

Original Research

From Dialogue to Action: The Influence of Environmental Protection Interviews on Corporate Environmental Investment

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Abstract

Environmental protection interviews offer an innovative method for enforcing environmental law, which is crucial for tackling ecological governance challenges and improving environmental performance. This study investigates the spillover effect of environmental protection interviews on corporate environmental investment. We find that a city's government being interviewed for environmental issues can urge 'non-interview' city enterprises within the same province to enhance environmental investment. The underlying mechanism of this is the peer behavior of non-interview city enterprises. This spillover effect is more pronounced in polluting industries, enterprises with fellow-townsmen relations with government officials, and areas with lower economic pressure or older officials. In addition, the spillover effect of environmental protection interviews significantly mitigates pollution in non-interviewed regions, demonstrating a degree of sustainability. This study enriches the literature on evaluating the effectiveness of environmental protection interviews. It offers valuable insights for enhancing the government's role in green governance, promoting a balance between economic growth and ecological protection.

Keywords: environmental protection interview, spillover effect, environmental investment, peer behavior

Introduction

Environmental pollution has become a major barrier to sustainable economic growth and human health, with frequent occurrences of global warming and

climate extremes [1]. The international community is focused on bridging the gap between economic progress and ecological preservation to achieve economic and environmental benefits. As green activities exhibit significant externalities, relying solely on market forces for ecological governance is commonly challenging. As the primary entities responsible for regional environmental management, local governments play a crucial role in building an ecological civilization. They

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are responsible for adhering to national environmental policies, enhancing regional regulations through local enforcement, and promoting sustainable resource use alongside effective pollution control. Sustaining the government's central role in ecological governance and fostering its coordination between economy and ecology is vital for advancing high-quality development.

However, environmental protection agencies encounter multiple objectives during policy implementation within China's political centralization and administrative decentralization system. This complexity, combined with the declining effectiveness of environmental enforcement at each administrative level, poses challenges for local governments in managing ecological issues. As China's economy grows rapidly, environmental pollution also intensifies. In 2023, China accounted for nearly one-third of global energy-related carbon dioxide emissions, exceeding the total emissions from the Western Hemisphere and Europe combined. The ineffectiveness of environmental enforcement hampers the execution of the high-quality development strategy. China's Ministry of Environmental Protection (now the Ministry of Ecology and Environment) issued the *Interim Measures for Interviews by the Ministry of Environmental Protection* in May 2014 to enhance regional environmental supervision. This document requires the Ministry to conduct public interviews with local government leaders who failed to perform their environmental responsibilities effectively, identify issues, and urge rectification. This system aims to promote regional environmental governance through political accountability.

Since enterprises are major polluters, their investments in environmental protection are essential for ecological governance. Previous studies have assessed the micro effectiveness of environmental interview policies by examining the behaviors of interviewed city enterprises. Findings suggest these interviews incentivize local governments to enhance enforcement and shift ecological governance responsibilities onto enterprises, prompting them to invest more in ecological protection [2]. As a public good, environmental regulation often creates spillover effects [3]. Current research on interviewed region enterprises neglects potential micro spillovers from environmental interviews. Based on government pressure perceptions and interactions with enterprises, environmental interviews may exert a spillover effect that encourages enterprises in neighboring non-interviewed areas to increase their environmental investments. When a city official is interviewed regarding insufficient ecological oversight, neighboring local governments become aware of the pressure and subsequently enhance their enforcement efforts. Enterprises within their jurisdiction are incentivized to engage with the government by assuming responsibility for environmental protection. Due to uncertainty in environmental protection investments, enterprises in non-interview cities that lack experience may rely on the green practices of similar

neighboring enterprises. By adopting peer behaviors that align with their peers' levels of environmental investment, these enterprises enhance their investment in environmental protection initiatives. This raises several questions: is there a spillover effect of environmental interviews on enterprises in non-interviewed areas? If so, what are its characteristics? What factors influence policy implementation effectiveness? Additionally, does the spillover effect contribute to sustainable pollution control? Exploring these issues is crucial for understanding corporate motivations for green behavior and optimizing regional ecological regulation.

We analyze the spillover effect of environmental protection interviews on corporate environmental investment. When the head of a city is interviewed, it is noted that the environmental protection investments made by enterprises in non-interviewed cities within the province tend to increase. The enterprise-level mechanism is grounded in the peer behavior among enterprises in non-interviewed cities towards the province's highest level of environmental investment. Heterogeneity analysis reveals that factors such as enterprise characteristics, government official traits, government-enterprise relations, and regional economic conditions influence the spillover effect of these interviews. It is especially evident in highly polluting industries, among enterprises with hometown ties to officials, in regions with less economic pressure, and under older officials. Moreover, the spillover effect of environmental protection interviews exhibits a certain temporal continuity and reduces pollution in areas not directly involved in the interviews.

Our study makes contributions in the following aspects. First, existing research on the micro-governance effects of environmental interviews primarily concentrates on enterprises within the interviewed areas, analyzing changes in their environmental behaviors—such as green innovation and environmental investment—before and after city leaders are interviewed [2, 4]. In contrast to this literature that investigates the direct effect, this study explores how such interviews impact the environmental investment behaviors of enterprises in non-interviewed areas. It highlights the spillover effects of environmental interviews at the enterprise level and broadens the scope of research on green governance impacts related to this policy. Second, the study conducted by Pan et al. and Sun et al. [5, 6] on environmental interviews primarily examines the behavioral pathways of individual enterprises, commonly neglecting the potential influence of inter-enterprise contacts on their decision-making processes. This study investigates the internal logic underlying the spillover effect of environmental interviews through the lens of peer behavior perspectives. The findings provide new evidence that clarifies the motives driving corporate green behavior and enhances our understanding of micro-level action pathways within the environmental interview system. Third, this study examines the environmental investment differences of enterprises in

non-interviewed areas, considering the characteristics and relationships between local governments and enterprises. Compared to previous research, this study elucidates a more comprehensive array of institutional and non-institutional factors affecting the governance effectiveness of environmental protection interviews. This offers evidence for developing economies to strengthen environmental regulations according to national contexts, effectively guiding enterprises in fulfilling their ecological responsibilities and promoting the harmonious balance between economic growth and environmental protection.

