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Original Research

Does Public Environmental Attentions Improve Corporate Sustainability? – The Mediating Role of Corporate Environmental Responsibility

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Abstract

With the increasingly serious pollution problem, environmental protection issues are also attracting the public's attention. This article selects Chinese manufacturing listed companies from 2013 to 2021 as research samples to examine the impact of public environmental attention on corporate sustainability, as well as the impact mechanism and heterogeneity between the two. The results indicate that, firstly, public environmental attention promotes corporate sustainability, environmental regulations promote corporate sustainability, and the impact of public environmental attention on corporate sustainability is positively moderated by environmental regulations. Secondly, public environmental attention promotes the sustainability of enterprises through enhancing corporate environmental responsibility. Finally, further research has indicated that there are differences in the impact of public environmental attentions on corporate sustainability based on the heterogeneity of scale, region, and ownership of enterprises. In large non-state-owned listed companies, as well as in the eastern and coastal regions, public environmental attentions are more related to corporate sustainability.

Keywords: public environmental attentions, corporate environmental responsibility, corporate sustainability, green innovation, manufacturing industry

Introduction

In recent years, China's economy has developed rapidly, and the problem of environmental pollution has become increasingly serious [1]. With the rapid development of industrial modernization, many environmental issues such as global climate change, severe vegetation destruction, increased industrial waste, and air and water pollution caused by environmental pollution have become increasingly prominent, seriously affecting public health and life [2-3]. According to the 2020 Environmental Performance Index, jointly released by Yale University and Columbia University in the United States, China ranks 120th in environmental performance among the 180 participating countries. In 2019, according to the disclosure of the Ministry of Ecology and Environment of China, the air quality of 180 cities in China (accounting for more than half of the total number of cities) seriously exceeded the standard, and the total time of serious pollution in domestic cities reached 1666 days, an increase of 88 days compared with 2018. The increasingly serious environmental

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problems have gradually become a key factor restricting China's sustainable development, a common challenge that endangers the survival of all humanity, and a focus issue of common concern worldwide.

As the most indispensable component of today's social structure, enterprises play an extremely important role in overall socio-economic development. On the one hand, enterprise development is an important manifestation of socio-economic development and an important channel for promoting national economic progress. Enterprises play a very important role in stabilizing the economy, absorbing employment, and earning foreign exchange from exports [4]. On the other hand, the pollutants generated by enterprise production also seriously damage the environment. Enterprises are not only the main body of the market economy, but also important participants in environmental protection. As the world's largest manufacturing country, the added value of China's manufacturing industry in 2021 has exceeded 31.4 trillion, accounting for nearly 30% of the global proportion. However, the rapid development of the manufacturing industry comes at the cost of sacrificing the environment. Low-cost production in the manufacturing industry generally has the characteristics of high consumption, high pollution, and high emissions. Therefore, enterprises have caused serious damage to the environment during production and operation processes [5]. With the implementation of the new Environmental Protection Law in 2015 and the formulation of the "carbon peak" and "carbon neutrality" targets in 2020, the government has strengthened the implementation of environmental laws and regulations and also strengthened environmental constraints on enterprises (especially heavy polluting manufacturing). Therefore, increasing the environmental responsibility of enterprises, reducing and controlling greenhouse gas emissions, and implementing sustainable development strategies are important factors for the stability of today's society. Currently, sustainable development has become a common goal of global public governance and a development consensus reached by countries around the world [6].

The wide spread of the concept of sustainable development has led to the rise of environmental protection around the world. The public's awareness of environmental protection is gradually increasing, promoting environmental protection as a conscious action for individuals to maintain their own survival and development in society. The public's concern for the environment has attracted more and more attention from the government. Studies have shown that public concern for the environment has gradually become the main way for the public to participate in social environmental management [7]. As stakeholders who have a significant impact on the development of enterprises, public pressure on enterprises directly affects their production decisions, and public attitudes towards the environment also affect the future development direction of enterprises. From the perspective of enterprises, as manufacturers of environmental pollution, enterprises themselves should bear corresponding social responsibilities. Enterprises have gained a large amount of economic benefit through production, but at the same time, they have also caused a lot of pollution and damage to the environment [8]. Therefore, the fundamental cause of environmental pollution is enterprises, which should have been dealt with by enterprises. However, the reality is vastly different. Due to significant differences in economic conditions, technological levels, pollution levels, and environmental responsibilities among a large number of enterprises, some may excessively pursue economic benefits and invest little or no in environmental protection. Such behavior not only damages the environment, but also guides other homogeneous enterprises to follow suit, leading to increasingly serious environmental problems. From the perspective of the public, in the face of harsh environments that can seriously affect physical health, in addition to showing concern for environmental issues and understanding of environmental knowledge, the public also targets manufacturers and enterprises for environmental problems. The public hopes that enterprises can reduce their impact on the surrounding environment through energy conservation, emission reduction, and the treatment and cleaning of existing pollutants, thereby improving the public's living environment.

With the increasingly prominent issue of environmental pollution, the environmental responsibility of enterprises is also attracting more and more attention. Corporate environmental responsibility requires enterprises, as participants in economic activities, to incorporate environmental protection and management into their business decisions and seek consistency between their own development and socio-economic development goals. Enterprises are the main source of pollutant emissions and a key link in environmental governance. Actively participating in environmental governance by enterprises may increase their economic burden in the short term, but in the long run, as public environmental awareness increases, improving the level of environmental management by enterprises is an opportunity rather than a threat [9-10]. With the strengthening of national environmental regulations, enterprises must consider environmental protection in order to survive and develop [11]. Therefore, consciously fulfilling environmental responsibilities and effectively implementing environmental practices are the fundamental factors for enterprises to implement long-term sustainable development strategies at present [12].

The existing research on corporate sustainability mainly focuses on the impact of corporate strategy on corporate sustainability [13], the impact of corporate environmental protection investment on corporate sustainability [14], and the impact of scientific and technological innovation on corporate sustainability [15]. The impact of public behavior on corporate sustainability is generally negative

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and rarely positive. So can public behavior have a positive impact on corporate sustainability? In what ways does public behavior have a positive impact on corporate sustainability? And whether the impact of public behavior on corporate sustainability is heterogeneous. That would be a very interesting question. Therefore, this article selects data from listed companies in China's manufacturing industry from 2012 to 2021 as the research sample to test the impact of public environmental attention on corporate sustainability. The research results indicate that public attention to the environment significantly promotes the sustainability of enterprises. Public environmental attention promotes corporate sustainability through corporate environmental responsibility. The impact of public environmental attention on corporate sustainability is actively regulated by environmental regulations. Further analysis indicates that the relationship between public environmental attentions and corporate sustainability is influenced by heterogeneity in corporate size, region, and ownership. Among them, non-state-owned enterprises, large enterprises, and enterprises in the eastern and coastal regions contribute more to the sustainability of enterprises through public environmental attention.

The main contributions of this study are as follows: First, from the perspective of public environmental attentions, the influencing factors of corporate sustainability were studied, providing a new research direction for corporate sustainability and enriching relevant literature; Secondly, based on social public evaluation data to measure corporate environmental responsibility, compared to previous questionnaire data, this data quantification is more objective and fair and has innovation in research data and methods; Thirdly, in the context of China's full penetration of corporate environmental responsibility, the results of this study have a strong practical significance for improving corporate sustainability, achieving high-quality economic growth, and achieving a double cycle of dual circulation.

The subsequent structural arrangement is as follows: The second part is a literature review and hypothesis; The third part is research design; The fourth part is the analysis of empirical results; The fifth part is further analysis; The final part is the conclusion and recommendations. The research in this article aims to promote enterprises to effectively fulfill their environmental responsibilities and has a positive guiding role in promoting the sustainable development of enterprises and even the entire social economy. The framework of this article is shown in Fig. 1.

Literature Review and Research Hypotheses

Public Environmental Attentions and Corporate Sustainability

With more and more serious environmental pollution, the concept of environmental protection has become more and more popular. The public is also becoming more concerned about environmental issues from the perspective of their own health [16]. Therefore, the pollution problem arouses public concern about the environment. As the source of pollution, the discharge of waste and pollutants in the production process of enterprises is the main cause of environmental pollution [17]. Therefore, if we want to reduce environmental pollution, we must promote enterprises to reduce pollution emissions and take the road to sustainable development. However, sustainable development requires enterprises to continue to invest in green environmental protection, which will occupy enterprise funds, increase production costs, and even reduce the competitiveness of enterprises [18]. In this case, it is generally necessary for the government to strengthen the supervision and management mechanisms to promote the environmental protection investment of enterprises so as to improve their sustainability. This paper constructs a trinity relationship model of public, government, and enterprise, as shown in Fig. 2. for details.

