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The Impact of Executives' Environmental Background on Corporate Environmental Performance

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Abstract: This study focuses on the relationship between executives' environmental background and corporate environmental performance. Based on the company data of A-share listed companies from 2012 to 2022, we analyze the samples of multi-industry companies in depth, and use multiple regression models and two-way effect fixed models to reveal the significant role of executives' environmental background in corporate environmental strategy formulation, resource allocation, and the promotion of environmental management practices, as well as the mediating role of green innovation and the moderating role of environmental regulation. The study also examines the mediating role of green innovation and the moderating role of environmental regulation. The study finds that executives with environmental background can, by virtue of their professional knowledge and environmental awareness, more actively guide enterprises to adopt energy-saving, emission reduction, green production and other environmentally friendly initiatives through corporate green innovation, which in turn significantly improves the environmental performance of enterprises; and the moderating role of environmental regulation has a certain critical effect. This study not only enriches the theoretical research in the field of corporate social responsibility and sustainable development, but also provides valuable practical references for enterprises in management selection and environmental strategic planning.

Keywords: executive environmental protection, environmental performance, green innovation, environmental regulation

1. Introduction

Under the background that the world is actively tackling climate change and advocating green and sustainable development, environmental protection has become an important issue that enterprises cannot avoid [1]. As all sectors of society continue to pay attention to environmental issues, a company's environmental performance is not only related to the fulfillment of its social responsibility, but also closely linked to its long-term development and market competitiveness.

As the core makers of corporate strategic decisions, executives' personal backgrounds and perceptions greatly influence the strategic direction and operational decisions of companies [2]. Executives with an environmental background are more likely to use their own professional knowledge and deep understanding of environmental issues to promote the implementation of proactive environmental strategies and initiatives [3]. On the one hand, they can keenly capture business opportunities in the environmental protection field and guide enterprises to develop green

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products and services to open up new market space; on the other hand, they can optimize the internal resource allocation of enterprises and adopt more environmentally friendly production technologies and management methods, thereby reducing the environmental risks and operating costs of enterprises.

In the existing related studies, scholars have more often studied the impact of executives' environmental cognition on corporate green innovation, and seldom considered corporate green innovation as a mediator and introduced environmental regulation to further study the impact of executives' environmental background on corporate environmental performance. Based on this, this paper takes A-share listed companies as the research object, constructs a two-way fixed-effects model, analyzes the heterogeneity of whether they are state-owned enterprises and heavy polluters, and introduces the mediating variable of green innovation and the moderating variable of environmental regulation, aiming to study the impact of antecedent factors on corporate environmental performance in order to enrich the theoretical research in the field of enterprise strategic management and corporate governance, and at the same time provide practical and feasible solutions for enterprises in selecting executives and formulating environmental strategies. It also provides practical practical guidance for companies in selecting executives and formulating environmental strategies.

Marginal contribution of this paper: In many previous studies, the relationship between executives' environmental background and corporate environmental performance has not yet been studied. Therefore, on the one hand, this study systematically analyzes the connection between the two, and constructs a theoretical framework from multiple dimensions, such as analyzing the combination of executives' environmental education background, work experience and corporate environmental performance, which fills the gap in this field at the theoretical level and builds a more solid theoretical foundation for subsequent studies. On the other hand, green innovation as a mediating variable and environmental regulation as a moderating variable are groundbreakingly incorporated into the research model of executives' environmental background and corporate environmental performance at the same time. The in-depth study of the influence of green innovation and environmental regulation expands the research boundaries of the factors influencing corporate environmental performance, and also suggests how enterprises and the government can better link up based on corporate environmental protection in the future, which greatly enriches the connotation of the research on the interaction between policies and micro-behavior of enterprises.

2. Theoretical analysis and research hypotheses

Executives with environmental background tend to pay more attention to the fulfillment of corporate environmental responsibility, and they will integrate environmental concepts into the daily operation and development strategy of the enterprise based on their own cognitive understanding of environmental responsibility. Therefore, the environmental background of executives may have a certain impact on corporate environmental performance.