Background and Research Hypothesis

Environmental Protection Interview

Local environmental protection departments in China face dual leadership challenges within the ecological governance system. Horizontally, their funding and personnel are managed by local governments, leading to localized management. Vertically, they follow guidance from higher-level environmental protection agencies [7]. This creates conflicting demands from various stakeholders. For instance, local governments usually prioritize economic growth due to political performance evaluations, which lead them to lower entry barriers for polluting enterprises at the expense of ecological health. Due to their reliance on local governments for personnel and funding support, local environmental protection departments struggle with autonomy in enforcing regulations and implementing policies.

To address governance failures due to inefficient policy implementation in the environmental management system, China's Ministry of Environmental Protection has implemented an environmental protection interview system since 2014. Environmental protection interviews are an administrative measure in which the Ministry meets with local officials who have not adequately fulfilled their environmental responsibilities. During these interviews, warnings are issued, issues are identified, corrective actions are proposed, and prompt implementation is urged. In 2014, six mayors from cities such as Hengyang (Hunan Province) and Liupanshui (Guizhou Province) were interviewed; in 2015, eighteen mayors faced similar scrutiny. Numerous mayors expressed deep remorse during interviews and pledged to avoid future lapses. Through 'face-to-face' communication between the central environmental protection department and local governments, this interview process imposes constraints on local authorities, addressing dual leadership challenges in environmental law enforcement and effectively promoting regional governance activities.

Previous studies have confirmed that environmental protection interviews positively influence green governance. These interviews can pressure local governments regarding administrative governance

and public opinion. This compels them to enhance intervention in ecological activities within their jurisdiction [8]. Governments effectively delegate environmental management to local enterprises by implementing stringent project approval restrictions, targeted tax increases, and temporary production suspensions. To attain behavioral legitimacy, enterprises in interviewed regions respond to the demand for green governance by investing in ecological protection and advancing green innovation [9, 10]. This benefits regional pollution management and enhances environmental governance performance while fostering high-quality enterprise development [11, 12]. However, the existing literature examining the green governance effects of environmental interviews primarily focuses on their impacts on governments and enterprises in the cities where these interviews are conducted, frequently overlooking potential spillover effects. This oversight has led to underestimating the overall governance effect of environmental protection interviews. In this study, we investigate enterprises in non-interviewed areas as our research subjects and reveal the micro-governance spillover effect of environmental interviews by analyzing changes in their environmental investments before and after being interviewed in neighboring cities.

Research Hypotheses

Environmental protection interviews are a tool for the central environmental authority to oversee local governments executing ecological governance responsibilities. Through direct communication, these interviews pressure local governments to prioritize environmental protection, addressing the challenges of traditional enforcement methods in China. The pressure of environmental interviews may extend spatially to neighboring regions. When a local government head is interviewed for negligence, they face intensified oversight and public censure, which can erode stakeholder trust [13]. This undermines governmental reputation and hinders officials' advancement. Considering the negative consequences of such interviews, neighboring non-interviewed governments are motivated to conduct self-examinations to avoid similar issues. In this process, governments in non-interviewed cities will strengthen their oversight of enterprises operating within their jurisdiction. They urge these enterprises to address pollution issues and impose more stringent requirements regarding corporate environmental investments.

According to social interaction theory, organizations influence and interact with each other dynamically within social life. The impact of environmental regulation is grounded in effective interactions between government and enterprise entities. In response to ecological governance requirements from non-interviewed local governments, enterprises within their jurisdictions are likely to consider their developmental needs and adjust their environmental investment behaviors accordingly.

On the one hand, enterprises are motivated to enhance investments in ecological protection to attain behavioral legitimacy. Establishing the environmental protection interview system has resulted in enterprises losing governmental support. To mitigate long-term business risks, enterprises must secure positive evaluations from the government. Compliance with regulatory policies is crucial for establishing and enhancing behavioral legitimacy [3, 14]. When a local government leader faces environmental interviews, neighboring governments become vigilant and strengthen regional regulations to reduce the risk of similar scrutiny. Under the pressure of ecological regulations, enterprises are driven to increase environmental investments to meet compliance and gain legitimacy. This proactive strategy helps them reduce warnings and penalties related to environmental issues.

On the other hand, enterprises are incentivized to cater to government ecological demands to acquire a resource advantage. China's market economy is still developing, with the government mainly controlling resource allocation [15]. A favorable government-enterprise relationship boosts an enterprise's ability to acquire resources, giving it a competitive edge [16]. As environmental governance pressures rise, enterprises that invest in environmental protection and generate social benefits signal their willingness to collaborate with the government. This approach helps them gain preferential treatment in resource distribution. Consequently, under pressure from neighboring areas' environmental oversight, enterprises in non-interview cities are motivated to collaborate with the government's willingness to enhance environmental investment, thereby mitigating risks and generating value. Therefore, we put forth the following hypothesis:

H1: Environmental protection interviews generate a spillover effect, prompting enterprises in non-interviewed cities within the same province to enhance their environmental investments when other cities are interviewed.

Insufficient investment in environmental protection leads to negative evaluations of the enterprise by the government. However, due to inherent externalities, high risks, and lengthy cycles in environmental investment, excessive environmental expenditure may crowd out productive investments and increase short-term operational pressures. In ambiguous green decision-making, independently determining investment levels in environmental protection can lead enterprises to face uneconomical costs and uncertain outcomes. Literature research indicates that consistent actions aligned with similar subjects are essential for enterprises to reduce risks and build legitimacy [17-19]. Cai and Li [20] suggest that government environmental regulatory pressures can motivate enterprises to learn green innovation from their peers. Peng et al. [21] argue that external pressures enhance enterprises' willingness to make eco-friendly decisions, spreading green knowledge and technology among peers under strict environmental rules. In ongoing enterprise contacts, optimal behaviors are

more likely to emerge as role models [22]. Additionally, theoretical analyses and data comparisons suggest a significant likelihood of behavior convergence among enterprises within neighboring regions and the same industries [23]. Therefore, when leaders of neighboring cities are interviewed about environmental protection, governments in non-interviewed areas commonly strengthen their enforcement of environmental laws to reduce the risk of being interviewed. In this process, enterprises in non-interview areas often rely on peer enterprises for information acquisition, considering the risks linked to environmental protection investments. They may adopt peer behaviors, aligning their environmental investments with the highest levels seen among provincial counterparts. This alignment can attract local government officials' attention, granting access to resources and fostering positive evaluations. Therefore, we propose the following hypothesis:

H2: In enhancing environmental investment, enterprises in non-interviewed cities exhibit peer behaviors towards those with the highest levels of environmental investment within the same province.