As a non-mandatory supervision mechanism, public environmental attention can compensate for the shortcomings of the government and environmental management departments in environmental governance and fully utilize its advantages in external supervision to conduct more comprehensive supervision

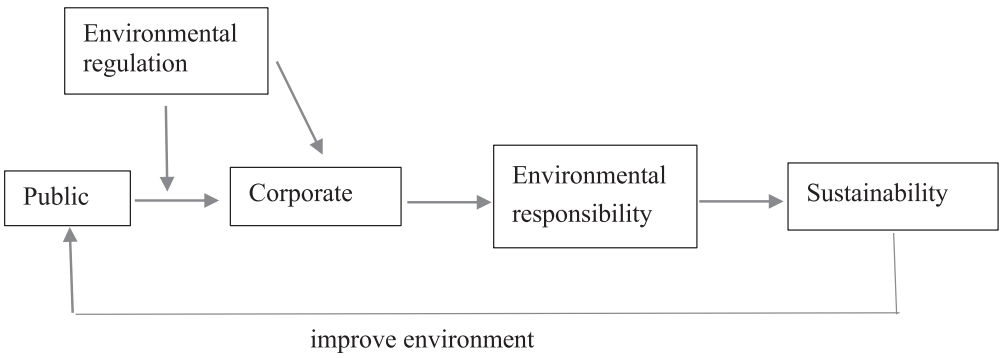

Fig. 1. Research frame diagram

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and management of environmental violations by enterprises. Firstly, with the rapid development of internet technology and the promotion and popularization of mobile internet, public environmental attention is no longer limited to voting, petitions, and proposals. The public's access to information and expression of their needs on internet platforms has become increasingly common. In addition, the public's emphasis on environmental issues can also enable the public to express their needs and dissatisfaction with the environment through the Internet and to understand and supervise the production behavior of enterprises through the power of the whole people in order to encourage enterprises to increase the environmental protection efforts through green investment [19]. Secondly, the high demands of the public on the environment will, to some extent, bring certain environmental pressure to the government [20]. Based on the contradiction between high public demand for the environment and corporate environmental pollution, if the government does not alleviate it in a timely manner, it may trigger a series of social conflicts at any time. Therefore, the government and relevant management departments will also increase environmental supervision of enterprises based on public environmental pressure, hoping to improve the environment through the green behavior of enterprises [21]. Thirdly, the environmental practices of enterprises can enhance their green reputation, generate certain social and environmental benefits, and attract the support of stakeholders. Therefore, when the public pays high attention to environmental issues, companies usually actively solve them to maintain their reputation and promote sustainable development [22]. Fourthly, in today's society, where environmental awareness is deeply ingrained, consumers are more willing to consider health, prefer more environmentally friendly and healthy green products, and are also willing to pay higher fees for green products. In order to adapt to the new consumption habits of the public, traditional enterprises must increase investment in environmental protection, promote green transformation of enterprises, meet consumer needs, and promote sustainable development of enterprises [23]. Finally, in the increasingly fierce competition, enterprises must prioritize environmental responsibility in their business strategies, enhance their green reputation, and expect to gain a preemptive advantage in future market competition [24]. Based on the above analysis, the hypotheses of this article are as follows:

Hypothesis 1 (H1): public environmental attentions have a positive effect on corporate sustainability.

Public Environmental Attentions, Corporate Environmental Responsibility, and Corporate Sustainability

As one of the most important responsibilities of corporate social responsibility, corporate environmental responsibility aims to strengthen the environmental awareness of enterprises, integrate environmental protection into all aspects of enterprise production and operation, and comprehensively promote the sustainable development of enterprises [25]. On the one hand, public environmental concern promotes corporate environmental responsibility. First of all, public environmental concerns will form public opinion and affect the reputation and image of enterprises. If a company is exposed to environmental violations, its brand image and reputation will be damaged, which will affect its market competitiveness. Therefore, companies will take the initiative to assume environmental responsibility to avoid the impact of negative public opinion. Secondly, public environmental concerns can also push the government to enact stricter environmental regulations and policies. These regulations and policies will restrict the production behavior of enterprises and urge them to adopt more environmentally friendly production methods and assume corresponding environmental responsibilities [26]. Third, corporate stakeholders, such as investors, suppliers, partners, etc., will also pay attention to the environmental performance of enterprises. If the company's environmental performance is poor, these stakeholders may choose to terminate cooperation with it, resulting in economic losses for the company. Therefore, enterprises will actively fulfill their environmental responsibilities to

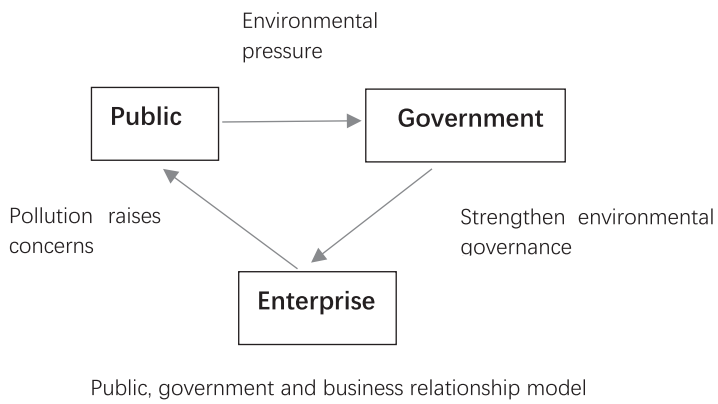

Fig. 2. Public, government and business relationship model

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maintain a good relationship with their stakeholders [27]. Finally, public environmental concerns will also be reflected in consumers' purchasing behavior. When consumers are more inclined to buy environmentally friendly products or services, enterprises will face market pressure, which prompts them to improve production methods and reduce environmental pollution to meet consumer needs [28].

On the other hand, the improvement of corporate environmental responsibility can promote the sustainable development of enterprises. Firstly, companies increase their environmental responsibility, often by adopting more environmentally friendly and sustainable production methods, which include using more efficient energy, reducing waste, and optimizing production processes. These measures can not only reduce the environmental burden of enterprises, but also improve the efficiency of resource utilization, reduce production costs, and promote the sustainability of enterprises [29]. Secondly, the improvement of corporate environmental responsibility helps to enhance its social image and reputation. The public is more inclined to support those enterprises that actively undertake social responsibilities, which can not only increase the market share of enterprises, but also improve their brand value and influence, which is conducive to the long-term sustainable development of enterprises [30]. Thirdly, enterprises actively fulfill their environmental responsibilities, which can reduce the legal and economic risks caused by environmental violations. This helps to maintain the stable operation of the enterprise and ensure its long-term development [31]. Finally, enterprises that actively fulfill environmental responsibility are more likely to attract outstanding talents who pay attention to social responsibility, and these talents can bring more innovation ability and competitiveness to the enterprise and then promote the sustainable development of the enterprise [32]**.** Based on the above analysis, the hypotheses of this article are as follows**:**

Hypothesis 2 (H2): Public environmental attentions enhance corporate sustainability through corporate environmental responsibility.

Public Environmental Attentions, Environmental Regulation, and Corporate Sustainability

The role of environmental regulations in the green environmental protection of enterprises is also crucial [33]. On the one hand, research has shown that reasonable and moderate environmental regulations have a positive promoting effect on corporate environmental practices [34]. Although incentive and disciplinary policies in environmental regulations have heterogeneous impacts on the sustainable development of enterprises. However, research has shown that the advantages of external environmental regulations, environmental supervision, and environmental protection industry policies have had a positive impact on the green practices of enterprises, thereby promoting their sustainable development [35]. On the other hand, in the context of weak environmental regulations, the concept of green environmental protection has not yet been deeply rooted in people's hearts, and most enterprises lack environmental awareness and are profit oriented. Environmental practice requires enterprises to invest a large amount of funds and manpower, and a large number of enterprises are unwilling to increase their own environmental investment. The level of environmental responsibility is generally low, and public attention to the environment cannot attract high attention from enterprises to environmental protection. At this point, public attention to the environment does not have a significant impact on the sustainable development of enterprises [36]. When environmental regulations are strong, the rough development of enterprises will inevitably face extremely serious environmental penalties, and there may even be a risk of forced closure. At this point, public attention to the environment directly affects the environmental protection of enterprises, which in turn has a significant impact on sustainable development [37]. Based on the above analysis, the hypotheses of this article are as follows:

Hypothesis 3 (H3): Environmental regulations have a positive effect on corporate sustainability; The relationship between public environmental attentions and corporate sustainability is positively moderated by environmental regulations.