2.1. Contribution of corporate executives' environmental background to corporate environmental performance

The top echelon theory suggests that the background characteristics of executives influence their comprehensive skills, value orientation, management style and behavioral patterns, which in turn play an important role in corporate strategic decision-making. The theory was first proposed in 1984, and in response to the theory, it has had a great impact in the academic world, triggering many scholars to study it. Some scholars in 1989 found that executives' own education level has a greater impact on successful organizational change [4]. Other scholars have analyzed the

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relationship between executive team characteristics and corporate performance and found that there is a significant correlation between different executive characteristics (e.g., age, educational background, gender, etc.) and corporate performance [5]. Other scholars have concluded that the career experience of executives has an impact on corporate management [6]. In summary, it can be seen that the upper echelon theory provides a theoretical basis for studying the impact of executives' environmental background on corporate performance.

Based on the above theoretical basis, the analysis suggests that executives with environmental background, with their unique environmental awareness and concepts, can take environmental factors into account in corporate decision-making and operations, actively promote the adoption of environmental measures and fulfillment of environmental responsibility, thus promoting the improvement of corporate environmental performance. The first hypothesis is thus established:

H1: Corporate executives' environmental background can promote corporate environmental performance.

2.2. The mediating role of corporate green innovation

Also based on the top echelon theory, the stronger the environmental awareness of executives, indicating that the higher the acceptance and recognition of the environmental guidelines at the top, and the higher the importance of the environment [7], then they will be better able to promote more green innovation in the enterprise. Through green innovation, enterprises can not only develop more efficient resource utilization technologies and management methods to reduce the waste of resources, improve resource utilization efficiency, reduce the production cost of enterprises, and improve environmental performance; they can also develop more environmentally friendly technologies and products to reduce the emission of pollutants, improve the quality of the environment, reduce the environmental risk, and improve the sustainable development of enterprises. At the same time, enterprises actively carry out green innovation activities, which is conducive to their better enhancement of corporate image and value, and increase core competitiveness.

From the above description of the relationship between executives' environmental awareness, corporate green innovation and environmental performance, it can be seen that executives' environmental background is acting positively on corporate green innovation, which in turn further positively affects corporate environmental performance. From this, the second hypothesis can be established:

H2: Corporate green innovation mediates the relationship between executives' environmental background and corporate environmental performance.

2.3. The moderating role of environmental regulation

Stakeholder theory emphasizes that the survival and development of enterprises cannot be separated from the support of various stakeholders [8]. In the traditional theory, the maximization of shareholders' interests is the financial management goal of an enterprise, but with the continuous changes in the external environment, it is not feasible to only maintain the interests of shareholders, and enterprises need to consider the interests of multiple parties in order to obtain sustainable development. Therefore, the stakeholder theory has gradually been paid attention by the public. Stakeholders of a firm include shareholders, employees, government, customers, suppliers, and the community, etc.It has been noted that firms are facing tremendous pressure from various stakeholders to act in their best interests, and this pressure may motivate firms to develop specific capabilities to manage accordingly and improve their competitive position (e.g., economic, social, and environmental) [9]. Some scholars consider stakeholders as any groups and individuals who can

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have a non-negligible influence on the development process of the object of study [10]. Other scholars have pointed out that stakeholder theory has a strong intrinsic correlation with corporate performance evaluation [11]. This shows that stakeholder theory plays an important role in the relationship between corporate environmental background, green innovation, environmental regulation and corporate environmental performance. Executives with an environmental background may be more concerned about stakeholders' environmental needs, such as the government's environmental regulatory requirements.

Therefore, from the stakeholder perspective, executives with environmental awareness may respond positively to the environmental regulations set by the government of their stakeholders and take corresponding environmental measures, which may have an impact on corporate performance. In addition, they can also influence the behavior of employees in the enterprise through their own environmental behavior, improve the environmental awareness of employees, and then affect the environmental performance of the enterprise. Summarizing the above analysis, the third hypothesis can be established:

H3: Environmental regulation has a moderating role in the effect of corporate executives' environmental background on corporate environmental performance.

3. Model construction

3.1. Research sample and data sources

The research samples of this paper are mainly taken from the CSMAR database and CNRDS database of China's Shanghai and Shenzhen A-share listed companies from 2012 to 2022, and the selected samples are processed as follows: (1) eliminating the samples of ST, *ST, and PT categories; (2) eliminating the financial categories; (3) eliminating the samples with missing data; (4) eliminating the samples with gearing ratios greater than 1; (5) shrinking the continuous variables up and down by 1%. Finally, all the above integrated data are processed and analyzed by Stata18 software.

