental variables and propensity score matching (PSM) approaches to resolve potential endogeneity. The results appear in Table 4.

4.3.1 Instrumental variable approach. ESG performance enhances firm competitiveness and improved firm competitiveness may influence managers' decisions, leading to better ESG performance. Considering potential bidirectional causality between competitiveness and ESG performance, this study uses the instrumental variables method. Following Aydoğmuş *et al.* (2022), we use the industry's annual average ESG score as the instrumental variable (IV_ESG) and apply two-stage least squares regression. The first-stage results in Table 4 indicate that the IV_ESG coefficient is significantly positive, with an *F*-statistic exceeding 10, confirming the instrumental variable's validity. In the second stage, the ESG coefficient remains significantly positive at the 1% level, aligning with baseline regression results and suggesting robust findings.

4.3.2 The propensity score matching approach. To address omitted variables, we use PSM by constructing control and experimental groups before regressing matched samples. We divided samples into "good ESG performance" and "poor ESG performance" groups based on median ESG performance, assigning values of 1 and 0, respectively. We then performed 1:1 nearest-neighbor matching using control variables as covariates. The PSM balancing test showed absolute deviations of all variables reduced to below 5%, effectively narrowing differences between control and experimental groups. Table 4 presents regression results for paired samples, with the third column showing ESG and COM maintaining a significantly positive relationship ($\alpha 1 = 0.1802$, $p < 0.01$). These results support our baseline regression conclusions after reducing sample selection bias.

4.4 Robustness tests

This study acknowledges that the impact of ESG performance on competitiveness might be influenced by variable measurement, sample selection and omitted variables, potentially

Table 4. Results of endogenous tests

Variables	First stage (1) ESG	Second stage (2) COM	PSM (3) COM
IV_ESG	0.8700*** (0.008)		
ESG		0.1980*** (0.030)	0.1802*** (4.373)
Size	2.2178*** (0.052)	−1.4048*** (0.192)	−1.7663*** (−6.575)
Lev	−3.4931*** (0.339)	−32.9784*** (1.066)	−37.5473*** (−24.512)
Far	−1.3945*** (0.316)	18.6023*** (0.970)	24.3058*** (16.884)
Grow	−0.0325 (0.149)	1.3656*** (0.457)	2.1622*** (3.040)
Top1	−0.0123*** (0.004)	−0.0710*** (0.011)	−0.0729*** (−4.602)
Cfo	4.7634*** (0.784)	51.8813*** (2.423)	43.6901*** (12.171)
Age	−0.4032*** (0.088)	−5.5555*** (0.267)	−5.0518*** (−12.695)
Constant	−44.5124*** (1.025)	49.0280*** (3.616)	57.9377*** (10.476)
F-test	2,471		
Firm	YES	YES	YES
Year	YES	YES	YES
Observations	11,867	11,867	5,874
R-squared	0.625	0.285	0.311

Note(s): *, ** and ***indicate significant at the 10, 5 and 1% levels, respectively
Source(s): Authors' own work

causing robustness issues. To address these concerns, several robustness tests were conducted using different core variable measures, random sampling and additional control variables. Table 5 presents these findings.

The measurement of the dependent variable underwent modification. When a company generates returns on its resources that exceed its cost of equity capital, it demonstrates a competitive advantage based on these resources (Wang *et al.*, 2023). Therefore, regression analysis was performed on profits where the return on investment capital exceeded the cost of capital as an alternative variable. According to the results shown in Column (1), the coefficient for ESG is 0.0459, indicating significance at the 5% level, which aligns with previous findings.

Furthermore, a random sample was drawn. Following Li *et al.* (2009), 80% of the total data were randomly selected to create a new sample for regression analysis. The results, shown in Column (2), indicate that the coefficient for ESG maintains positive significance at the 5% level, confirming the robustness of the baseline results.

Finally, additional control variables were incorporated into the baseline regression based on previous studies (Huang and Duan, 2024; Qian *et al.*, 2023). Specifically, the proportion of independent directors (Indep) and the proportion of institutional investor holdings (Inst) were included as control variables. Indep represents independent directors divided by all board members. Inst represents the percentage of shares held by institutional investors. The robustness of our results is supported by the ESG coefficient in Column (3), which equals 0.0529 and remains positively significant.