Material and Methods

Data Sources

Our data sample for testing the hypotheses included A-share Chinese companies listed on the Shanghai and Shenzhen exchanges from 2014 to 2022, located in non-interview cities. We chose 2014 as our starting point because it marked the official establishment of the environmental protection interview system by the *Interim Measures for Interviews by the Ministry of Environmental Protection*. Specifically, we manually collect detailed information on assets and expenses from the notes of corporate financial statements. We then summarize expenditures related to environmental protection to gather data on corporate investments in ecological governance. Following Zeng et al. [24], the data for environmental protection interviews are collected from the official website of the Ministry of Ecology and Environment, local government portals, authoritative news reports, and Sina News Network. The remaining data are obtained from the China Stock Market & Accounting Research database. Samples with missing data are excluded, and continuous variables undergo upper and lower 1% quantile shrinkage to mitigate extreme value effects. The final sample includes 19,632 firm-year observations.

Model Construction

To detect the spillover effect of the environmental protection interview system on corporate environmental investment, we employ the following model:

$$EI_{it} = \beta_0 + \beta_1 EPI_{it} + \gamma Controls + \sum Industry + \sum Year + \varepsilon_{it} \quad (1)$$

The dependent variable is the level of corporate investment in environmental protection. Specifically, EI_1 represents the proportion of environmental expenditure against total assets. EI_2 is the proportion of environmental expenditure to the enterprise's income.

The independent variable, EPI , is a dummy variable that indicates whether the province where non-interview cities' enterprises are located had any cities interviewed by the Ministry of Ecology and Environment during the current year. If true, EPI takes the value of 1 and 0 otherwise. For instance, in year t , only City B in Province A is interviewed nationwide, and enterprises in City B would be excluded from the analysis. Enterprises in other cities within Province A would have $EPI=1$ for year t , while all others would have $EPI=0$.

The existing literature has explored the factors influencing corporate environmental investment from multiple perspectives. For instance, Xie and Wang [25] argue that strong cash flow enhances corporate environmental investments, while Zhu et

al. [26] indicate that these investments are affected by governance structures and regional economic development. Considering the influence of firm-specific characteristics and external factors on environmental investment behavior, we follow Ma and Tang [27] to control for various factors on corporate environmental investment. These include corporate operations (firm size, operating performance, financial leverage, and growth capacity), capital management (cash holdings, fixed asset ratio, and operating cash flow), corporate governance (proportion of independent directors, dual-role occupation, proportion of first shareholder ownership, separation of powers, shareholding balance, and internal control systems), characteristics specific to listed companies (Tobin's Q, nature of property rights, and time since listing), as well as regional economic development (regional GDP). We use a firm fixed effects model for regression analysis to control the effects of factors that do not change over time within the enterprise. The variables and their definitions are listed in Table 1.

Table 1. Variable definitions.

Symbol	Definition
EPI	1 if the enterprise is in a province where at least one city in the same year was interviewed by the Ministry of Ecology and Environment and 0 otherwise
EI_1	$100 \times \text{total environmental expenditure} / \text{total assets}$
EI_2	$100 \times \text{total environmental expenditure} / \text{total income}$
Size	The natural logarithm of the total assets
ROA	Net profit / total assets
Lev	Total liabilities / total assets
Growth	$(\text{Current operating income} - \text{previous operating income}) / \text{current operating income}$
Cash	Cash holding amount / total income
Tobin Q	Market value / asset replacement cost
Fix	Fixed assets / total assets
Ocf	Operating cash flow / total assets
First	Percentage of shares held by the largest shareholder
Dual	1 if the chairman and chief executive officer are the same person and 0 otherwise
Shrz	Shareholding ratio of the first largest shareholder / shareholding ratio of the second largest shareholder
Ddrate	Percentage of independent directors on the board
Separation	Difference between control rights and proprietary rights of the actual controller
Incontr	The natural logarithm of Internal control index
State	1 if the enterprise is state owned and 0 otherwise
Stime	Time since listing
GDP	Gross domestic product at the rovincial level (Unit: trillions RMB)

Table 2. Descriptive statistics.

Variable	N	Mean	SD	Min	Median	Max
EPI	19632	0.221	0.415	0.000	0.000	1.000
EL ₁	19632	0.106	0.385	0.000	0.000	2.626
EL ₂	19632	0.238	0.945	0.000	0.000	6.808
Size	19632	22.254	1.223	19.676	22.126	25.904
ROA	19632	0.028	0.081	-0.417	0.033	0.203
Lev	19632	0.435	0.208	0.061	0.424	0.977
Growth	19632	0.411	1.057	-0.818	0.149	7.327
Cash	19632	0.422	0.477	0.028	0.276	3.329
Tobin Q	19632	2.188	1.527	0.835	1.710	10.146
Fix	19632	0.204	0.156	0.001	0.171	0.673
Ocf	19632	0.045	0.070	-0.179	0.045	0.249
First	19632	0.330	0.142	0.082	0.307	0.724
Dual	19632	0.288	0.453	0.000	0.000	1.000
Shrz	19632	0.080	0.123	0.010	0.036	0.767
Ddrate	19632	0.384	0.076	0.188	0.375	0.800
Separation	19632	0.047	0.074	0.000	0.000	0.595
Incontr	19632	6.098	1.506	0.000	6.492	6.848
State	19632	0.346	0.476	0.000	0.000	1.000
Stime	19632	11.729	7.442	1.000	10.014	32.055
GDP	19632	5.263	3.195	0.094	4.351	12.912