Research Design

Data Selection

This article selects data from A-share listed companies in China's manufacturing industry from 2013 to 2021 as the research object and constructs corresponding models to empirically test the relationship between public environmental attentions and corporate sustainability. The data in this article mainly comes from the CSMAR database and annual reports of manufacturing listed companies and is manually collected and organized. Finally, 322 enterprises were identified, processed, and analyzed using STATA15.0.

Variable Definitions

The explained variable is corporate sustainability (Cs). According to relevant research [38-40], corporate sustainability is mostly considered based on two dimensions: The economy and social responsibility. The sustainable growth rate of the enterprise economy is usually used to reflect the sustainability of the enterprise's profitability. Therefore, this article uses the sustainable growth rate to measure the economic performance of the enterprise. Meanwhile, this article uses corporate social responsibility scores from the Rankins CSR Ratings (RKS) database to measure corporate social responsibility performance.

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Considering the multi-dimensional and multi-level nature of enterprise sustainability, as well as the differences between different indicators, the entropy method is used to measure enterprise sustainability after establishing an indicator system.

The explanatory variable is public environmental concern (Pea). Referring to Bonsón's approach [41], this article uses the annual average of Baidu's search haze index to describe the public's environmental attention. The main reasons are: Firstly, Baidu, as the largest search engine in China, has wide coverage and high data availability, and its data can best reflect the actual situation; Secondly, compared with other environmental theme keywords such as "environmental pollution", "haze weather" has a higher environmental perception, and the public can only identify haze weather through visibility. Thirdly, the concentration of PM2.5 pollution is highly correlated with the Air Quality Index (AQI), and haze pollution is a good method to measure air quality.

The mediating variable is corporate environmental responsibility (Cer). Compared to research and questionnaire data, third-party social data is more objective and can better reflect the actual situation of the enterprise. This article uses data from Hexun.com on corporate environmental responsibility ratings to measure corporate environmental responsibility.

The moderated variable is environmental regulation (Er). In order to more fairly and objectively reflect the intensity of regional environmental regulations, according to Morgenstern et al.'s approach, this paper uses the proportion of industrial pollution control investment in the secondary industry to measure the intensity of environmental regulation [42]. This indicator can reflect the required pollution control costs per unit output value and accurately measure the intensity of regional environmental regulations.

Control variables. Based on the existing research, this paper finds that many factors affect the sustainability of enterprises, such as enterprise corporate size, Leverage, and Areal features. Therefore, this article selects size of assets (Size), Leverage (lev), independent director ratio (Indep), main business income (Mbi), economic density (Ed), and regional carbon emission (Rce) as control variables. In addition, the annual effect (Year) and individual effect (Ind) were also controlled. The detailed definition and measurement of variables are shown in Table 1.

Model Building

This article selects 322 Chinese manufacturing listed companies as research samples and measures their environmental responsibility based on Hexun's evaluation of the environmental responsibility of 322 listed companies. Meanwhile, this article refers to the practice of Xu et al. In 2018 [10], the following econometric models were proposed:

$$Cs_{i,t} = \alpha + \beta_1 Pea_{i,t} + \beta_2 Size_{i,t} + \beta_3 Lev_{i,t} + \beta_4 Indep_{i,t} + \beta_5 Mbi_{i,t} + \beta_6 Ed_{i,t} + \beta_7 Rce_{i,t} + Year + Ind + \varepsilon_{i,t} \quad (1)$$

To test hypothesis 2, models (2) to (3) were constructed by drawing on the "three-step approach"

Table 1. Variable definition and interpretation.

Variables	Name	Symbol	Definition or measurement
The explained variable	Corporate sustainability	Cs	A comprehensive indicator constructed by the entropy method
The explanatory variable	Public environmental attentions	Pea	The natural logarithm of Baidu Haze keyword search frequency
The mediating variable	Corporate environmental responsibility	Cer	Hexun 's rating of corporate environmental responsibility
The moderating variable	Environmental regulation	Er	The proportion of industrial pollution control investment in the secondary industry
Control variables	Size of assets	Size	The natural logarithm of total assets at the end of the period
	Leverage	Lev	The enterprise's year-end asset liability ratio
	independent director ratio	Indep	The proportion of the number of independent directors in the total number of directors
	Main business income	Mbi	The natural logarithm of the total annual main operating income
	Economic density	Ed	Measured by dividing the total annual GDP in the region by the regional area (in provinces)
	Regional carbon emissions	Rce	The total annual carbon emissions in the region
	Year dummy variable	Year	Controlling for year effects
	Individual dummy variable	Ind	Controlling for individual effects

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for testing mediating effects proposed by He and Yao in 2022 and others [43-45].

$$Cer_{i,t} = \alpha + \beta_1 Pea_{i,t} + \beta_2 Size_{i,t} + \beta_3 Lev_{i,t} + \beta_4 Indep_{i,t} + \beta_5 Mbi_{i,t} + \beta_6 Ed_{i,t} + \beta_7 Rce_{i,t} + Year + Ind + \varepsilon_{i,t} \quad (2)$$

$$Cs_{i,t} = \alpha + \beta_1 pea + \beta_2 Size_{i,t} + \beta_3 Lev_{i,t} + \beta_4 Indep_{i,t} + \beta_5 Mbi_{i,t} + \beta_6 Ed_{i,t} + \beta_7 Rce_{i,t} + \beta_8 Cer_{i,t} + Year + Ind + \varepsilon_{i,t} \quad (3)$$

To verify hypothesis 3, environmental regulation and the interaction between public attentions and corporate environmental responsibility are introduced, and model (4) is constructed.

$$Cs_{i,t} = \alpha + \beta_1 Pea_{i,t} + \beta_2 Er_{i,t} + \beta_3 \beta_1 Pec_{i,t} * Er_{i,t} + \beta_4 Size_{i,t} + \beta_5 Lev_{i,t} + \beta_6 \beta_4 Indep_{i,t} + \beta_7 Mbi_{i,t} + \beta_8 Ed_{i,t} + \beta_9 Rce_{i,t} + Year + Ind + \varepsilon_{i,t} \quad (4)$$

where α is the intercept term and $\varepsilon_{i,t}$ is the random error term; at the same time, the year fixed effect (*Year*) and individual fixed effect (*Ind*) are controlled bidirectionally.

Empirical Analysis

Variable Description

Table 2 reports the results of descriptive statistics for all variables. The table shows that the mean value of corporate sustainability (Cs) is 0.063 and the standard deviation is 0.090, indicating that the sustainable development level of listed manufacturing companies in China is low and varies widely. Public environmental attentions (Pea) has a maximum value of 6.519, a minimum value of 1.059, and a standard deviation of 1.779, indicating that there are also significant differences in the Pubic environmental attention of listed manufacturing companies at present. The existence of good dispersion between the moderating variables and each of the control variables indicates that the variables were selected in a reasonable manner, which is conducive to the regression analysis later on.

There are many ways in which listed companies with high and low corporate environmental responsibility can differ significantly. To provide a clearer picture of the differences between the two different types of companies, the groups were next grouped according to the mean of corporate environmental responsibility, and t-test analyses of the differences between the groups were conducted. Table 3.: univariate analysis. It can be seen that when corporate environmental responsibility is low, the mean value of corporate sustainability (Cs) is 0.052; When corporate environmental responsibility is high, the mean value of corporate sustainability (Cs) is 0.071. The above results indicate that the higher the corporate environmental responsibility, the higher the level of sustainable development of enterprises. It can also be found that when corporate environmental responsibility is low, the mean value of public environmental attentions (Pea) is 2.317; When corporate environmental responsibility is high, the mean value of public environmental attentions (Pea) is 3.082; The difference between groups is significant at the 1% level. The above results indicate that listed companies with a higher level of corporate environmental responsibility also have a higher level of corporate sustainability.

Benchmark Test

Table 4. reports the basic regression results for the impact of public environmental attentions on corporate sustainability. According to column (1), without considering the influence of control variables, the correlation coefficient between Cs and Pea is 0.182 and is significant at the 1% level, indicating that public environmental attentions are significantly and

Table 2. Summary statistics.

