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How Executives' Green Awareness Affects Corporate ESG Performance: Empirical Evidence based on Green Investment Intermediation Mechanisms and Environmental Dimensions

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Abstract:
Against the backdrop of "dual carbon" goals and high-quality development, ESG performance has become an important indicator for measuring a company's sustainable development capabilities. Based on a sample of A-share listed companies in China from 2009 to 2024, this paper constructs an executive green awareness index, adopts a two-way fixed-effects model to empirically examine the impact of executive green awareness on corporate ESG performance, and further conducts an in-depth analysis from the environmental dimension perspective and the mediating mechanism of green investment. The empirical results indicate that executive green awareness significantly enhances corporate ESG performance, with such an effect mainly manifested in the environmental dimension. Furthermore, green investment exerts a partial mediating effect on the relationship between executive green awareness and corporate environmental performance. Robustness tests show that the above conclusions still hold after using lagged variables and replacement variables. This paper enriches the research on the influencing factors of corporate ESG performance from the perspective of executive cognition, and provides micro-level empirical evidence for enterprises' green transformation and environmental governance practices.

Keywords: Executive green awareness; ESG performance; environmental dimension; green investment; mediating effect

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1. Introduction

ESG performance not only reflects a company's sustainable development capabilities, but also serves as an important indicator of the quality of its non-financial information disclosure and external evaluation results. With the continuous advancement of the dual carbon goals, capital markets and regulatory authorities are paying increasing attention to companies' environmental responsibility, social responsibility, and governance levels. Existing studies have mostly explained corporate ESG performance from the perspectives of environmental regulation, green finance, corporate governance, and digital transformation [1-8], but attention to the micro-internal factor of executive cognition remains relatively insufficient.

The senior management hierarchy theory holds that the cognitive foundation and value orientation of senior managers will affect the strategic choices of enterprises [9]. In the context of green transformation, the importance that senior executives attach to green development and environmental responsibility may influence corporate resource allocation, environmental governance and non-financial information disclosure.. In recent years, relevant studies have begun to focus on the relationship between senior executives' green cognition, environmental background and corporate ESG performance [10-13], but there is still room for expansion in the discussion on its role dimensions and behavioral mechanisms.

This paper uses a sample of A-share listed companies in China from 2009 to 2024 to examine the overall impact of executives' green awareness on corporate ESG performance, and further focuses on the environmental dimension to test the mediating role of green investment. Compared with existing research, this paper introduces executives' green awareness into the research framework of corporate ESG performance, expanding the application of the senior management hierarchy theory in sustainable development issues; at the same time, from the environmental dimension and green investment mechanism, it provides new empirical evidence for understanding the micro-driving mechanism of corporate ESG performance.

2. Literature Review and Research Hypotheses

Existing research on corporate ESG performance mainly focuses on two aspects: external institutional environment and internal governance structure. In terms of the external environment, factors such as green finance, environmental regulations, green investor preferences, and climate risk disclosure can influence corporate ESG behavior through incentive and constraint mechanisms [1-6]. In terms of internal governance, corporate governance structure, executive characteristics, and internal control quality can also affect corporate ESG performance [8,14-15]. However, existing research focuses more on institutional pressure and governance arrangements, while systematic research on the soft constraint factor of executive green awareness is still lacking.

Theoretically, executives' green awareness does not directly translate into corporate ESG performance; rather, it plays a role through corporate strategic guidance and resource allocation processes. On the one hand, executives' green awareness influences the company's focus on green issues, making the company more environmentally responsible in investment decisions and governance arrangements. On the other hand, green governance behaviors can improve corporate environmental responsibility fulfillment and external ESG evaluation results. Therefore, this paper proposes:

H1: Executives’ green awareness can significantly improve corporate ESG performance.

ESG comprises three dimensions: environmental, social, and governance. The environmental dimension more directly reflects a company's performance in energy conservation, emission reduction, pollution control, and green transformation. Since executive green awareness is inherently environmentally oriented, its impact is more likely to be manifested first in the environmental dimension, rather than being evenly distributed across the social and governance dimensions [1,5,10-11,16-17]. Based on this, this paper proposes :

H2: The positive impact of executives' green awareness on corporate ESG performance is mainly reflected in the environmental dimension.

Green investment is an important vehicle for enterprises to translate green concepts into concrete actions, mainly manifested in behaviors such as investment in environmental protection facilities, energy-saving renovations, pollution control, and green projects [16-19]. The stronger the green awareness of senior executives, the more likely the enterprise is to increase green investment and further improve ESG performance by improving environmental performance. Therefore, this paper proposes:

H3: Green investment plays a mediating role in how executives’ green awareness influences corporate environmental performance.