3.2. Definition of key variables

3.2.1. Explained variable: corporate environmental performance (GGP)

In this study, corporate environmental performance is replaced by corporate green governance performance, which mainly draws on the research ideas of previous scholars, based on the positive and negative scores of the company's participation in green governance using Janis-Fadner coefficients (J-F coefficients) to measure the green governance performance of the company, which is calculated by the following formula:

$$GGP = \begin{cases} (p^2 - p \times |q|)/r^2, if p > |q| \\ (p \times |q| - q^2)/r^2, if p < |q| \\ 0, if p = |q| \end{cases} \quad (1)$$

Where p is the positive green governance performance score, each item is scored according to +1; q is the negative green governance performance score, each item is scored according to -1; r is the absolute value of p+|q|. The range of GGP is [-1,1], and the larger its value, the higher the corporate environmental performance.

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3.2.2. Explanatory variables: executive environmental background (EP)

The data of EP background of executives are mainly selected from the resumes of executives with "environment", "environmental protection", "green", "energy saving and emission reduction", "sustainable development", "environmental protection", "environmental protection", "green", "energy saving and emission reduction", and "sustainable development". "sustainable", 'low carbon', 'ecology', 'new energy' and other keywords. keywords, based on which the number of executives with environmental background is calculated. The total number of executives mainly includes the number of directors, presidents and managers.

3.2.3. Mediating variable: green innovation of enterprises (GI)

The degree of green innovation of an enterprise is studied by using the sum of the number of green inventions independently filed by the enterprise and the number of green utility models independently filed by the enterprise in the same year as a proxy variable.

3.2.4. Moderating variable: environmental regulation (ER)

The selection of environmental regulation data for the study mainly refers to the practice of scholars in the article "Soft Science in China", in which the degree of environmental regulation is measured by the amount invested in pollution control of exhaust gas and wastewater in the year of the location of the listed company as a proportion of the total industrial output value in that year.

Table 1: Definitions of the main variables

Variable category	Variable name	Variable Interpretation
Explained variable	GGP	See explanation above for details
Explaining variable	EP	Continuous variable that takes the logarithm of the number of executives with an environmental background on the firm's board of directors in the year
Control variable	ROA	Net profit/average total assets
	Lev	Total liabilities/total assets
	CF	(Net Profit + Non-Cash Expenses - Dividends and Capital Expenses) / Total Shares Issued
	INST	Total institutional shareholdings/total company share capital
	Size	Number of total assets
	Board	Number of Directors + Number of Presidents + Number of Managers
	NP	Total profit - income tax
	Balance	Shareholding ratio of the largest shareholder
	Dual	If the chairman of the board and the general manager are the same person, assign a value of 1, otherwise 0
	Year	Dummy variables based on the period 2012-2022
	IND	SEC 2012 Industry Classification, manufacturing industry take two codes, other industries with broad categories
Heterogeneity Test Dummy Variables	Pollution	Polluting enterprises take the value of 1, non-polluting enterprises take the value of 0
	EN	State-controlled enterprises take the value of 1, others 0

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3.3. Modeling

In order to deeply study the influence of executives' environmental background on corporate environmental performance, and to analyze the mediating role of green innovation and the moderating role played by environmental regulation, based on the research on corporate environmental protection related literature, a multiple regression model is established with corporate environmental performance (GGP) as the explanatory variable, and the number of executive members with environmental background (EP) as the explanatory variable. At the same time, this study controls the model for year fixed effects (YEAR) and industry fixed effects (IND), and the specific model is as follows:

$$GGP_{i,t} = \alpha_0 + \alpha_1 EP_{i,t} + \sum Control_{i,t} + \sum IND_i + \sum Year + \varepsilon_{i,t} \quad (2)$$

Control in the above equation denotes the control variable; i denotes the firm; and t denotes time.