Variables	Obs	Mean	Median	Std. Dev	Min	Max
Cs (Index)	2898	0.063	0.047	0.090	-0.325	0.366
Pea (Index)	2898	2.811	2.142	0.779	1.059	6.519
Cer (Index)	2898	4.336	4.119	1.425	0.000	30.00
Er (%)	2898	0.801	0.504	0.361	0.062	2.772
Size (CNY 10000)	2898	6.714	8.326	2.138	5.503	14.11
Lev (%)	2898	57.13	66.41	4.741	7.472	81.33
Indep (No)	2898	4.331	4.000	0.826	0.000	8.000
Mbi (CNY 10000)	2898	5.419	6.052	0.104	4.271	11.28
Ed (CNY 10000/square kilometer)	2898	9.07	9.81	0.419	7.027	11.84
Rce(10000 tons)	2898	6.417	6.204	0.683	4.482	9.528

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Table 3. Grouping descriptive statistics according to Corporate environmental responsibility.

Variables	Cer <= 2.936			Cer > 2.936			Mean Diff
	Obs	Mean	Std. Dev	Obs	Mean	Std. Dev	
Cs	1764	0.052	0.042	1134	0.071	0.050	-0.009***
Pea	1764	2.317	0.316	1134	3.082	0.816	-0.005***
Er	1764	0.612	0.201	1134	0.941	0.286	-0.091***
Size	1764	5.632	1.312	1134	8.813	2.294	-0.105***
Lev	1764	21.32	3.066	1134	95.36	5.227	-0.050***
Indep	1764	3.054	0.081	1134	4.849	0.128	-0.014**
Mbi	1764	5.048	0.087	1134	6.226	0.121	-0.009*
Ed	1764	8.106	0.027	1134	10.151	0.023	0.019***
Rce	1764	5.830	0.142	1134	6.611	0.550	-0.030**

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

positively correlated with corporate sustainability, i.e., public environmental attentions will promote corporate sustainability, and hypothesis 1 is preliminarily verified. In column (2), when the influence of control variables is considered, but the year and individual fixed effect are not, the correlation coefficient between Cs and Pea is 0.109, which is significant at the level of 5%, indicating that public environmental attentions are significantly positively correlated with corporate sustainability after considering the influence of control variables. In column (3), when the influence of control variables is considered and the year and individual fixed effects are controlled bidirectionally, the correlation coefficient between Cs and Pea is 0.139, which is still significant at the 1% level, again indicating that public environmental attentions are significantly positively correlated with corporate sustainability. Hypothesis 1 is verified.

Table 5. shows the test results of the moderating effect of environmental regulation on public environmental attentions and corporate sustainability. In column (2), it can be seen that the correlation coefficient between Cs and Pea is 0.184 and is significant at the 1% level after the introduction of the interaction term between environmental regulation and public environmental attentions; And the interaction term Pea*Er is 0.033 and is significant at the 5% level; Indicating that environmental regulation positively moderates the promotion effect of public environmental attentions on corporate sustainability, and hypothesis 3 is verified.

Columns (1)-(3) in Table 6. show the test results of the impact mechanisms of public environmental attentions on corporate sustainability. According to column (1), the correlation coefficient between Cer and Pea is 0.186 and is significant at the 5% level, indicating that public environmental attentions are significantly and positively correlated with corporate environmental responsibility, i.e., public environmental attentions will promote corporate environmental responsibility. Meanwhile, as can be seen in column (2), the correlation coefficient between Cer and Pea is 0.301 and is significant at the 10% level after the introduction of corporate environmental responsibility. In column (3), the correlation coefficient between Cer and Pea is 0.167 and is significant at the 1% level; The coefficient of Cer is not significant; At this point, further sobel tests are needed. The Z statistic in the sobel test is greater than 0.97, indicating that the mediation effect is significant, that it is incomplete mediation at this time, and that its mediation ratio reaches 42.7%. Further, in order to maintain the robustness of the mediating effect, the Z statistic is modified and the Goodman test is performed.

The results of the Goodman1 and Goodman2 tests are consistent with the sobel tests, indicating that the mediation effect is significant. This suggests that corporate environmental responsibility plays a partially mediating role in public environmental attentions and corporate sustainability, i.e., public environmental attentions can promote corporate sustainability through influencing corporate environmental responsibility, and hypothesis 2 is verified.

Robust Test

Considering that the new Environmental Protection Law of 2015 has increased the punishment for environmental pollution, the manufacturing industry has become more focused on environmental practices, and the efforts to promote the sustainable development of corporations have significantly increased. In order to eliminate the impact of policy releases, the time frame was shortened, data before 2015 was deleted, and only data from 2016 to 2021 was used for regression. Table 7. reports the robustness test results after shortening the time pane. It can be seen that the regression results are consistent with the above results, indicating that the regression conclusion is robust.

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Table 4. Benchmark test.

Variables	Cs	Cs	Cs
	(1)	(2)	(3)
Pea	0.182***	0.109**	0.139***
	(3.31)	(2.39)	(2.90)
Size		0.062***	0.053***
		(4.37)	(5.21)
Lev		-0.126**	-0.141**
		(-2.27)	(-2.40)
Indep		0.047	0.037
		(0.88)	(0.92)
Mbi		0.221***	0.284**
		(3.11)	(2.64)
Ed		0.171**	0.184*
		(2.27)	(1.90)
Rce		-0.139***	-0.142***
		(-3.40)	(-3.21)
Constants	1.217***	0.705***	0.720***
	(2.82)	(3.91)	(2.99)
Control year	Yes	No	Yes
Control individual	Yes	No	Yes
Observations	2898	2898	2898
R2	0.301	0.280	0.269

Note: *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively, and is the same below.
The numbers in brackets are "t" of the estimated coefficients; R^2 is the goodness of fit of the model.

Table 5. Test of the moderating effect.

Variables	Cs	Cs
	(1)	(2)
Pea	0.162***	0.184***
	(2.83)	(3.21)
Er		0.301**
		(2.47)
Pea*Er		0.033**
		(2.10)
Size	0.055***	0.064***
	(4.09)	(4.89)
Lev	-0.128**	-0.206**
	(-2.22)	(-2.40)
Indep	0.133*	0.161*
	(1.94)	(1.73)
Mbi	0.219**	0.266**
	(2.50)	(2.16)
Ed	0.115**	0.121**
	(2.36)	(2.49)
Rce	-0.172	-0.139**
	(-1.60)	(-2.01)
Constants	0.199***	0.284***
	(3.17)	(2.90)
Control year	Yes	Yes
Control individual	Yes	Yes
Observations	2898	2898
R2	0.262	0.279

Note: *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively, the same below.
The numbers in brackets are "t" of the estimated coefficients; R^2 is the goodness of fit of the model.

Dynamic Panel Test

Considering the endogeneity problems that may exist in the static panel model, the causal relationship between dependent variables and independent variables, the potential selection bias of samples, and the deviation of missing variables may cause a series of errors in the test results, leading to inaccurate results. Therefore, we refer to the approach of Cheng et al., who introduced the first-order lag term of corporate sustainability variables [46]. The difference generalized moment (GMM) estimation method was selected to correct the errors in the static panel model, further testing the relationship between public environmental attentions and corporate sustainability.

The results in Table 8. show that the p-values of AR (2) in columns (1) to (4) are all greater than 0.05, indicating that the model does not have second-order autocorrelation problems and that the random interference terms do not have sequence correlation problems. The Sargan test values for the overidentification of instrumental variables are all greater than 0.05, indicating that the selected instrumental variables in the model are all effective. This result shows that the one-lagged period of corporate sustainability is significantly positive. The effect of public environmental attentions is significantly positive. The effect of environmental regulation is significantly positive, and the interaction coefficients are also significantly positive. With the exception of some control variables, the dynamic panel regression results are consistent with benchmark regression.

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Table 6. Test of influence mechanism.

Variables	Cs	Cer	Cs
	(1)	(2)	(3)
Pea	0.186**	0.301*	0.167***
	(2.01)	(1.89)	(2.80)
Cer			0.229
			(1.47)
Size	0.082***	0.237**	0.071***
	(3.04)	(2.29)	(3.81)
Lev	-0.302**	0.173	-0.339*
	(-2.12)	(0.49)	(-1.84)
Indep	0.129*	0.063	0.142**
	(1.74)	(0.69)	(2.08)
Mbi	0.302**	0.319*	0.189**
	(2.41)	(1.74)	(2.20)
Ed	0.121*	0.281*	0.160**
	(1.92)	(1.91)	(2.42)
Rce	-0.180**	-0.319*	-0.288*
	(-2.01)	(-1.94)	(-1.82)
Constants	0.307***	0.531**	0.172***
	(3.82)	(2.49)	(2.90)
Sobel test	Z = 5.082		
	|Z|>0.97		
Goodman test1	Z = 5.104		
	|Z|>0.97		
Goodman test2	Z = 5.104		
	|Z|>0.97		
Mediating effect	Significantly		
Proportion of mediating effect	47.82%		
Observations	2898	2898	2898
R2	0.280	0.249	0.283

Note: *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively, and is the same below.
The numbers in brackets are "t" of the estimated coefficients; R^2 is the goodness of fit of the model.