Results and Discussion

Descriptive Statistics

Table 2 reports the descriptive statistics of the variables used in our analysis. The proportion of enterprises' provinces with at least one city interviewed that year is 22.1%, indicating comprehensive coverage and excellent implementation of the current environmental interview policy. On average, the ratio of corporate environmental investment to total assets (EL_1) is 0.106% and to total income (EL_2) is 0.238%, where the maximum values are 2.626% and 6.808%, respectively, while the minimum value for both is 0. These results suggest that the problem of insufficient investment in environmental protection by Chinese listed companies is serious, and the amount of investment across the sample varied widely. Therefore, it is necessary to strengthen ecological supervision and urge enterprises to fulfill their environmental and social responsibility. Concerning control variables, on average, the return on assets is 2.8%, and the firm leverage is 43.5%, indicating that the sample enterprises have good profitability and moderate debt levels. In 28.8% of cases, the board chairman also serves as the chief executive officer.

The distribution of the remaining control variables is primarily consistent with the existing literature.

Baseline Regression Analysis

We test the hypothesis using Model (1) and present the results in Table 3. Column (1) indicates that the EPI regression coefficient is 0.002, which is significant at the 10% level when corporate environmental investment is measured as the ratio of environmental expenditure to total assets. This means that a significant positive relationship exists between environmental protection interviews and environmental expenditures of non-interview city enterprises within the same province. In Column (2), where the dependent variable is the ratio of corporate environmental investment to total income, the EPI coefficient is 0.005, which is also significant at the 10% level. These results reveal that city leaders' environmental interviews increase pressure on neighboring local governments to enhance the supervision of ecological protection. In response to rising government demands for ecological governance, enterprises in non-interviewed cities are motivated to boost their investments in environmental protection. This leads to a spillover effect of the environmental interviews. The empirical evidence provides support for H1.

Table 3. Baseline regression analysis.

Variables	(1)	(2)
	EI1	EI2
EPI	0.002*	0.005*
	(1.76)	(1.83)
Size	-0.001	0.011
	(-0.22)	(0.68)
ROA	0.026	-0.096***
	(1.48)	(-3.92)
Lev	0.007	0.014
	(1.58)	(0.77)
Growth	0.000	0.004***
	(0.19)	(3.52)
Cash	0.008**	0.067***
	(2.01)	(7.33)
Tobin Q	0.004***	0.010***
	(3.79)	(4.09)
Fix	0.054*	0.128
	(1.67)	(1.16)
Ocf	0.017	-0.111***
	(1.64)	(-3.92)
First	0.071***	0.060
	(2.84)	(0.85)
Dual	0.005**	0.017**
	(2.20)	(2.14)
Shrz	-0.040	-0.062**
	(-1.62)	(-2.34)
Ddrate	-0.060***	-0.159***
	(-14.06)	(-7.00)
Separation	-0.043	-0.046
	(-1.39)	(-0.51)
Incontr	0.004***	0.005*
	(3.43)	(1.68)
State	-0.019***	-0.029**
	(-3.60)	(-2.23)
Stime	-0.005***	-0.019***
	(-11.31)	(-8.39)
GDP	0.003***	0.013***
	(4.68)	(5.57)
Ind/Year	YES	YES
N	19632	19632
R ²	0.006	0.007
F	138.517	134.140

Note: ***, **, * represent significance levels of 1%, 5%, and 10%, respectively, in the following tables.

Table 4. Alternative measures of dependent variable.

Variables	(1)	(2)
	EI ₃	EI ₄
EPI	0.087***	0.006*
	(2.87)	(1.85)
Controls/Ind/ Year	YES	YES
N	19632	19632
R ²	0.014	0.006
F	212.680	220.562

Robustness Test

Alternative Measures of Dependent Variable

We subdivided the types of environmental investment and regressed Model (1) using asset-based investment (EI_3) and expense-based expenditure (EI_4) as measures. The results in Table 4 indicate a significant positive correlation between city leaders' acceptance of environmental interviews and enterprises' level of environmental investment in non-interviewed cities within the same province.

Endogeneity Tests

Although we included firm fixed effects in our baseline model (Table 3), endogeneity issues may still affect our findings. The more enterprises invest in environmental protection and the better the regional ecological quality, the less likely the region will be interviewed. As such, the results may have a reciprocal causation issue. Following Bai and Rui [28], we use the average river density of other cities in the same province as an instrumental variable.

Considering transportation costs, enterprises often set up factories in areas with higher river density. According to an interview from the Ministry of Ecology and Environment, this suggests that cities with greater river density are more prone to pollution. Consequently, there is a correlation between the average river density of other cities in the province and interviews conducted by environmental authorities within the same province. However, no evidence suggests that this average river density affects corporate environmental investment. The second-stage regression results using instrumental variables are shown in Table 5, Panel A. The *EPI* coefficients are significantly positive, aligning with prior analyses.

We also minimize endogeneity issues using propensity score matching (PSM). Specifically, we apply the nearest neighbor matching method based on firm, industry, and regional characteristics to pair samples. We examine how city leaders undergoing interviews influenced environmental investment levels

Table 5. Endogeneity tests.

Panel A: Instrumental variable analysis		
Variables	(1)	(2)
	EI_1	EI_2
EPI	1.238***	1.833**
	(2.66)	(2.05)
Controls/Ind/ Year	YES	YES
N	19632	19632
Chi ²	647.630	1138.807
Panel B: PSM estimation		
Variables	(1)	(2)
	EI_1	EI_2
EPI	0.006***	0.020***
	(2.97)	(2.77)
Controls/Ind/ Year	YES	YES
N	7090	7090
R ²	0.012	0.010
F	33.761	9.987

in enterprises from other cities within the same province while maintaining consistency between internal and external enterprise environments. Panel B in Table 5 reports the regression results of model (1) regression using the paired samples. The coefficient of *EPI* is still significantly positive, indicating that cities in the same province being interviewed can promote enterprises in non-interviewed locations to expand their environmental investments. H1 is thus again supported.