3. Research Design

3.1 Sample selection and data sources

This paper uses Chinese A-share listed companies from 2009 to 2024 as the research sample, constructing an unbalanced panel dataset at the enterprise level. To ensure sample comparability, financial enterprises, ST and PT listed firms and samples with missing core variables are excluded, yielding a final sample of 49,405 observations covering 5,231 listed companies. Enterprise ESG performance and environmental dimension scores were obtained from the Huazheng ESG Rating Database, executive green awareness variables were constructed based on corporate annual reports, and green investment and control variables were mainly derived from the listed companies' financial and governance database.

3.2 Variable definition

The dependent variables include corporate ESG performance (ESG) and environmental performance (E). ESG measures a company's overall performance across the three dimensions of environment, society, and governance, while E corresponds to the environmental score, reflecting the company's level of environmental responsibility fulfillment.

The core explanatory variable is executive green awareness (cog). This variable is constructed based on the annual reports of listed companies. It is constructed by identifying and statistically counting the frequency of relevant keywords including environmental protection strategy, environmental governance, energy conservation and emission reduction, followed by standardization and logarithmic transformation, so as to measure the degree of executive attention to green development issues. To test the robustness of the results, this paper further uses the original executive green awareness index (cog_raw) for alternative regression.

The mediating variable is green investment (ln_ginv1), which measures a company's investment level in green projects, environmental protection facilities, energy-saving renovations, and pollution control. Considering the potential skewness of the original data distribution, this indicator is logarithmically transformed to reduce the impact of extreme values. Control variables include firm size (Size), debt-to-equity ratio (Lev), return on assets (ROA), growth (Growth), percentage of shares held by the largest shareholder (Top1), board size (Board), percentage of independent directors (Indep), dual roles (Dual), and ownership structure (SOE).

3.3 Model Design

To examine the impact of executives' green awareness on corporate ESG performance, this paper constructs the following two-way fixed effects model:

Where represents the ESG performance of firm i in year t, represents the green awareness of senior executives, represents the control variable, represents the firm fixed effect, represents the year fixed effect, and represents the random disturbance term.

To further focus on the environmental dimension, this paper replaces the explanatory variables with environmental dimension performance, and constructs the following model:

To examine the mediating role of green investment, the following model was further constructed:

If both the indirect and indirect effects are significant, it indicates that green investment plays a mediating role in the impact of executives' green awareness on corporate environmental performance. Furthermore, this paper uses the Bootstrap method to test the significance of the indirect effects.

4. Results Analysis

4.1 Descriptive Statistical Analysis

Descriptive statistics show that the mean ESG performance of the sample companies was 4.131, with a standard deviation of 1.092, indicating certain differences in overall ESG performance among different companies. The mean environmental dimension performance (E) was 61.200, with a standard deviation of 7.218, indicating that the sample companies were generally at a moderate level in fulfilling their environmental responsibilities, with significant differences among companies. The average value of executive green awareness (cog) is 1.032, with a standard deviation of 0.891, revealing obvious heterogeneity in green awareness among senior executives. The average green investment level is 0.804, with a standard deviation of 1.276, suggesting strong heterogeneity in corporate green investment decisions.

4.2 Correlation Analysis

Table 1. Correlation Analysis Table

variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) ESG	1.0 00							
(2) E	0.5 22***	1.0 00						
(3) cog	0.0 44***	0.2 60***	1.0 00					
(4) cog_raw	0.0 35***	0.2 19***	0.8 89***	1.0 00				
(5) Size	0.2 17***	0.2 94***	0.2 08***	0.2 04***	1.0 00			

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variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(6) Lev	-0.108***	0.0 97***	0.0 95***	0.1 01***	0.4 82***	1.0 00		
(7) ROA	0.2 25***	0.0 05	-0.007	-0.007	-0.003	-0.375***	1.0 00	
(8) SOE	0.0 56***	0.0 53***	0.0 77***	0.0 88***	0.3 54***	0.2 89***	-0.081***	1.0 00

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 1 reports the results of the correlation analysis among the main variables. Overall, the correlation coefficients between all variables are below 0.9, suggesting no severe multicollinearity concern. Executives' green awareness (cog) was significantly positively correlated with corporate ESG performance, with a correlation coefficient of 0.044. Meanwhile, the correlation coefficient between cog and environmental performance (E) was 0.260, significantly higher than its correlation with the total ESG score, preliminarily suggesting that executives' green awareness may be more sensitive to the impact on the environmental dimension.

4.3 Analysis of Benchmark Regression Results

Table 2. Benchmark Regression Results

variable	(1) ESG	(2) E
cog	0.0 326***	0.7 582***
	(0.0102)	(0.0682)
Size	0.3 408***	1.2 399***
	(0.0163)	(0.1114)
Lev	-1.1373***	-2.0962***
	(0.0615)	(0.4208)
ROA	0.8 087***	1.6 872**
	(0.1158)	(0.7696)
Growth	-0.1110***	-0.7692***
	(0.0134)	(0.0820)
Top1	0.4 735***	1.4 801**
	(0.1092)	(0.7092)
Board	-0.2045***	-0.1762
	(0.0266)	(0.1641)
Indep	0.5 415***	-0.3999
	(0.0793)	(0.5004)
Dual	-0.0057	-0.0801
	(0.0191)	(0.1305)
SOE	0.0 691*	0.1 352
	(0.0413)	(0.3025)
Firm fixed effects	yes	yes
Annual fixed effects	yes	yes
N	49,405	49,405
Within R^2	0.0 659	0.1 441

Table 2 reports the baseline regression results of executives' green awareness on corporate ESG performance. As shown in the ESG regression results, the regression coefficient for executives' green awareness (cog) is 0.0326, which is significant at the 1% level, indicating that the higher the level of executives' green awareness, the better the overall ESG performance of the company. This finding suggests that corporate ESG performance is affected not only by external institutional and market constraints, but also by managers' green development cognition and strategic choices.