Further Analysis

Furthermore, we explored the differences in results reflected by different types of samples from the perspectives of scale, region, and ownership.

Scale Heterogeneity

Based on the significant differences in economic conditions, talent reserves, and corporate culture among listed companies of different sizes, these factors will ultimately affect the sustainability of the enterprise [47]. Therefore, this article further grouped regression based on the median number of employees in the enterprise. Table 9. reports the test results for scale heterogeneity. It can be seen that in large listed companies, the correlation coefficient between Cs and Pea is 0.134, which is significant at the 1% level; The correlation coefficient between Cs and Pea in small listed companies is 0.091, which is significant at the 10% level. This indicates that in large listed companies, public environmental attentions have a stronger promoting effect on corporate sustainability. This may be because large listed companies have strong financial strength and abundant human resources, providing sufficient funds and human resources for the sustainable development of enterprises. Therefore, public environmental attentions have a strong positive effect on the sustainable development of large enterprises.

Region Heterogeneity

Based on significant differences in regional economic development levels, industrial policies, openness to the outside world, and resource endowments, the impact of public environmental attentions on corporate sustainability will also vary depending on the region [48]. According to the classification of the eastern, central, and western regions by the National Development and Reform Commission, regression is further grouped based on the provinces where the listed companies are located and divided into three sub samples: eastern and coastal regions, central regions, and western regions. Table 10. reports the results of regional heterogeneity testing. It can be seen that in the eastern and coastal regions, the correlation coefficient between Cs and Pea is 0.131, which is significant at the 1% level; The correlation coefficient between Cs and Pea in the central region is 0.112, which is significant at the 10% level; In the western region, the correlation coefficient between Cs and Pea is 0.094, which is significant at the 10% level. It can be seen that on the one hand, public environmental attentions have significantly promoted the sustainability of enterprises in the eastern and coastal regions, as well as in the central and western regions; On the other hand, in the eastern and coastal regions, public environmental attentions contributes the most to the sustainable development of enterprises, with significant differences compared to the central and western regions. This may be because the eastern and coastal regions are more developed than the central and western regions in terms of ecological environment and resource endowment, as well as in terms of economic development level and business environment. Therefore, when the public is highly concerned about environmental issues, they can

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Table 7. Robustness test: Shorten the time pane.

Variables	Cs	Cer	Cs	Cs
	(1)	(2)	(3)	(4)
Pea	0.106***	0.282**	0.137***	0.191**
	(3.33)	(2.37)	(3.72)	(2.30)
Cer			0.061	
			(1.39)	
Er				0.261**
				(2.04)
Pea*Er				0.046*
				(1.87)
Size	0.104***	0.109**	0.092***	0.090***
	(3.25)	(2.30)	(3.03)	(3.31)
Lev	-0.131	-0.072	-0.162	-0.064
	(-1.36·)	(-0.42)	(-0.77)	(-0.79)
Indep	0.184	0.077*	0.122	0.141
	(1.41)	(1.88)	(0.94)	(1.25)
Mbi	0.277***	0.182*	0.303***	0.287***
	(3.39)	(1.85)	(3.09)	(3.15)
Ed	0.101**	0.078	0.138***	0.120**
	(2.09)	(0.79)	(3.20)	(2.40)
Rce	.			
	(-1.80)	(1.40)	(-2.00)	(-2.30)
Constants	0.345***	0.206**	0.366***	0.440***
	(3.72)	(2.03)	(4.21)	(3.52)
Sobel test	Z=3.184			
	|Z|>0.97			
Goodman test1	Z=3.220			
	|Z|>0.97			
Goodman test2	Z=3.221			
	|Z|>0.97			
Mediating effect	Significantly			
Proportion of mediating effect	30..19%			
Control year	Yes	Yes	Yes	Yes
Control individual	Yes	Yes	Yes	Yes
Observations	1932	1932	1932	1932
R2	0.274	0.262	0.281	0.280

Note: *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively, and is the same below. The numbers in brackets are "t" of the estimated coefficients; R2 is the goodness of fit of the model.

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Table 8. Dynamic test: Difference generalized method of moments (GMM)

Variables	Cs	Cs	Cs
	(1)	(2)	(3)
Cs_{-1}	0.104***	0.111***	0.130***
	(3.01)	(3.67)	(3.27)
Pea	0.060*	0.093*	0.090*
	(1.81)	(1.70)	(1.92)
Er			0.172**
			(2.30)
Cer*Er			0.050*
			(1.76)
Size		0.080*	0.77*
		(1.92)	(1.81)
Lev		-0.161	-0.092
		(-1.20)	(-1.29)
Indep		0.129	0.134
		(1.08)	(1.40)
Mbi		0.117*	0.125
		(1.87)	(1.34)
Ed		0.126	0.130
		(1.24)	(1.40)
Rce		0.078	-0.146*
		(1.00)	(-1.72)
Constants	0.315***	0.269***	0.321***
	(3.11)	(3.27)	(3.09)
AR(1)test(p-value)	0.000	0.000	0.000
AR(2)test(p-value)	0.108	0.081	0.126
Sargan)test(p-value)	0.126	0.153	0.121
Observations	2898	2898	2898

Note: *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively, and is the same below.
The numbers in brackets are "t" of the estimated coefficients.

achieve better results and have a stronger promotion of corporate sustainability.

Ownership Heterogeneity

Based on China's unique economic system, there are significant differences between state-owned and non-state-owned enterprises in terms of economic strength, policy support, and social functions [49]. Enterprise ownership, to some extent, affects the sustainability of enterprises. Therefore, this article further analyzes the impact of public environmental attentions under different ownership systems on corporate sustainability. Table 11. reports the test results for ownership differences. It can be seen that in state-owned listed companies, the correlation coefficient between Cs and Pea is 0.169, which is significant at the 10% level, while in non-state-owned listed companies, the correlation coefficient between Cs and Pea is 0.134, which is significant at the 1% level. Research has shown that, on the one hand, public environmental attentions promote the sustainability of state-owned and non-state-owned listed companies; On the other hand, research has found

Table 9. Test of scale heterogeneity.

Variables	Cs	
	Large-scale	Small-scale
	(1)	(2)
Pea	0.134***	0.091*
	(3.30)	(1.80)
Er	0.095***	0.190**
	(3.29)	(2.25)
Pea *Er	0.062	0.170**
	(1.38)	(2.14)
Size	0.092***	0.064**
	(3.11)	(2.50)
Lev	-0.142***	-0.212**
	(-2.79)	(-2.40)
Indep	0.130	0.170
	(0.99)	(1.20)
Mbi	0.281***	0.126***
	(3.22)	(2.85)
Ed	0.70***	0.060*
	(3.01)	(1.78)
Rce	-0.102*	-0.081*
	(-1.76)	(-1.82)
Constants	0.806***	0.606***
	(3.20)	(2.95)
Control year	Yes	Yes
Control individual	Yes	Yes
Observations	1701	1197
R2	0.282	0.258

Note: *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively, and is the same below.
The numbers in brackets are "t" of the estimated coefficients;
R^2 is the goodness of fit of the model.

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Table 10. Test of regional heterogeneity.

Variables	Cs		
	Eastern region	Central region	Western region
	(1)	(2)	(3)
Pea	0.131***	0.112*	0.094*
	(3.14)	(1.77)	(1.75)
Er	0.240**	0.149*	0.132***
	(2.11)	(1.80)	(3.37)
Pea*Er	0.066	0.109	0.131**
	(1.21)	(1.47)	(2.01)
Size	0.055***	0.071***	0.020**
	(3.51)	(2.87)	(2.23)
Lev	-0.151**	-0.142***	-0.209***
	(-2.81)	(-4.66)	(-3.20)
Indep	0.119	0.140	0.200
	(0.90)	(0.68)	(0.81)
Mbi	0.216***	0.169***	0.216***
	(3.02)	(3.43)	(2.77)
Ed	0.130*	0.201**	0.162*
	(1.86)	(2.26)	(1.81)
Rce	-0.034*	-0.042**	-0.091*
	(-1.70)	(2.07)	(-1.80)
Constants	0.519***	0.415***	0.263***
	(3.09)	(3.61)	(4.29)
Control year	Yes	Yes	Yes
Control individual	Yes	Yes	Yes
Observations	1548	855	495
R2	0.270	0.274	0.301

Note: *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively, and is the same below.
The numbers in brackets are "t" of the estimated coefficients; R^2 is the goodness of fit of the model.