5. Mechanism analysis

5.1 Mediating mechanism analysis

The previous findings suggest that enhanced ESG performance strengthens firms' competitiveness. The mediating mechanism producing this effect is an increase in GI

Table 5. Results of robustness tests

Variables	Substitution of the dependent variable (1) ROIC	Randomly selected sub-sample (2) COM	Add control variables (3) COM
ESG	0.0459** (2.207)	0.0592** (1.981)	0.0529* (1.932)
Size	2.1282*** (5.049)	0.3221 (0.583)	0.0679 (0.124)
Lev	−19.2079*** (−9.397)	−18.1574*** (−8.512)	−16.9007*** (−8.913)
Far	−7.8574*** (−5.372)	−4.5879 (−1.560)	−5.0125** (−1.966)
Grow	4.2529*** (15.478)	1.0694** (2.431)	1.0841*** (2.800)
Top1	0.0665*** (4.636)	0.0122 (0.412)	−0.0083 (−0.274)
Cfo	33.7978*** (14.984)	18.2344*** (5.537)	18.3524*** (6.526)
Age	0.6966* (1.784)	0.0124 (0.013)	0.0879 (0.098)
Indep			−0.0217 (−0.665)
Inst			0.0435** (2.450)
Constant	−35.1439*** (−4.106)	0.1072 (0.009)	4.2407 (0.351)
Firm	YES	YES	YES
Year	YES	YES	YES
Observations	11,867	9,494	11,867
R-squared	0.240	0.077	0.079

Note(s): *, ** and ***indicate significant at the 10, 5 and 1% levels, respectively
Source(s): Authors' own work

capacity. Table 6 presents the results of the regressions examining this mechanism. In Column 2, the coefficient for ESG is 0.0072, which is significantly positive at the 1% level, indicating that improved ESG performance promotes greater GI in companies. Column 3 adds GI as a mediating variable to the model, showing that the coefficient for ESG on COM is 0.0512, which is slightly lower than the ESG coefficient of 0.0533 in Column 1. Furthermore, the *p*-value of the bootstrap test is significantly positive at the 1% level. This indicates that GI serves as a partial mediating effect in the impact of ESG performance on competitiveness; specifically, improved ESG performance promotes GI, which subsequently enhances competitiveness. The direct effect of ESG performance on competitiveness equals 0.0512, while the total effect equals 0.0533. The indirect effect of ESG performance on competitiveness through GI equals 0.0021, supporting *H2*. While a company's ESG performance communicates information to investors, it also strengthens investors' willingness to invest and their confidence in the company's long-term sustainable development, thereby securing more resources for the company's GI (Liu *et al.*, 2024c). By establishing an effective green isolation mechanism through GI, companies can increase competitors' difficulty in imitation (Juo and Wang, 2022), thereby securing a larger market share.

5.2 Moderating mechanism analysis

Drawing from theoretical analysis, we predict that industry competition and media attention will have an impact on how competitiveness is affected by ESG performance. Following the approach of Geng *et al.* (2024), this study adds the interaction terms between ESG and the moderating variables, namely, ESG × HHI and ESG × Med, to Model (1). Table 7 presents the regression results for the moderating effects of industry competition and media attention.

Table 6. Mediation mechanism analysis result

Variables	(1) COM	(2) GI	(3) COM
ESG	0.0533* (1.937)	0.0072*** (3.403)	0.0512* (1.866)
GI			0.2853* (1.682)
Bootstrap method for testing indirect effects		0.0259*** (LLCI = 0.020, ULCI = 0.032)	
Size	0.2758 (0.503)	0.0209 (0.907)	0.2698 (0.493)
Lev	−17.1243*** (−8.964)	−0.0160 (−0.212)	−17.1197*** (−8.966)
Far	−5.2402** (−2.039)	−0.1623 (−1.511)	−5.1939** (−2.020)
Grow	1.1935*** (3.086)	−0.0146 (−1.186)	1.1977*** (3.097)
Top1	0.0118 (0.411)	−0.0029** (−2.357)	0.0126 (0.441)
Cfo	18.5655*** (6.623)	−0.0745 (−0.871)	18.5868*** (6.628)
Age	−0.0223 (−0.025)	0.0729 (1.415)	−0.0431 (−0.048)
Constant	1.0651 (0.091)	−0.3445 (−0.666)	1.1634 (0.099)
Firm	YES	YES	YES
Year	YES	YES	YES
Observations	11,867	11,867	11,867
R-squared	0.077	0.0423	0.078

Note(s): *, ** and ***indicate significant at the 10, 5 and 1% levels; respectively. LLCI = lower level for confidence interval; ULCI = upper level for confidence interval
Source(s): Authors' own work

Table 7. Moderation mechanism analysis result

Variables	(1)	(2)
ESG	0.0316 (1.040)	0.0289 (1.030)
ESG × HHI	0.0488* (1.676)	
ESG × med		0.0744*** (2.794)
HHI	1.2368 (1.421)	
Med		0.0664 (0.238)
Size	0.2757 (0.499)	0.2982 (0.545)
Lev	−17.1359*** (−8.991)	−17.1558*** (−8.996)
Far	−5.1824** (−2.020)	−5.2135** (−2.030)
Grow	1.2050*** (3.128)	1.1746*** (3.033)
Top1	0.0098 (0.342)	0.0101 (0.354)
Cfo	18.5773*** (6.615)	18.6188*** (6.661)
Age	−0.0928 (−0.104)	0.0345 (0.039)
Constant	2.2243 (0.187)	2.2111 (0.186)
Firm	YES	YES
Year	YES	YES
Observations	11,867	11,867
R-squared	0.079	0.078

Note(s): *, ** and ***indicate significant at the 10, 5 and 1% levels, respectively
Source(s): Authors' own work

In the first column, the coefficient of ESG × HHI is 0.0488 and significant at the 10% level. This suggests that the beneficial effect of ESG on COM is strengthened by industry competition, supporting *H3*. Good ESG performance helps firms reduce information asymmetry (Galletta *et al.*, 2023), enhance their reputation (Wong and Zhang, 2024), attract talent and improve employee engagement, thereby boosting production efficiency (Cicchiello *et al.*, 2023). This enables firms to maintain their competitive advantage in highly competitive industries (Xing *et al.*, 2024).