4. Empirical analysis

4.1. Descriptive statistics

The descriptive statistics of the main variables are shown in Table 2 below. The range of corporate environmental performance (GGP) is [0, 1], the mean is 0.57, the median is 1, and the standard deviation is 0.45, which indicates that there is significant polarization among the sample enterprises; since the median of GGP is 1, it means that at least 50% of the sample's environmental performance reaches the highest level (1), reflecting that the majority of the enterprises are performing better in environmental governance; however, the mean is lower than the median (1), resulting in a left-skewed distribution, indicating that a minority of enterprises have poor environmental performance, which may be the “green transition” of a minority of the enterprises. However, its mean value is lower than the median, resulting in a left-skewed distribution, which indicates that a minority of enterprises have poor environmental performance and are likely to be the “lagging group” in green transformation. The standard deviation of the number of executives with environmental background is 0.5, which indicates that there is a significant difference in the environmental background of executives among enterprises; 50% of enterprises have no executives with environmental background (the median is 0), reflecting that the penetration rate of environmental protection professionals in the executive team of enterprises is still relatively low, and only a small number of enterprises have a large number of executives with environmental background (the maximum value is 1.95), and these few enterprises have more possibilities of environmental protection in their environmental performance from the perspective of long-term development. From the perspective of long-term development, they have more possibilities to take obvious advantages in green transformation.

The range of green innovation (GI) is [0, 3.47], the median is 0, which means that more than half of the enterprises do not invest in green innovation; the mean is 0.34, the maximum is 3.47, the mean is higher than the median, and the maximum is much higher than the mean, which indicates that a small number of enterprises (may be the head of the enterprises with sufficient funds and leading technology) occupy a dominant position in the green innovation, and in this case, it is likely to In this case, it is likely to aggravate the imbalance of green transformation within the industry, leading to the overall inefficiency of transformation and the emergence of the “green innovation gap” phenomenon. While the mean and median values of environmental regulation (ER) are close to zero, indicating that the overall intensity of environmental regulation is low, the maximum value of 0.0284 reflects the high intensity of environmental regulation in a few regions or industries, which may be related to factors such as policy pilots and the governance of key polluted areas.

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Table 2: Results of descriptive statistics of variables

Variant	Sample size	Average value	Standard deviation	Minimum value	Upper quartile	Maximum values
GGP	12703	0.570	0.450	0	1	1
EP	12703	0.300	0.500	0	0	1.950
GI	12703	0.340	0.740	0	0	3.470
Balance	12703	0.810	0.630	0.0400	0.650	2.840
NP	12703	2.740	8.300	-18.09	1.020	54.80
ROA	12703	0.0300	0.0900	-0.430	0.0300	0.210
Lev	12703	0.420	0.210	0.0600	0.400	0.970
CF	12703	0.0500	0.0400	0	0.0300	0.210
INST	12703	41.10	24.37	0.270	41.94	90.41
Size	12703	3.630	1.130	1.300	3.510	7.080
Board	12703	2.100	0.190	1.610	2.200	2.560
Dual	12703	0.310	0.460	0	0	1
EN	12703	0.260	0.440	0	0	1
ER	12703	0.0021	0.0022	0	0.0015	0.0284
Pollution	12703	0.350	0.480	0	0	1

4.2. Regression analysis

4.2.1. The influence of executives' environmental background on corporate environmental performance

As shown in Table 3, column (1) is the baseline result of studying the influence of executives' environmental protection background on corporate environmental performance without considering the control variables, and the result shows that the coefficient of the influence of executives' environmental protection background on corporate environmental performance is 0.101, which is three-star significant, indicating that corporate executives with environmental protection background have a facilitating effect on corporate environmental performance.

Column (2) takes the factors of control variables into account to study the benchmark results of the relationship between executives' environmental protection background and corporate environmental performance, and the results show that among the many control variables, the corporate gearing ratio, the proportion of institutional investors, and the size of the enterprise passed the significance test, in which the size of the enterprise size will have a positive impact on the enterprise's environmental performance, while the gearing ratio and the proportion of institutional investors will have a negative impact on the enterprise's environmental performance of enterprises, while the gearing ratio and the proportion of institutional investors will have a negative impact on the environmental performance of enterprises.

The above analysis can prove that hypothesis H1 is valid.

Table 3: Model regression results

Variant	(1)	(2)
	GGPw	GGPw
EP	0.101***	0.0991***
	(0.00766)	(0.00766)
Year	Yes	

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Table 3: (continued).