Table 11. Test of ownership heterogeneity.

Variables	Cs	
	State-owned enterprise	Non-state-owned enterprise
	(1)	(2)
Pea	0.169*	0.134***
	(1.86)	(3.40)
Er	0.128*	0.235***
	(1.79)	(3.09)
Pea*Er	0.060	0.102
	(1.02)	(1.24)
Size	0.049**	0.033***
	(2.47)	(2.77)
Lev	-0.089*	-0.070**
	(-1.82)	(-2.25)
Indep	0.038	0.050
	(1.24)	(0.90)
Mbi	0.139***	0.192***
	(3.31)	(3.90)
Ed	0.161*	0.121**
	(1.79)	(2.20)
Rce	0.081**	0.090*
	(2.07)	(1.88)
Constants	0.504***	0.622***
	(3.11)	(3.87)
Control year	Yes	Yes
Control individual	Yes	Yes
Observations	1269	1629
R2	0.278	0.302

Note: *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively, and is the same below.
The numbers in brackets are "t" of the estimated coefficients; R^2 is the goodness of fit of the model.

that public environmental attentions have a strong promoting effect on the sustainable development of non-state-owned listed companies. This may be because state-owned enterprises occupy a special and important position in the national economy and social life and have always been the object of government support and cultivation. The level of sustainable development of enterprises itself is relatively high, leading to a less significant manifestation of public environmental attentions in promoting sustainable development than non-state-owned enterprises.

Discussion

In recent years, due to the impact of pollution, the public's attention to the environment has become increasingly high. Faced with pressure from the public and the government, enterprises must increase investment in environmental governance, improve environmental quality by reducing their negative impact on the environment, and meet the environmental requirements of the government and relevant departments for enterprises to achieve sustainable development. Therefore, this study selected A-share listed companies in China's manufacturing industry

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from 2013 to 2021 as research samples to explore the relationship between public environmental attention and corporate sustainability and analyzed the relevant research results as follows:

This paper first examines the role of public environmental concerns in promoting the sustainable development of enterprises. First, this paper constructs a model of the relationship between the public, the government, and the enterprise. See Fig. 2. for details. First of all, as a source of pollution, the pollution caused by the production of enterprises has caused health threats to the public, which has aroused public concern. Second, heightened public concern about the environment may put pressure on businesses and governments [50]. On the one hand, for enterprises, the public, as the largest stakeholder group and consumer group, has a significant impact on the development of enterprises. Public pressure on enterprises directly affects their production decisions, and the attitude of enterprises towards the environment also affects their future development directions. Under the pressure of public opinion, enterprises must increase environmental protection efforts, improve environmental performance, fully implement green transformation, and promote sustainable development [51]. On the other hand, for the government, environmental pollution not only affects the public's attitude toward enterprises, but also directly affects the public's attitude toward the government. When the public's dissatisfaction with the environment reaches a certain level, it will lead to a series of social contradictions. Therefore, when the public puts pressure on the government and relevant departments according to their own environmental requirements, the government and management departments must take corresponding measures to restrain the pollution behaviors of enterprises, promote the sustainable development of enterprises, improve environmental quality, and meet the environmental protection needs of the public. Finally, to improve the sustainability of enterprises and reduce environmental pollution and damage, it is fundamentally necessary to meet the public's needs for environmental health, which is also consistent with the conclusion of this study [52].

Secondly, this article examines how public environmental attentions promote corporate sustainability through corporate environmental responsibility. Corporate environmental responsibility refers to the social obligation that enterprises must fulfill to protect the environment while pursuing the maximization of their own and the economic interests of their shareholders [53]. In the past few decades, the rapid development of the economy has brought serious environmental problems, and a large number of enterprises have neglected environmental pollution due to economic reasons, leading to a lack of environmental responsibility among enterprises. This is not a problem for individual industries or regions. With increasing public attention on the environment, the government is continuously increasing environmental supervision and advocating for the sustainable development of enterprises. The development of enterprises cannot be decoupled from the environment, and rough and crazy enterprise development will eventually be eliminated [54]. Therefore, in the face of public environmental pressure, a large number of enterprises have begun to strengthen environmental responsibility and focus on sustainable development. Firstly, in the face of public pressure, corporate environmental responsibility can encourage enterprises to increase investment in green environmental protection under their own conditions, achieving the effects of energy conservation and emission reduction. This can improve the environmental performance of enterprises, meet the environmental requirements of the public and the government, reduce the environmental penalties suffered by enterprises due to pollution, and thus achieve sustainable development for enterprises. Secondly, the improvement of corporate environmental responsibility directly affects the green reputation of enterprises [55]. With the gradual intensification of pollution issues and the deepening of environmental awareness, the public's environmental awareness is becoming increasingly strong. A good green reputation will enhance the company's new image in the public eye. As the largest consumer of a company, public recognition undoubtedly improves its efficiency and promotes its sustainable development. Finally, as a form of social responsibility, environmental responsibility also represents the legitimate rights and interests of other stakeholders, such as customers, the public, and the government. Enterprises promote their environmental performance through their own environmental responsibilities, meet the legitimate rights and interests of other stakeholders in the environment, and obtain support and assistance from other stakeholders, thereby promoting the sustainable development of the enterprise.

Thirdly, this article examines the promoting effect of environmental regulations on the sustainable development of enterprises. The promoting effect of public environmental attention on the sustainable development of enterprises is positively regulated by environmental regulations. When the pollution problem becomes increasingly serious and cannot be solved, the role of environmental regulations is reflected. Adding environmental regulations can improve the pollution control standards of enterprises, enabling them to constrain production with stricter environmental standards, thereby achieving the goal of improving environmental performance [56]. On the one hand, the strengthening of environmental regulations means an increase in environmental requirements, which also means an increase in environmental investment. The increase in environmental investment can enable enterprises to effectively control pollution generated in the production process, thereby improving their environmental performance and promoting sustainable development. On the other hand, the increase in environmental protection investment not only greatly

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squeezes the funds of enterprises, but also increases their production costs and reduces their profits. Therefore, in the context of relatively loose environmental regulations, companies will try to reduce profit based environmental investment as much as possible. Some companies even intentionally avoid making necessary investments in environmental protection, and environmental practices cannot be effectively implemented. At this point, the impact of public attention on the environment on corporate sustainability is not significant. When environmental regulations continue to be strengthened to a certain extent, enterprises will face greater environmental penalties than environmental investments due to environmental issues. At this point, when the public pays high attention to environmental issues, enterprises can no longer avoid their own environmental problems and must implement environmental practices, especially those responsible for the environment, which can play a leading role in environmental protection. At this point, public attention to the environment has a more important impact on the sustainability of enterprises.