Column (2) presents the results of the moderating effect of media attention. In the second column, the coefficient of ESG × Med is significantly positive ($\lambda 2 = 0.0744$, $p < 0.01$). This indicates that companies receiving substantial media attention have a stronger beneficial effect of ESG performance on competitiveness, thus supporting *H4*. Extensive media coverage increases the effectiveness of communication between the company and its stakeholders (He *et al.*, 2024), accelerates the dissemination of ESG performance, enhances its visibility and directly influences consumer purchasing decisions (Zhou *et al.*, 2024b). Moreover, media scrutiny exerts external pressure on firms, increasing regulatory attention (Perego and Yuksel, 2022) and raising the likelihood of penalties, thereby deterring corporate misconduct. This helps firms avoid economic losses in the market due to unethical behavior.

6. Conclusion and practical implications

In China, the idea of ESG has attracted significant interest with the adoption of the "dual carbon" goals and has entered the policy-making sphere of economic and financial regulators. In practice, the ESG concept has gradually evolved from being policy-driven to receiving market attention and implementation by companies. Academically, scholars have extensively explored ESG, with the majority of existing research concentrating on the determinants of ESG performance and its economic impacts. However, there has been less focus on the connection between ESG performance and competitiveness. Corporate competitiveness is fundamental to a company's long-term development and is crucial for achieving high-quality growth in Chinese companies. Therefore, in this context, this paper explores the connection between ESG performance and competitiveness.

Using A-share-listed companies in China from 2010 to 2022 as the sample, we investigate the association between ESG performance and competitiveness, as well as the corresponding mechanisms. The study concludes that increased competitiveness is linked to improved ESG performance, a result that remains robust after conducting sensitivity tests. Additionally, based on stakeholder theory, the research reveals that ESG performance enhances competitiveness through fostering GI. This improvement is attributed to the fact that strong ESG performance increases trust and support from various stakeholders, thereby creating favorable conditions for GI. As an intangible strategic capability, GI can enhance corporate competitiveness. The study demonstrates that industrial competition strengthens the benefits of ESG performance on competitiveness from an external environmental perspective. This effect may occur because intense industry competition increases customer sensitivity to ESG performance, encouraging firms to improve their ESG efforts to secure a competitive advantage. Moreover, media attention also amplifies this relationship. Media scrutiny compels companies to allocate more resources toward ESG initiatives, strengthening the contribution of ESG performance to increased competitiveness.

The study provides several recommendations for policymakers and businesses. First, the government should expedite the enhancement of ESG-related systems and management measures to support listed companies in better implementing ESG initiatives. Companies should standardize their ESG performance and strengthen their ESG responsibility awareness. Second, the government should implement targeted policy incentives for companies with strong ESG performance to help translate their ESG advantages into tangible innovation benefits. For instance, by further enhancing tax incentives for GI, the Government can guide companies to focus their investments and human resources on GI, thereby improving the quality and quantity of their innovations. Third, regulatory agencies should enhance media management to ensure that media reporting on companies is more accurate and consistent, thus strengthening the media's supervisory and governance role. Fourth, market regulatory authorities should foster a healthy competitive environment and actively promote the role of market competition in external governance.

This study has certain limitations. First, the research focuses exclusively on China; hence, it is possible that the conclusions do not apply to other developing countries. Future research should be conducted in different countries to facilitate a comparison with the findings of this study. Second, there are limitations in the selection of indicators for GI and corporate ESG performance. We use green patents to measure GI. However, GI encompasses all innovative activities that can generate sustainable competitive advantages and reduce environmental pollution. The number of green patents represents only a portion of a company's green technological innovation and does not fully measure overall GI. The Bloomberg ESG Index serves as an assessment tool for ESG performance measurements in this study. Given that ESG research in China is still developing, the ESG rating system remains incomplete and foreign rating criteria may not fully apply to China. Additionally, China lacks strict regulations requiring ESG information disclosure and stringent standards for the quality of disclosed information, which could lead to discrepancies affecting final performance scores. Therefore, future research should consider more appropriate alternative indicators for GI and ESG performance. Finally, while this study analyzes the mediating and moderating mechanisms between ESG performance and competitiveness, it does not further investigate the potential offsetting or interactive effects of these mechanisms. This limitation could be addressed in future research.

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