Additional Analyses

Mechanism Test

According to the previous analysis, environmental protection interviews incentivize both the interviewed region's government and neighboring regions to strengthen ecological regulations on local enterprises. With intensified environmental enforcement, enterprises in nearby non-interviewed areas are driven to enhance their environmental investments for legitimacy and resource advantage. Due to the risks and uncertainties of these investments, they often use peer behavior, increasing their environmental investment to align with the optimal levels observed among peers. The potential mechanism of environmental protection interview spillovers is analyzed through enterprises' peer behavior concerning environmental investment in non-interviewed areas.

We design the *PE* indicator to evaluate non-interview city enterprises' environmental protection investment peer behavior. It is calculated as the absolute difference between an enterprise's environmental investment level and the highest level observed among its industry peers within the same province and year. The smaller the *PE* value, the more closely the scale of environmental investment by enterprises aligns with that of their peers. It suggests a more pronounced peer effect on environmental investment in non-interviewed regions. Corporate environmental investment levels in PE_1 and PE_2 are measured as environmental expenditures as a percentage of total assets and total revenues, respectively. We use *PE* as a mediating variable and construct a mediating effect model to empirically test this potential path based on the basic regression results. We follow the mediating effect test procedures proposed by Wen et al. [29] and Preacher and Hayes [30]. Table 6 presents the results.

The results in Columns (1) and (2) of Table 6 indicate that the coefficient of *EPI* is significantly negative, regardless of how corporate environmental investment peer behavior is measured. This suggests that environmental interviews have bridged the gap between enterprises in non-interviewed areas and those at the highest level of environmental investment within the same industry and province, promoting peer behavior in corporate environmental investments. Columns (3) and (4) include the *PE* variable in Model (1). Both PE_1 and PE_2 show significant negative correlations with the magnitude of such investments at a 1% level. This implies that peer behavior in non-interviewed areas enhances the spillover effect of environmental interviews. Compared to the regression results in Table 3, the coefficients of *EPI* change from significantly positive to non-significant. This finding suggests that corporate environmental investment peer behavior plays a completely mediating role in the formation path of the spillover effect of environmental interviews. When neighboring regions undergo interviews, local governments enhance ecological regulations. In response, these enterprises align their environmental investments with the highest levels among peers to mitigate non-compliance risks and gain a resource advantage. The spillover effect of the environmental interview system emerges this way.

The verification of H2 has been successfully completed.

Heterogeneity Analysis

The spillover effect of environmental interviews on corporate environmental investment essentially arises from the perception and response of governments in non-interviewed areas to the pressure created by neighboring interviews. Government officials in non-interviewed regions perceive pressure differently based on various characteristics, and the area's overall development influences their responses. As environmental regulations

Table 6. Mechanism test.

Variables	(1)	(2)	(3)	(4)
	PE ₁	PE ₂	EI ₁	EI ₂
EPI	-0.100**	-0.323***	-0.012	-0.029
	(-2.54)	(-3.47)	(-1.20)	(-1.54)
PE ₁	-	-	-0.145***	-
	-	-	(-16.90)	-
PE ₂	-	-	-	-0.104***
	-	-	-	(-12.36)
Size	-0.013***	-0.040**	-0.003	0.007
	(-2.65)	(-2.32)	(-0.61)	(0.37)
Roa	0.124***	0.452***	0.044*	-0.049
	(3.50)	(4.33)	(1.70)	(-1.25)
Lev	0.070***	0.150**	0.017	0.029
	(3.00)	(2.15)	(1.45)	(0.75)
Growth	-0.004***	-0.005*	-0.001	0.003
	(-3.44)	(-1.94)	(-0.40)	(1.13)
Cash	-0.014***	-0.080***	0.006	0.058***
	(-4.55)	(-10.51)	(1.32)	(4.77)
Tobin Q	-0.001	-0.005	0.004**	0.010**
	(-0.40)	(-1.06)	(1.99)	(2.07)
Fix	-0.022	-0.143	0.051	0.113
	(-0.42)	(-1.28)	(0.79)	(0.67)
Ocf	-0.057***	-0.127***	0.009	-0.124**
	(-5.22)	(-4.01)	(0.49)	(-2.34)
First	-0.252***	-0.692***	0.034	-0.012
	(-6.70)	(-7.41)	(0.81)	(-0.08)
Dual	-0.007*	0.005	0.004	0.017
	(-1.82)	(0.70)	(0.91)	(1.46)
Shrz	0.054	-0.021	-0.032	-0.064**
	(1.06)	(-0.16)	(-1.64)	(-2.39)
Ddrate	0.150***	0.227***	-0.038***	-0.135***
	(5.53)	(3.06)	(-3.92)	(-3.16)
Separation	0.192***	0.239**	-0.015	-0.022
	(5.72)	(2.08)	(-0.34)	(-0.21)
Incontr	0.001	-0.001	0.004**	0.004
	(0.41)	(-0.19)	(2.50)	(1.01)
State	0.006	-0.020	-0.018**	-0.031**
	(0.33)	(-0.37)	(-2.31)	(-2.18)
Stime	0.023***	0.026**	-0.002***	-0.016***
	(8.88)	(2.02)	(-2.65)	(-3.82)
GDP	-0.030***	0.073**	-0.002*	0.020***
	(-4.53)	(2.32)	(-1.93)	(3.40)
Ind/Year	YES	YES	YES	YES
N	19632	19632	19632	19632
R2	0.104	0.100	0.095	0.064
F	402.631	358.349	31.695	44.990

strengthen, government expectations for environmental conduct vary across different types of enterprises. These factors may result in a disparity in the effectiveness of environmental interviews on corporate green governance in non-interviewed areas. Considering the characteristics of various subjects involved in generating spillover effects, we examine the factors influencing spillovers by differentiating the characteristics of government officials, regional economic development, government-enterprise relationships, and industry-specific traits.