Finally, this article examines the heterogeneous impact of public environmental attention on corporate sustainability. Based on scale heterogeneity, compared to small-scale enterprises, public environmental attention has a more significant impact on the sustainability of large enterprises. Environmental regulations promote the sustainable development of enterprises, whether they are large or small. The relationship between public environmental attention and corporate sustainability is only positively regulated by environmental regulation in small enterprises and not significantly regulated in large enterprises. The reason for this is that, on the one hand, environmental governance will occupy a large amount of human and material resources in enterprises, not only damaging their financial performance, but also reducing their production efficiency. Generally speaking, large enterprises, with their financial and resource endowments, are more capable of implementing environmental protection. However, due to issues such as funding shortages, small businesses have performed poorly in environmental protection, making it difficult for them to rely on their own efforts to solve their own environmental problems, even though public attention to the environment has put pressure on them. Therefore, the impact of public attention to the environment on the sustainability of small businesses is not as significant as that of large enterprises. On the other hand, due to issues such as insufficient funds, small enterprises are not as proactive in environmental protection as large enterprises, especially under the premise of relatively loose environmental regulations. With the continuous strengthening of regional environmental regulations and high environmental penalties, small enterprises have to face their own environmental problems, forcing them to increase environmental investment. At this point, environmental regulations have a significant positive regulatory effect. Large enterprises, due to their abundant resource endowments, have already invested a large amount of funds in environmental protection and have high environmental requirements for themselves. In the context of strengthening environmental supervision, large enterprises continue to implement environmental practices, and there have been no significant changes in environmental investment, so the regulatory effect is not significant. Based on regional heterogeneity, compared to enterprises in the central and western regions, public environmental attention has a more significant impact on the sustainability of enterprises in the eastern and coastal regions. Environmental regulations promote the sustainable development of enterprises, whether in the eastern coastal areas or the central and western regions. The relationship between public environmental attention and corporate sustainability is only positively regulated by environmental regulation in enterprises in the western region, while there is no significant regulation in enterprises in the eastern coastal and central regions. On the one hand, compared to the central and western regions, the eastern and coastal regions have developed economies, a high concentration of enterprises, more serious pollution problems, and relatively strict environmental regulations. In such an environment, facing the public's demand for the environment, enterprises must enhance their environmental awareness and sense of responsibility in order to survive, effectively deal with their own pollution problems, and achieve sustainable development for the enterprise. For enterprises that lack link responsibility and even fail to strictly implement environmental protection, they are likely to be eliminated. On the other hand, due to relatively loose environmental management in the western region in recent years, the level of environmental supervision is relatively low compared to the eastern and coastal regions. The manufacturing industry in the western region has insufficient investment in green environmental protection, and many environmental practices have not been implemented. The impact of public attention on the environment on corporate sustainability is not significant. With the implementation of the new Environmental Protection Law in 2015, enterprises that violate environmental regulations will face high environmental penalties. The public's attention to the environment undoubtedly strengthens the supervision of corporate pollution violations, which has a significant impact on the sustainability of enterprises. Therefore, the regulatory effect of environmental regulations is relatively significant. Compared to the western region, the environmental regulations in the eastern coastal and central regions have always been strict, and enterprises have also strengthened their environmental law enforcement efforts. Therefore, changes in environmental regulations have not had a significant impact on the environmental behavior of enterprises. Therefore, the moderated effect of environmental regulations is relatively significant. Therefore, the regulatory effect of environmental regulations is

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relatively significant. Compared to the western region, the environmental regulations in the eastern coastal and central regions have always been strict, and enterprises have also strengthened their environmental law enforcement efforts. Therefore, changes in environmental regulations have not had a significant impact on the environmental behavior of enterprises, and the moderated effect of environmental regulations on the environment is also not significant. Based on the heterogeneity of ownership, compared to state-owned enterprises, public attention to the environment has a more significant impact on the sustainability of non-state-owned enterprises. Environmental regulations promote the sustainable development of enterprises, whether state-owned or non-state-owned. The regulatory effect of environmental regulations is not significant for state-owned and non-state-owned enterprises. The main reason for this situation is that state-owned enterprises, as economic pillars, not only aim for profitability, but also play a macro regulatory role. In addition, the public's expectations for state-owned enterprises are relatively high, leading to an unquestionable level of environmental protection and a relatively high level of environmental practice in state-owned enterprises. The results indicate that regardless of the level of public attention to the environment, there are enterprises in the Principality that continue to carry out environmental practices, and the impact of public attention to the environment on the sustainable development of state-owned enterprises is not significant. In private enterprises, public attention to the environment directly affects their sustainable development, especially under increasingly strict environmental regulations. Therefore, public attention to the environment has a more significant impact on the sustainable development of private enterprises.

Conclusions and Recommendations

Conclusions

Based on the panel data of Chinese manufacturing A-share listed companies from 2013 to 2021, this study examines the relationship between public environmental attentions and corporate sustainability and conducts in-depth discussions on its impact mechanism and heterogeneity characteristics. The results are as follows:

Firstly, public environmental attentions have promoted corporate sustainability; Secondly, public environmental attentions can promote corporate sustainability by influencing corporate environmental responsibility; Thirdly, the impact of public environmental attentions on corporate sustainability is positively moderated by environmental regulation; Finally, based on the heterogeneity perspective, the promotion of public environmental attentions on corporate sustainability is stronger in large companies, but the moderated effect of environmental regulation is only significant in small enterprises; The promotion of public environmental attentions on corporate sustainability is stronger in the eastern and coastal regions; The moderated effect of environmental regulation is only significant in western regions; The promotion of public environmental attentions on corporate sustainability is stronger among non-state listed companies.

Recommendations

In this article, we examined the impact of public environmental attentions on corporate sustainability, conducted a deep analysis of the impact mechanism between the two, and conducted in-depth discussions from the perspective of heterogeneity. Based on the above analysis, we propose the following policy recommendations:

Firstly, the government should fully recognize the important role of the public in environmental protection, continuously open up more channels for environmental demands, and allow more public participation in environmental supervision. On the one hand, further expand public environmental demands and feedback channels and actively pay attention to the way the public demands the environment. On the other hand, the government should attach great importance to the public's demands for the environment. On the basis of timely handling and resolving the public's demands for environmental issues, it should further clarify the public's attentions about the environment and engage in good interaction with the public in environmental protection, fully mobilizing and exerting the public's supervisory role in environmental protection work.

Secondly, the government should further improve environmental regulations to ensure the effective implementation of environmental protection policies. On the one hand, when formulating environmental policies, the government should fully integrate public environmental health with the affordability of enterprises, emphasizing both environmental protection and promoting development. On the other hand, the government should further strengthen environmental supervision and management of enterprises, advocate and encourage compliance with environmental protection norms, and resolutely punish violations of environmental protection laws and regulations to ensure the implementation of environmental protection policies.

Thirdly, the government should further increase support for environmental protection for small and medium-sized enterprises, enterprises in western regions, and private enterprises, and improve corresponding support and screening mechanisms. For the government, when implementing the funding targets of environmental subsidies, it is necessary to fully consider the heterogeneity of enterprises, vigorously improve the precise support policies for environmental subsidies, and establish a reasonable evaluation mechanism. Pay more attention to non-financial

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performance, such as corporate CSR levels, and include them in the screening criteria for environmental subsidy support targets in order to achieve the "dual dividend" of economic growth and environmental protection.

Finally, accelerate green innovation in enterprises and drive sustainable development through innovation. Enterprises should further increase their investment in green innovation, including capital investment and talent introduction to compensate for the lack of funds in the environmental protection process by improving technological efficiency, in order to achieve sustainable development for the enterprise.

limitations and Future Research

Limitations and future research: On the one hand, this study only explores the impact of public environmental attentions on enterprise sustainability and does not involve too much at the macro level, such as the coordinated development of socio-economic and environmental factors. On the other hand, due to limited data, this study only covers samples of Chinese enterprises rather than samples from developed countries (such as the United States, the United Kingdom, etc.) or poor and underdeveloped countries (such as Africa, etc.). It is worth discussing whether public environmental attentions have an impact on the sustainability of enterprises in other countries.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