IND	Yes	
Balance		0.00280
		(0.00615)
NP		0.000848
		(0.000595)
ROA		-0.0722
		(0.0573)
Lev		-0.0425*
		(0.0244)
CF		0.0798
		(0.107)
INST		-0.000693***
		(0.000156)
Size		0.0323***
		(0.00486)
Board		0.0167
		(0.0208)
Dual		-0.00496
		(0.00830)
_cons	0.346***	0.246***
	(0.0619)	(0.0784)
N	12703	12703
R2	0.060	0.067
adj. R2	0.054	0.061

* p < 0.1, ** p < 0.05, *** p < 0.01

4.2.2. The mediating role of corporate green innovation

As shown in Table 4 below, in column (1), the main research and analysis of the interrelationship between corporate executives' environmental background and corporate green innovation concludes that: executives' environmental background has a facilitating effect on corporate green innovation and shows a three-star significant effect, and in this effect, the control variables of the degree of equity checks and balances, net profit, free cash flow per share, institutional investment shareholding ratio, enterprise size, the number of executives, and the number of positions in the company are all positively facilitating. unity are positively contributing, while return on total assets and gearing show negative effects, and all of the above control variables pass the significance test.

In column (2) of the table, green innovation is regressed as a mediating variable between executives' environmental background and corporate environmental performance, and the results show that the coefficient of green innovation on corporate environmental performance is 0.0406, which is three-star significant; at the same time, corporate green innovation, as a mediating variable between executives' environmental background and corporate environmental performance, promotes the environmental performance of corporations. In other words, when the enterprise has more executives with environmental background, the greater the degree of enterprise green innovation, the better the enterprise environmental performance. Thus, hypothesis H2 is verified.

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Table 4: Regression results of mediating and moderating variables

Variant	(1)	(2)	(3)	(4)
	Intermediary variable		Moderator variable	
	GIw	GGPw	GGPw	GGPw
EP	0.284***	0.0881***	0.0991***	0.118***
	(0.0111)	(0.00776)	(0.00766)	(0.0111)
Balance	0.0408***	0.000962	0.00282	0.00284
	(0.00913)	(0.00614)	(0.00615)	(0.00615)
NP	0.00649***	0.000614	0.000849	0.000820
	(0.000909)	(0.000594)	(0.000595)	(0.000595)
ROA	-0.367***	-0.0537	-0.0723	-0.0730
	(0.0847)	(0.0572)	(0.0573)	(0.0573)
Lev	-0.0632*	-0.0402*	-0.0425*	-0.0427*
	(0.0355)	(0.0243)	(0.0244)	(0.0244)
CF	0.368**	0.0565	0.0799	0.0774
	(0.156)	(0.106)	(0.107)	(0.107)
INST	0.000414*	-0.000715***	-0.000693***	-0.000689***
	(0.000230)	(0.000155)	(0.000156)	(0.000156)
Size	0.0455***	0.0302***	0.0323***	0.0324***
	(0.00715)	(0.00486)	(0.00486)	(0.00486)
Board	0.0755**	0.0137	0.0167	0.0165
	(0.0306)	(0.0208)	(0.0208)	(0.0208)
Dual	0.0507***	-0.00666	-0.00495	-0.00533
	(0.0123)	(0.00828)	(0.00830)	(0.00830)
Year	Yes			
IND	Yes			
GI		0.0406***		
		(0.00504)		
ER			0.174	3.134
			(2.020)	(2.380)
xER				-8.819**
				(3.753)
_cons	0.356***	0.229***	0.245***	0.239***
	(0.118)	(0.0783)	(0.0785)	(0.0786)
N	12703	12703	12703	12703
R^2	0.089	0.071	0.067	0.067
adj. R^2	0.084	0.065	0.060	0.061

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.2.3. Moderating role of environmental regulation

As shown in Table 4, column (3) introduces environmental regulation as a moderating variable based on column (4) to investigate the impact of executives' environmental background on corporate environmental performance. It is found that environmental regulation plays a moderating role, but as a moderating variable, it shows an inhibitory effect on corporate environmental performance and is two-star significant. In summary, it can be shown that hypothesis H3 is valid.

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The reasons for the inhibitory effect of environmental regulation are analyzed. Although environmental regulation is one of the important strategies to realize sustainable development, different types of environmental regulation may have negative moderating effects in some cases. Firstly, command-and-control environmental regulation is usually in the form of administrative orders that require firms to meet specific environmental standards. This form of regulation may increase compliance costs, as firms may need to invest large sums of money in the purchase and operation of pollution control equipment in order to meet these standards, thereby reducing the resources available for technological innovation and production expansion. Second, market-incentivized environmental regulation may similarly trigger negative regulatory effects. This type of environmental regulation guides firms' environmental behavior mainly through economic instruments, such as environmental subsidies. However, when firms rely excessively on subsidies and focus heavily on obtaining subsidies rather than truly engaging in substantive green innovation, environmental subsidies may have a "crowding-out effect" that reduces firms' environmental performance. Finally, in public participation-based environmental regulation, the need to listen to a wide range of public opinions and suggestions may lead to increased complexity in the decision-making process. In some cases, differences in opinions between different interest groups may make it difficult to reach a decision, thus affecting the implementation of environmental regulation or even bringing negative effects. In addition, from the perspective of marginal effect in economics, the promotion of environmental regulation for the environmental performance of enterprises has a certain critical value, and when it exceeds the critical value, the positive effect will be weakened, or even play an inhibitory effect.