Age of Local Government Officials

The promotion mechanism for local government officials in China imposes an age “ceiling”, gradually restricting their advancement opportunities as they grow older [31]. For older local government officials, the promotional benefits of sacrificing ecology for economic development diminish. To maintain their reputation and secure favorable retirement benefits, they typically enhance environmental governance in their jurisdictions to prevent disciplinary actions from environmental accidents [32]. Li and Lu [33] also found that older officials exhibit weaker risk preferences, greater concern for reputation and job security, and are less likely to engage in behaviors that may jeopardize their positions than younger officials. Older local officials’ willingness to respond to central environmental regulations driven by the desire to avoid interviews and maintain a positive reputation is stronger. This enhances their self-examination regarding local ecological issues, leading enterprises in non-interviewed areas to face greater pressure to comply with regulations, thus promoting higher levels of environmental investment.

The variable *Old* measures the age status of local government officials. *Old* takes the value of 1 when the mayor’s age exceeds the sample mean and 0 otherwise. We conduct a regression analysis with *Old* as the independent variable and corporate environmental investment peer behavior *PE* as the dependent variable. The results are presented in Table 7. The negative coefficients of *Old* in Columns (1) and (2) are significant at the 5% and 10% levels, respectively. This indicates that as local government officials age, environmental investment peer behavior among enterprises in non-interview cities and those within the same provincial industry increases, highlighting the spillover effect of environmental interviews. The green governance effect of environmental protection interviews on enterprises in non-interviewed areas is affected by local government officials’ pressure perception, leading to heterogeneous spillover effects due to their differing risk preferences.

Regional Economic Pressure

Amid rising economic pressure and stricter environmental regulations, local governments must balance economic growth with ecological protection.

Table 7. The influence of the age of local government officials.

Variables	(1)	(2)
	PE ₁	PE ₂
Old	-0.045**	-0.185*
	(-2.10)	(-1.73)
Controls/Ind/ Year	YES	YES
N	1206	1206
R ²	0.254	0.261
F	139.029	567.108

Multiple goal constraints tie environmental regulation to economic conditions, leading to a lack of independence [34]. Research shows that China’s existing fiscal and personnel systems incentivize local governments to pursue regional economic development. On the one hand, fiscal decentralization allows localities and the central government to share revenues, incentivizing local governments to drive economic development. On the other hand, the necessity of economic development has made GDP a key metric for assessing officials’ effectiveness. Although environmental performance indicators have been gradually incorporated into China’s performance appraisal system, economic development is more observable than green governance with long-term returns. This leads local governments to prioritize limited resources for economic growth [35]. If local economic growth pressure is high, considering overall performance and competitive demands, the government will likely prioritize achieving economic objectives. In interviews with other cities within the province, there tends to be diminished self-reflection regarding ecological protection. Therefore, the government’s requirements for local enterprises’ green behavior are relatively low. This results in weak incentives for enterprises to enhance their environmental investments.

We use the median of the natural logarithm of per capita GDP from cities in the same province to group data and construct a regional economic growth pressure indicator *Stress*. When the city’s per capita GDP exceeds the provincial median, *Stress* takes the value of 0 and 1 otherwise. We include *Stress* in the model, with results presented in Table 8. The coefficients of the stress variables are all significantly positive at the 1% level, indicating that the local economic growth pressure inhibits the peer behavior of non-interview cities’ enterprises from converging towards the highest level of environmental investment within their industry and province. Local governments may prioritize economic development over ecological governance in response to pressures for economic growth, thereby diminishing the spillover effect of environmental protection interviews.

Table 8. The influence of regional economic pressure.

Variables	(1)	(2)
	PE ₁	PE ₂
Stress	0.087***	0.227***
	(2.99)	(2.60)
Controls/Ind/ Year	YES	YES
N	4345	4345
R ²	0.165	0.155
F	27.893	6.383

Fellow-township Relationship

Literature indicates that government officials' geopolitical ties impact corporate operations [36]. In Chinese society, the fellow-township relationship, shaped by traditional culture, is a significant geographical bond. When corporate executives and local officials share the same hometown, their emotional identification and ethical constraints may influence corporate environmental investments. From the perspective of emotional identity, executives and government officials from the same region share a common growing environment. Their cultural and value similarities can bridge the psychological distance, fostering affinity and mutual identification [37]. In response to the government's pressure on ecological governance due to the neighboring regions being interviewed, enterprises with executives having fellow citizen connections to officials can proactively shoulder the policy burden out of emotional identification and increase expenditures to help the government achieve its eco-construction goals.

Regarding ethical constraints, there has traditionally been a strong emphasis on mutual assistance among fellow town members. The effective implementation of governmental ecological governance requires close collaboration from enterprises in their investments for environmental protection. Within an ethical framework of reciprocal assistance among fellow township members, increasing investments in environmental protection becomes a compliant strategy for enterprises with executives and officials from the same region. Amidst increasing government demands for ecological governance, executives who fail to enhance their enterprises' environmental investment promptly face negative evaluations from their township networks. This is due to perceived negligence in meeting environmental responsibilities and a lack of commitment to hometown ties. This exposes executives to public condemnation and the loss of their network, hindering career development and impeding enterprise operations [38]. When neighboring cities undergo interviews that improve local environmental enforcement, enterprises in non-interviewed cities—particularly those with executives

with hometown connections to the officials—increase their environmental expenditures. This behavior stems from emotional identification and ethical obligations to support the government's environmental fiduciary responsibility.

We select the existence of a fellow-township relationship between the mayor of the enterprise location and the chairman of the board as the basis for the measurement. The variable *Same* takes the value of 1 when there is a fellow-township relationship between the mayor and the chairman of the board and 0 otherwise. Table 9 shows that for various measures of environmental investment peer behaviors, the coefficients for *Same* are significantly negative at the 1% level. These results indicate that the hometown ties between corporate executives and local government officials promote the convergence towards the highest level of corporate environmental investment in non-interviewed places. The close government–enterprise relationship is key in promoting the spillover effect of the environmental interview system.