The environmental dimension, the regression coefficient of cog was 0.7582, which was also significant at the 1% level, and its impact on the environmental dimension was more pronounced, indicating that the role of senior executives' green awareness is mainly reflected in the fulfillment of environmental responsibility. Regarding control variables, firm size had a significant positive impact on both ESG and environmental dimensions, while the debt-to-equity ratio (Lev) had a significant negative impact, suggesting that larger firms with lower financial pressure are more capable of investing in ESG governance and environmental responsibility practices.

4.4 Robustness Test

Table 3. Robustness test results

variable	(1) ESG (L.cog)	(2) E (L.cog)	(3) ESG (cog_raw)	(4) E (cog_raw)
L.cog	0.0 407***	1.3 765***		
	(0.0098)	(0.0710)		
cog_raw			0.0 022	0.0 954***
			(0.0022)	(0.0142)
control variables	yes	yes	yes	yes
Firm fixed effects	yes	yes	yes	yes
Annual fixed effects	yes	yes	yes	yes
N	43,544	43,544	49,405	49,405
Within R^2	0.0 647	0.1 741	0.0 656	0.1 409

To ensure the credibility of the baseline regression findings, this paper conducts robustness tests by addressing reverse causality bias and adopting alternative variable measures. The results are shown in Table 3. First, Columns 1 and 2 adopt the one-period lagged term of executive green awareness to alleviate endogeneity concerns arising from reverse causality, whereby current ESG performance may affect firms' green textual disclosure in annual reports. The results show that the one-period lag in executive green cognition still has a significantly positive effect on ESG and environmental dimensions. Second, the third and fourth columns use the raw executive green cognition indicator (cog_raw) instead of the logarithmic indicator for regression, and the results also support the main conclusions of this paper.

4.5 Mediation Effect Test

Table 4. Mediation Path Regression Results

variable	(1) Green Investment	(2) E
L.cog	0.0 711***	1.3 680***
	(0.0122)	(0.0708)
Green Investment		0.1 130***
		(0.0433)
control variables	yes	yes
Firm fixed effects	yes	yes
Annual fixed effects	yes	yes
N	43,544	43,544
R^2	0.0 15	0.1 74

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Table 5. Results of Bootstrap Mediation Effect Test

project	coefficient
Path a: L.cog → Green Investment	0.0 711
Path b: Green investment → E	0.1 131
Indirect effect a×b	0.0 080
Bootstrap standard error	0.0 024
z value	3.3 477
p-value	0.0 008
95% confidence interval lower limit	0.0 033
Upper limit of 95% confidence interval	0.0 127

Table 4 reports the regression results of the mediating path for green investment. The regression results of the green investment equation show that lagged executive green awareness (L.cog) has a significant positive effect on green investment, suggesting that firms with higher executive green awareness tend to increase green investment. In the environmental performance regression, after incorporating green investment into the model, its coefficient is 0.1130 and significant at the 1% level, which confirms that green investment can significantly enhance corporate environmental performance.

Table 5 reports the results of the Bootstrap mediation effect test. The estimated value of the indirect effect is 0.0080, with a 95% confidence interval of [0.0033, 0.0127], which does not include 0, indicating that the mediation effect is statistically significant. This demonstrates that executives' green awareness can not only directly improve corporate environmental performance but also indirectly improve corporate environmental performance by promoting green investment.

5. Conclusion

This paper uses a sample of A-share listed companies in China from 2009 to 2024 to examine the impact and mechanism of senior management's green awareness on corporate ESG performance. The study shows that senior management's green awareness can improve corporate ESG performance, with this impact being more pronounced in the environmental dimension; green investment plays a partial mediating role in the influence of senior management's green awareness on environmental performance. These results indicate that management's green development awareness can further improve corporate environmental responsibility fulfillment and external ESG evaluation results by influencing corporate green resource allocation behavior.

This paper still has several limitations. First, the measurement approach of the green investment indicator can be further optimized. Second, this paper only adopts fixed-effects models, lagged variables and alternative indicators for endogeneity identification. Future research may incorporate exogenous policy shocks and quasi-natural experiments to strengthen causal inference. In practice, enterprises should attach importance to cultivating green awareness among senior executives and transform green concepts into environmental governance actions through green investment.

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