



How Environmental Regulation Affects Corporate ESG Performance: An Empirical Study Based on the Compliance Cost Hypothesis

Jingwen Lu*

Economics and Finance (BSc), Faculty of Social Sciences and Law, University of Bristol,
Bristol, BS8 1QU, United Kingdom

*Corresponding author. Email: 2660551975@qq.com

Abstract. As global environmental issues become increasingly severe, countries have introduced a series of environmental regulation policies to promote environmental protection. Using data from Chinese listed companies, this paper explores whether environmental regulation policies enhance corporate ESG performance. The empirical findings reveal that environmental regulation policies, instead, reduce corporate ESG performance. This is because environmental regulations increase corporate tax burdens and compliance costs, negatively impact corporate revenue and R&D investments. These findings align with the compliance cost hypothesis, which posits that environmental regulations increase production costs, reduce financial performance, and consequently hinder improvements in corporate environmental efficiency. Based on this, the paper recommends that environmental protection policies should be implemented gradually, without disrupting normal business operations and R&D decision-making, to sustainably achieve improvements in corporate environmental efficiency.

Keywords: environmental regulation, ESG, compliance costs

1 Introduction

Global environmental issues are becoming increasingly severe, and the coordinated development of environmental protection and the economy has become a major challenge faced by countries worldwide. In recent years, China has continuously emphasizing the sustainable development and green growth, introducing a series of stringent environmental protection regulations and policies. These include the Environmental Protection Tax Law implemented in 2018 and the establishment of environmental courts across various regions (Wang, 2024)[1]. The impact of environmental regulations on corporate behavior and financial performance has become a focal point for both academic researchers and policymakers. This article reviews representative literature concerning the relationship between environmental protection laws and corporate financial performance. The theoretical debate in this area revolves around the "Porter Hypothesis" and

the "Compliance Cost Hypothesis." The "Compliance Cost Hypothesis" argues that environmental regulations increase production costs and reduce financial performance, whereas the "Porter Hypothesis" primarily examines whether environmental regulation can enhance competitiveness through innovation compensation effects, thereby improving corporate financial performance. Methodologically, studies in this field commonly employ quasi-natural experiments and difference-in-differences (DID) models. Simultaneously, as the importance of the ESG (Environmental, Social, and Governance) evaluation system continues to grow, the China Securities Regulatory Commission (CSRC) mandated in 2024 that certain listed companies must compulsorily disclose their ESG scores, further directly linking environmental performance to corporate value.

This paper's investigation into the impact of environmental protection laws on corporate financial performance and ESG scores holds significant theoretical and practical value. Theoretically, it can test and expand the applicability of the "compliance cost hypothesis" in developing countries, enriching the theoretical understanding of the economic consequences of environmental regulation. Practically, exploring the mechanism through which environmental protection laws affect corporate financial performance aids governments in designing more scientific environmental policy tools and promotes corporate transformation and upgrading.

This paper focuses on the impact of environmental protection laws on corporate financial performance and ESG scores, specifically including: 1. whether the Environmental Protection Tax Law can improve the financial performance of heavily polluting enterprises 2. whether the Environmental Protection Tax Law influences firms' financial performance and R&D.

Based on data from Chinese listed companies spanning 2009 to 2023, this paper employs a Difference-in-Differences (DID) model to systematically evaluate the impact of the Environmental Protection Tax Law implemented in 2018—an environmental regulation policy—on corporate ESG performance, operating revenue, and R&D investment. The findings are as follows: 1) Environmental regulation significantly reduced the ESG scores of the treatment group (heavily polluting enterprises). This decline may be attributed to the increased cost pressures, which potentially led to reduced corporate investment in ESG-related activities, thereby failing to effectively promote the enhancement of corporate environmental and social governance levels. 2) Furthermore, environmental regulation directly and significantly decreased corporate operating revenue. The environmental protection tax and associated compliance costs directly increased the burden on enterprises, adversely affecting their financial performance. 3) The study also found that environmental regulation did not significantly promote corporate R&D investment. This suggests that the existing environmental regulation policy might not have effectively incentivized enterprises to innovate in response to environmental pressures. On the contrary, it is possible that the resource crowding-out effect suppressed firms' motivation to engage in R&D.