Industry Attributes

The intensity of ecological regulation for enterprises varies by industry due to the varying likelihood of pollution problems arising from production and the degree of environmental damage. The analysis of enterprises' green behavior needs to consider their industry attributes. According to the 'polluter pays' concept, polluting industries bear primary environmental responsibility and should invest more in pollution prevention. Polluting industries have weaker legitimacy than non-polluting ones and tend to create negative externalities, causing greater ecological harm. This poses significant challenges for local governments in improving their environmental assessment performance, resulting in greater pressure for regulation under similar conditions [39, 40]. Influenced by inter-regional ecological supervision and political pressure from interviews, non-interviewed governments focus more on polluting industries during self-examinations of ecological issues, improving their supervision and requirements. This gives enterprises in

Table 9. The influence of fellow-township relationship.

Variables	(1)	(2)
	PE ₁	PE ₂
Same	-0.097***	-0.269***
	(-10.07)	(-20.71)
Controls/Ind/ Year	YES	YES
N	1136	1136
R ²	0.264	0.263
F	182.077	113.922

Table 10. The influence of industry attributes.

Variables	(1)	(2)
	PE ₁	PE ₂
Pollute	-0.132***	-0.298***
	(-5.04)	(-3.18)
Controls/Ind/ Year	YES	YES
N	3325	3325
R ²	0.531	0.509
F	226.902	91.699

polluting industries a stronger incentive to enhance their environmental investments to mitigate non-compliance risks, leading them to adopt more peer behaviors.

We construct a variable, *Pollute*, which equals 1 for enterprises in polluting industries and 0 otherwise. The analysis results for the effect of industry attributes are shown in Table 10. The *Pollute* coefficient is consistently negative for various quantitative indicators of corporate environmental investment peer behavior. This suggests that increased government enforcement in non-interviewed areas to mitigate interview risks imposes greater regulatory pressure on polluting industries. Enterprises in polluting industries are more likely to adopt peer behavior for environmental investments to gain legitimacy. This enhances the spillover effect of environmental interviews on corporate environmental investments.

The Influence of Spillover Effects on Regional Pollution Management

The current stage of China's ecological civilization is still in early development. Due to limited environmental awareness and technological capabilities, increased investment in environmental protection does not necessarily lead to improved governance effectiveness [41]. When a local government is interviewed regarding ecological issues, neighboring governments that are not interviewed utilize these issues as benchmarks for self-assessment. This process subsequently enhances their supervision of enterprises operating within their jurisdictions. Enterprises in non-interviewed cities tend to increase their environmental expenditures to enhance legitimacy and secure a resource advantage. This creates a spillover effect on environmental interviews regarding enterprise investment in non-interviewed cities. Additionally, can increased environmental investments by enterprises in these cities aid local governments in effectively achieving regional pollution control? This question remains to be explored.

Here, we design the variable *Dust* to measure regional environmental pollution, reflecting local industrial smoke emissions. By examining the correlation between corporate environmental

Table 11. The influence of spillover effects on regional pollution management.

Variables	Dust	
	(1)	(2)
PE ₁	0.124**	-
	(2.56)	-
PE ₂	-	0.059***
	-	(2.81)
Size	-0.163	-0.157
	(-0.43)	(-0.42)
Roa	-8.860**	-8.888**
	(-2.19)	(-2.18)
Lev	-4.719**	-4.742**
	(-2.45)	(-2.44)
Growth	-0.175*	-0.175*
	(-1.70)	(-1.70)
Cash	-0.169***	-0.171***
	(-3.23)	(-3.25)
Tobin Q	-0.086*	-0.087*
	(-1.93)	(-1.94)
Fix	-3.314***	-3.331***
	(-2.96)	(-2.97)
Ocf	-1.524**	-1.517**
	(-2.50)	(-2.49)
First	-3.763*	-3.752*
	(-1.67)	(-1.67)
Dual	-1.310**	-1.307**
	(-2.45)	(-2.46)
Shrz	-0.984	-0.957
	(-1.58)	(-1.56)
Ddrate	0.278	0.271
	(0.97)	(0.94)
Separation	10.375**	10.351**
	(2.38)	(2.38)
Incontr	0.126***	0.127***
	(3.47)	(3.49)
State	-0.496**	-0.486**
	(-2.23)	(-2.22)
Stime	0.562	0.552
	(0.63)	(0.62)
GDP	0.869***	0.874***
	(3.49)	(3.49)
Ind/Year	YES	YES
N	3662	3662
R ²	0.186	0.186
F	2.555	2.651