1. CUI L., HUANG Y. Exploring the schemes for green climate fund financing: International lessons. World Development, **101**, 173, **2018**.
2. FENG Y., NING M., Lei Y., SUN Y., LIU W., WANG J. Defending blue sky in China: effectiveness of the "air pollution prevention and control action plan" on air quality improvements from 2013 to 2017. Journal of Environment Management, **252**, 109603, **2019**.
3. DUANMU J.L., BU M.L., PITTMAN R. Does market competition dampen environmental performance: Evidence from China. Strategic Management Journal, **39**, 3006, **2018**.
4. FREEMAN R.E. Strategic management: A stakeholder approach. Journal of Management Studies, **29** (2), 131, **1984**.
5. SIEDSCHLAG I.L., YAN W.J. Firms' green investments: What factors matter? Journal of Cleaner Production, **310**, 127554, **2021**.
6. SHAO S., HU Z., CAO J., YANG L., GUAN D. Environmental regulation and enterprise innovation: a review. Business Strategy and the Environment, **29**, 1465, **2020**.
7. ALMEIDA M.F.L., MELO M.A.C. Sociotechnical regimes, technological innovation and corporate sustainability: from principles to action. Technology Analysis& Strategy Management, **29** (4), 395, **2016**.
8. STARR M.A. Socially responsible investment and pro-social change. Journal of Economic Issues, **42** (1), 51, **2016**.
9. WALKER K., NI N., HUO W. Is the red dragon green? An examination of the antecedents and consequences of environmental proactivity in China. Journal of Business Ethics, **125** (1), 27, **2014**.
10. X X., ZENG S., CHEN H. Signaling good by doing good: How does environmental corporate social responsibility affect international expansion? Business Strategy and the Environment, **27**, 946, **2018**.
11. DENG X., LI L. Promoting or inhibiting? The impact of environmental regulation on corporate financial performance – An empirical analysis based on China. International Journal of Environmental Research and Public Health, **17**, 3828, **2020**.
12. BIAN J., LIAO Y., WANG Y.Y., TAO F. Analysis of firm CSR strategies. European Journal of Operational Research, **290** (3), 914, **2021**.
13. MARANO V., TASHMAN P., KOSTOVA T. Escaping the iron cage: Liabilities of origin and CSR reporting of emerging market multinational enterprises. Journal of international Business Studies, **48** (3), 386, **2017**.
14. VOICA M C., PANAIT M., RADHLESCU I. Green investments-between necessity, fiscal constraints and profit[J]. Procedia Economics and Finance, **22**, 72, **2015**.
15. SAUNILA M., UKKO J., RANTALA T. Sustainability as a driver of green innovation investment and exploitation. Journal of Cleaner Production, **179**, 631, **2018**.
16. FRITSCHE I., EVA J., DANIELA N.K., NICOLAS K. Existential threat and compliance with pro-environmental norms. Journal of Environmental Psychology, **30** (1), 67, **2010**.
17. SHAO S., HU Z., CAO J., YANG L., GUAN D. Environmental regulation and enterprise innovation: a review. Business Strategy and the Environment, **29,** 1465, **2020**.
18. SCHALTENBRAND B., FOERSTL K., AZADEGAN A., LINDEMAN K. See what we want to see? The effects of managerial experience on corporate green investments. Journal of Business Ethics, **150**, 1129, **2018**.
19. CHEN M., QIAN X., ZHANG L. Public participation in environmental management in China: Status quo and mode innovation. Environmental Management, **55** (3), 523, **2016**.
20. JIA M., TONG L., VISWANATH P.V., ZHANG Z. Word power: The impact of negative media coverage on disciplining corporate pollution. Journal of Business Ethics, **138** (3), 437, **2016**.
21. ZHU S., HE C., LIU Y. Going green or going away: Environmental regulation, economic geography and firms' strategies in China's pollution-intensive industries. Geoforum, **55**, 53, **2014**.
22. MARTIN P.R., MOSER D.V. Managers' green investment disclosures and investor's reaction. Journal of Accounting and Economics, **61** (1), 239, **2016**.
23. CHEN M.F. Self-efficacy or collective efficacy within the cognitive theory of stress model: which more effectively explains people's self-reported pro-environmental behavior? Journal of Environmental Psychology, **42**, 66, **2015**.

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24. DYLLICK T., HOCKERTS K. Beyond the business case for corporate sustainability. Business Strategy and the Environment, **11**, 130, **2002**.
25. NEWMAN C., RAND J., TARP F., TRIFKOVIC N. Corporate social responsibility in a competitive business environment. Journal of Development Studies, **56**, 1455, **2020**.
26. CAI L., CUI J., JO H. Corporate environmental responsibility and firm risk. Journal of Business Ethics, **139** (3), 563, **2016**.
27. BEATRIZ J.P., DANIEL A.M., JOSE L.G. The influence of corporate social responsibility on air pollution: Analysis of environmental regulation and eco-innovation effects. Corporate Social Responsibility Environmental Management, **25**, 1363, **2018**.
28. CHOI J., WANG H. Stakeholder relations and the persistence of corporate financial performance. Strategic Management Journal, **30** (8), 895, **2009**.
29. RAMCHANDER S., SCHWEBACH R.G., STAKING K. The informational relevance of corporate social responsibility: Evidence from DS400 index reconstitutions. Strategic Management Journal, **33** (3), 303, **2012**.
30. HEAL G. Corporate social responsibility: An economic and financial framework. Geneva Papers on Risk & Insurance Issues and Practice, **30** (3), 387, **2005**.
31. HERATH H., HERATH T.C., DUNN P. Profit-driven corporate social responsibility as a bayesian real option in green computing. Journal of Business Ethics,**158** (2), 387, **2017**.
32. DYLLICK T., KAI H. Beyond the business case for corporate sustainability. Business Strategy and the Environment, **11** (2), 130, **2002**.
33. HUANG L.Y., LEI Z.J. How environmental regulation affect corporate green investment: Evidence from China. Journal of Cleaner Production, **279**, 123560, **2021**.
34. WANG M. Will carbon tax affect the strategy and performance of low-carbon technology sharing between enterprises. Journal of Cleaner Production, **210**, 724, **2019**.
35. WANG C. Green insurance attention drive corporate social responsibility. Journal of Cleaner Production, **148**, 111, **2017**.
36. LI G., LU S., SHAO S., YANG L., ZHANG K. Do environmental regulations hamper small enterprises' market entry? Evidence from China. Business Strategy and the Environment, **30**, 252, **2021**.
37. LIAO X.C., SHI X.P. Public appeal, environmental regulation and green investment: evidence from China. Energy Policy, **119**, 554, **2018**.
38. SHAO W., YANG K., BAI X. Impact of financial subsidies on the R&D intensity of new energy vehicles: A case study of 88 listed enterprises in China. Energy Strategy Reviews, **33**(4), 100580, **2021**.
39. BELLAVITIS C., KAMURIWO D.S., Hommel, U. Mitigation of moral hazard and adverse selection in venture capital financing: The influence of the country's institutional setting. Journal of Small Business Management, **57** (4), 1328, **2019**.
40. BLOOM N., VAN R.J., WILLIAMS H. A toolkit of policies to promote innovation. Journal of Economic Perspectives, **33** (3), 163, **2019**.
41. BONSON E., PEREA D., BEDNAROVA M. Twitter as a tool for citizen engagement: An empirical study of the Andalusian municipalities. Government Information Quarterly, **36** (3), 480, **2019**.
42. MORGENSTERN R.D., PRIZER, W.A., SHIH J.S. Jobs versus the environment: an industry-level perspective. Journal of Environmental Economics and management, **43** (3), 412, **2002**.
43. HE S.B., YAO H.L. Business environment, human capital structural upgrading, and economic development quality. Frontiers in Environmental Science, **10**, 964922, **2022**.
44. DONG Z., ZHANG Z. Does the business environment improve the sustainable development of enterprises? Sustainability, **14** (20), 13499, **2022**.
45. YU W., JACOBS M.A., CHAVEZ R. Exploring the effect of business environment on supply chain integration and financial performance: An environment–system–performance paradigm. IEEE Transactions on Engineering Management, **69** (06), 3197, **2022**.
46. CHENG Z., LI L., LIU J. The impact of foreign direct investment on urban PM2.5 pollution in China. Journal of Environment Management, **265**, 110532, **2020**.
47. ANOKHIN S., WINCENT J., PARIDA V., CHISTYAKOVA N., OGHAZI P. Industrial clusters, flagship enterprises and regional innovation. Entrepreneurship and Regional Development, **31** (1/2), 104, **2019**.
48. DIETER E., KIM L. Global production networks, knowledge diffusion, and local capability formation. Research Policy, **31** (8), 1417, **2001.**
49. GAO Y.Q., YANG H.B. Does ownership matter? Firm ownership and corporate illegality in China. Journal of Business Ethics, **168** (2), 431, **2021**.
50. MILLER S.R., EDEN L., LID. CSR reputation and firm performance: A dynamic approach. Journal of Business Ethics, **163** (3), 619, **2020**.
51. DMYTRIYEV S.D., FREEMAN R.E., HORISCH J. The relationship between stakeholder theory and corporate social responsibility: Differences, similarities, and implications for social issues in management. Journal of Management Studies, **58** (6), 1441, **2021.**
52. RAMANATHAN R., BLACK A., NATH P., MUYLDERMANS L. Impact of environmental regulations on innovation and performance in the UK industrial sector. Management Decisions, **48** (10), 1493, **2010**.
53. DAHLSRUD A. How corporate social responsibility is defined: An analysis of 37 definitions. Corporate Social Responsibility and Environmental Management, **1**, 1, **2008**.
54. SONG Q., HONG Z. Empirical study on financial sustainable growth of the family-controlled listed companies in Zhejiang province. WIT Transactions on Information and Communication Technologies, **46,** 271, **2013**.
55. GATZERT N. The impact of corporate reputation and reputation damaging events on financial performance: empirical evidence from the literature. European Management Reviews, **33** (6), 485, **2015.**
56. HADRICH J.C., WOLF C. Citizen complaints and environmental regulation of Michigan livestock operations. Journal of Animal Science, **89** (1), 277, **2011**.