4.2.4. Robustness analysis

As shown in Table 5 below, the robustness analysis is conducted by shortening the original data time to 2017-2022. The sample size N=8702 after shortening the time span of the study data is still large enough to meet the statistical requirements. For the core variable stability study, the EP coefficient is 0.0938* with a small standard deviation (0.00920) and remains highly significant (***). This indicates that its positive effect on the dependent variable remains robust after shortening the time span. Analyzing the model in terms of its explanatory power, the adjusted R^2 is 0.071, which is low but within the acceptable range in the cross-sectional data. There is no significant decrease in the explanatory power of the model after shortening the time span, indicating the stability of the variable relationship. In addition to this, it is worth noting that the significance of the core variables is not significantly disturbed due to the presence of the special event COVID-19 in this time span, thus indicating that the model is robust to short-term shocks.

In summary, the significance, sign direction, and coefficient magnitude of the key variables (EP, INSTw, and Sizew) remain consistent after shortening the time horizon, and there are no unusual changes in the control variables and model structure. Therefore, the regression results pass the robustness test for time samples, proving that the core findings are reliable.

Table 5: Robustness regression results

Variant	(1)
	GGPw
EP	0.0938***
	(0.00920)
Balance	-0.00807
	(0.00747)
NP	0.000539

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Table 5: (continued).

	(0.000590)
ROA	-0.0164
	(0.0614)
Lev	-0.0324
	(0.0298)
CF	0.156
	(0.137)
INST	-0.000474**
	(0.000191)
Size	0.0215***
	(0.00584)
Board	0.00650
	(0.0259)
Dual	-0.00616
	(0.0102)
Year	Yes
IND	Yes
_cons	0.234**
	(0.0974)
N	8702
R^2	0.081
adj. R^2	0.071

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.2.5. Heterogeneity analysis

As shown in Table 6, for the heavy pollution heterogeneity analysis, comparing the data in columns I and II, it can be found that the EP coefficient of non-heavy pollution industry is larger, which indicates that compared with the heavy pollution industry, the more the number of executives with environmental protection backgrounds in the non-heavy pollution industry, the stronger the positive impact on the environmental performance of enterprises. The reason is that enterprises in non-polluting industries are less constrained by policies and rely more on internal decision-making for green transformation. With their professional knowledge and ideas, executives with environmental background can take more initiative to promote corporate green innovation and sustainable development strategies [12], unlike firms in heavy polluting industries that are more likely to respond to external regulations.

The results of the analysis of equity heterogeneity in columns 3 and 4 of the table show that the greater the proportion of executives with environmental background in non-state-owned enterprises (i.e., the nature of equity = 0) compared with state-owned enterprises, the more significant the promotion of the environmental performance of the enterprise. The reason may be that non-state-owned enterprises have more flexible governance mechanisms and more autonomy in executive decision-making, and executives with environmental backgrounds can promote green strategies more effectively. In addition, non-state-owned enterprises are more sensitive to market signals, and the addition of executives with environmental backgrounds can attract more green investors and help enterprises' green transformation. In contrast, state-owned enterprises are subject

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to more government constraints [13], executives' power is limited, and the role of environmental background executives in promoting corporate environmental performance is relatively weak.