Table 12. The sustainability of spillover effects.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	F1.EI ₁	F1.EI ₂	F2.EI ₁	F2.EI ₂	F3.EI ₁	F3.EI ₂
EPI	0.006***	0.009*	0.008***	0.004	-0.006***	-0.004
	(3.23)	(1.65)	(2.85)	(0.79)	(-2.93)	(-0.57)
Size	-0.003	-0.017*	-0.008***	-0.023***	-0.027***	-0.048***
	(-0.94)	(-1.67)	(-2.98)	(-4.24)	(-5.30)	(-3.60)
ROA	-0.026	-0.055	-0.002	0.000	0.084***	0.144***
	(-1.11)	(-0.84)	(-0.07)	(0.00)	(5.03)	(3.43)
Lev	-0.023***	-0.083***	-0.024***	-0.049	0.084***	0.152***
	(-3.05)	(-4.86)	(-3.08)	(-1.48)	(3.14)	(3.03)
Growth	0.000	-0.001	-0.001	-0.002	-0.000	0.004
	(0.51)	(-0.27)	(-0.29)	(-0.63)	(-0.11)	(0.85)
Cash	-0.012***	-0.020**	-0.010***	-0.026***	-0.001	0.006
	(-5.87)	(-2.50)	(-4.96)	(-2.99)	(-0.42)	(0.74)
Tobin Q	-0.000	0.001	-0.002	0.002	-0.008***	-0.008***
	(-0.49)	(0.65)	(-1.24)	(0.38)	(-8.76)	(-2.92)
Fix	-0.044	-0.242**	-0.034	-0.107*	-0.041*	-0.076
	(-0.84)	(-2.23)	(-1.32)	(-1.95)	(-1.75)	(-1.16)
Ocf	0.114***	0.102***	0.062***	0.087***	-0.000	0.060
	(9.87)	(3.19)	(3.43)	(2.66)	(-0.02)	(1.45)
First	0.117***	0.228***	0.084	0.185	0.064***	0.120*
	(5.35)	(5.03)	(1.41)	(1.24)	(5.22)	(1.80)
Dual	0.017***	0.037***	0.012***	0.037***	0.004*	0.014
	(4.20)	(3.16)	(4.12)	(7.96)	(1.66)	(1.41)
Shrz	-0.080***	-0.113***	0.014	0.034	0.027*	0.082***
	(-4.13)	(-3.58)	(0.70)	(0.89)	(1.87)	(2.87)
Ddrate	0.029***	0.058**	-0.033	-0.063	-0.062**	-0.099
	(6.69)	(2.26)	(-1.53)	(-1.47)	(-2.29)	(-1.41)
Separation	-0.012	0.022	0.033*	0.079	0.026	0.106***
	(-0.54)	(0.38)	(1.76)	(1.42)	(1.02)	(3.14)
Incontr	0.004***	0.005**	0.002*	0.001	0.002**	0.001
	(2.95)	(2.29)	(1.76)	(0.17)	(2.30)	(0.24)
State	-0.002	-0.017	-0.015	-0.040	-0.005	-0.006
	(-0.14)	(-0.68)	(-1.09)	(-1.11)	(-0.45)	(-0.32)
Stime	0.006	0.054**	0.026**	0.064**	0.076***	0.117***
	(1.12)	(2.51)	(2.56)	(2.38)	(6.09)	(3.63)
GDP	0.003***	0.012***	0.001	0.002	0.002	-0.000
	(4.02)	(3.61)	(1.06)	(0.67)	(1.04)	(-0.07)
Ind/Year	YES	YES	YES	YES	YES	YES
N	18456	18456	15782	15782	13015	13015
R ²	0.007	0.007	0.008	0.008	0.009	0.008
F	16.267	50.853	33.801	82.541	51.559	11.116

investment peer behavior in non-interviewed areas and local environmental conditions, we can assess whether spillover effects of environmental protection interviews contribute to regional pollution control. Table 11 presents the empirical analysis results. For both measures of corporate environmental investment peer behavior, the coefficients of the variable *PE* are correspondingly positive and significant at the 5% and 1% levels. These findings indicate that such peer behavior reduces local industrial soot emissions and enhances regional pollution management, suggesting that spillover effects of environmental interviews positively impact regional environmental quality.

The Sustainability of Spillover Effects

The preceding analyses show that environmental protection interviews not only prompt the interviewed regions to strengthen ecological governance but also encourage enterprises in nearby non-interviewed cities to boost their environmental investments. This spillover effect expands the impact of these interviews. Additionally, can this spillover effect be sustained over time? In this section, we explore the sustainability of the spillover effect from environmental protection interviews.

We regress data on corporate environmental investment over the next one to three periods, with results shown in Table 12. The findings indicate an increase in such investments during the two years following environmental protection interviews in neighboring cities. This spillover effect diminishes after the third year. The analysis suggests that the sustainability of this spillover effect is indeed persistent, but there is still room for further improvement. To achieve stable governance improvements from environmental protection interviews, it is essential to refine the repeated inspection mechanism further and strengthen follow-up supervision of regional ecological pollution management.

Conclusions

Environmental protection interviews serve as an effective mechanism to enhance the efficiency of regional ecological enforcement. This study examines their micro-governance spillover effects. The findings indicate that interviews with city leaders encourage enterprises in non-interviewed cities within the same province to boost environmental investments. This spillover effect arises from peer behavior among non-interviewed city enterprises, which align their environmental investments with the highest levels in their industry within the province. The spillover effect of environmental interviews is more pronounced for enterprises that have older local officials, operate in regions with lower economic pressures, employ executives who share a hometown with local government officials, and belong

to polluting industries. Further analysis indicates that the aforementioned spillover effects exhibit limited sustainability. The rise in environmental investments by enterprises in non-interviewed cities significantly improves regional governance performance. The results illustrate the effective transmission of information regarding governmental pressures on ecological governance and enterprises' decision-making in environmental protection through social contacts. This dynamic presents an opportunity to enhance the impact of environmental policies and address knowledge gaps in enterprises' green development. Such insights carry crucial implications for accelerating ecological civilization construction and fostering a mutually beneficial relationship between economics and ecology.

Based on the analysis of the research findings, we present the following recommendations. First, establishing a normalized framework for environmental protection interviews and enhancing subsequent ecological supervision. Moreover, it is essential to advance the comprehensive implementation of the environmental interview policy and amplify its influence on the green behaviors of enterprises in adjacent jurisdictions. Likewise, an irregular follow-up visit and re-accountability mechanism should be implemented to sustain the pressure exerted by central environmental protection interviews on local governments. This approach can enhance the sustainability of ecological governance outcomes resulting from these interviews.

Second, a categorized environmental appraisal system should be established in accordance with the level of comprehensive regional development. In evaluating regional environmental performance, it is essential to fully consider the potential constraints imposed by economic development and other factors on the government's ecological governance. A differentiated policy framework should be established at various levels, including the provision of policy subsidies and the recruitment of green development professionals, to strengthen regional environmental governance capacity comprehensively.

Third, enhancing the development of ecological civilization by leveraging the strengths of informal systems. Factors such as official characteristics, enterprise interactions, and government-enterprise relations significantly affect the environmental protection decisions made by enterprises. In the context of regional environmental management activities, it is essential to enhance communication between government entities and enterprises. This will foster a greater sense of recognition among enterprises regarding ecological development goals. Concurrently, the government can provide incentives to enterprises that demonstrate exemplary environmental performance within its jurisdiction. This strategy aims to establish models of environmental protection and encourage similar enterprises to actively pursue pathways toward sustainable development.

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Conflict of Interest

The authors declare no conflict of interest.

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