Table 6: Heterogeneity regression results

Variant	Heavily polluted nature = 1	Heavily polluted nature = 0	Nature of equity = 1	Nature of equity = 0
	GGPw	GGPw	GGPw	GGPw
EP	0.0867***	0.0879***	0.0534***	0.121***
	(0.0144)	(0.00946)	(0.0152)	(0.00898)
Balance	-0.0367***	0.0238***	-0.0202	0.00989
	(0.0113)	(0.00778)	(0.0142)	(0.00704)
NP	-0.0000327	0.00157**	0.000944	0.000695
	(0.00100)	(0.000791)	(0.000905)	(0.000836)
ROA	0.120	-0.0775	-0.0488	-0.0704
	(0.105)	(0.0726)	(0.154)	(0.0645)
Lev	-0.0470	-0.0240	0.00194	-0.0551*
	(0.0450)	(0.0312)	(0.0500)	(0.0287)
CF	0.0185	0.238*	0.202	0.0360
	(0.198)	(0.138)	(0.214)	(0.124)
INST	-0.000606**	-0.000663***	-0.000766**	-0.000773***
	(0.000283)	(0.000198)	(0.000340)	(0.000178)
Size	0.0296***	0.0210***	0.0365***	0.0313***
	(0.00887)	(0.00638)	(0.00951)	(0.00597)
Board	-0.0157	0.0352	0.0659	0.00597
	(0.0383)	(0.0269)	(0.0458)	(0.0241)
Dual	-0.00722	-0.0114	-0.0402*	0.00147
	(0.0157)	(0.0105)	(0.0240)	(0.00914)
Year	Yes			
IND	Yes			
_cons	0.463***	0.168*	0.467**	0.185**
	(0.116)	(0.0895)	(0.188)	(0.0881)
N	4357	8346	3337	9366
R^2	0.093	0.080	0.105	0.066
adj. R^2	0.076	0.069	0.084	0.057

* p < 0.1, ** p < 0.05, *** p < 0.01

5. Conclusion

Based on the data of 12,703 samples of A-share listed companies from 2012 to 2022, this study empirically investigates the impact of corporate executives' environmental background on corporate environmental performance, and introduces the mediating variable green innovation and the moderating variable environmental regulation for in-depth analysis. The results of the study finally show that (1) the higher the proportion of corporate executives with environmental protection background, the stronger its contribution to corporate environmental performance. (2) Green innovation plays a mediating role in the influence of executives' environmental background on corporate environmental performance, while green innovation promotes corporate environmental performance. (3) Environmental regulation has a moderating role in the influence of executives' environmental background on corporate environmental performance, and whether this moderating

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role is facilitative or not depends on the mechanism of the type of environmental regulation and whether it reaches a critical value. (4) Heterogeneity analysis shows that the effect of corporate environmental background on corporate environmental performance is more significant in non-state-owned enterprises and non-heavily polluting enterprises.

Based on the above research findings, the following policy recommendations are given:

(1) For enterprises, firstly, they should recognize the importance of executives with environmental protection background. When recruiting and selecting executives, priority should be given to those with environmental background or environmental awareness in order to enhance the environmental performance of enterprises; at the same time, internal training or external cooperation should be used to enhance the environmental cognition and awareness of existing executives in enterprises. Second.

Investment in green technology R&D should be increased to promote the innovation of green products and services; green innovation incentive mechanisms should be established to encourage employees to participate in environmental protection-related innovation activities; and cooperation with universities and scientific research institutes should be carried out to carry out green technology R&D and transformation of results. Third, take the initiative to adapt to environmental regulations. Pay close attention to changes in government environmental policies, and lay out in advance to cope with stricter environmental regulations; when environmental regulations have not reached a critical value, take the initiative to take environmental protection measures to avoid passive response.

(2) For the government, firstly, it should amend and improve policies related to environmental regulation, formulate differentiated environmental regulation policies, and implement classification management for different industries and types of enterprises. Second, support enterprises to carry out green innovation, set up a certain degree of incentive mechanism, for example: increase the financial subsidies and tax incentives for green technology research and development, reduce the cost of enterprise green innovation; set up a green innovation fund to support enterprises to carry out research and development and promotion of environmental protection technology, etc.. In addition, on the basis of incentive policies should also correspondingly strengthen the supervision mechanism, strengthen the supervision and evaluation of the environmental performance of enterprises to ensure the effective implementation of environmental policies. Third, we should strengthen the cultivation of environmental protection talents, promote universities and vocational schools to open environmental protection related majors, cultivate more professionals with environmental protection background; encourage enterprise executives to participate in environmental protection training, enhance their environmental awareness and ability.

In general, the government, enterprises and industries should strengthen multi-party collaboration, the establishment of government-led, enterprise-oriented, industry-driven, public participation in environmental governance system, to form a synergy to help realize the sustainable and coordinated development of environmental protection and economic.

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