Therefore, this paper recommends that the government should avoid overly aggressive environmental regulations to prevent severe impacts on business operations. Instead, regulatory policies should be implemented gradually, avoiding disruptions to

normal business operations and R&D decision-making due to excessive policy intensity. Additionally, the government can improve environmental innovation subsidy mechanisms, such as providing subsidies for green technologies and supporting green credit, to alleviate the cost pressures enterprises face in complying with environmental requirements.

The rest of this paper is structured as follows. Section II reviews the relevant literature. Section III provides empirical evidence. Section IV concludes.

2 Literature Review

The existing literature explores the multidimensional interactions among environmental policies, ESG performance, and corporate behavior, yet significant differences persist in research perspectives and conclusions. Regarding the policy-driven effects, multiple studies have confirmed the promoting effect of the Environmental Protection Tax Law (EPTL) on corporate ESG performance, although there is disagreement about its pathways: some scholars emphasize the mediating role of green technological innovation, while others find that the financial mechanism of reduced audit costs is more critical (Li & Hua, 2024; Li et al., 2024)[2,3]. This suggests that policy instruments may influence ESG through different transmission channels. Further analysis reveals that this policy effect exhibits notable heterogeneous characteristics. Non-state-owned enterprises (Li & Hua, 2024)[3], clean industries (Bao & Yu, 2022)[4], and companies in eastern regions (He et al., 2020)[5] demonstrate greater sensitivity and responsiveness to such policies. Furthermore, the sustainability of the policy's effectiveness remains in question. Chu (2025)[6] points out that local government behaviors can dynamically adjust the intensity of environmental tax reform implementation, but empirical tests on the long-term marginal effects of the policy are still lacking.

However, the impact of environmental regulation on financial performance remains divisive. Some scholars argue that the Porter Hypothesis does not hold within China's manufacturing sector. He et al. (2020)[5] suggest a key mechanism for this failure is China's imperfect intellectual property rights environment, which fails to adequately protect returns on innovation investments, thereby significantly dampening corporate enthusiasm for innovation. Conversely, others hold the opposite view. For instance, Bao and Yu (2022)[4], employing a dynamic game-theoretic approach, found that environmental regulation significantly enhances corporate financial performance.

Regarding the economic consequences of ESG performance, scholars have revealed that ESG promotes corporate innovation and financial performance through mechanisms such as alleviating financing constraints, reducing agency costs, and enhancing reputation (Tang, 2022; Noor et al., 2023)[7,8]. However, the impact across ESG dimensions is not balanced. Aydogmus et al. (2022)[9] found that social (S) and governance (G) scores contribute significantly to corporate value, while the environmental (E) score's effect was not significant. This disparity may be related to industry characteristics, yet existing research generally lacks mechanism analysis within specific industries (Aydogmus et al., 2022; Gillan et al., 2021)[9,10]. Furthermore, the bidirectional causal relationship between ESG and financial performance remains unclear (Aydogmus et

al., 2022)[9], and most studies overlook how major external shocks (e.g., pandemics, geopolitical conflicts) moderate the utility of ESG (Tang, 2022)[7], which limits the timeliness of the conclusions.

Existing research predominantly analyzes the static effects of policies, often overlooking corporate adaptive learning behaviors. Most studies also examine single policies in isolation (e.g., environmental taxes), neglecting the combined effects of policy mixes such as "environmental tax + carbon trading + subsidies". Furthermore, current theories are primarily based on experiences in developed countries, with insufficient attention paid to the unique institutional contexts of emerging economies like China (e.g., government dominance, imperfect markets). Developing theoretical frameworks suited to developing countries' contexts is a crucial future direction. Regarding the economic impact of environmental regulations, both the "compliance cost hypothesis" and the "Porter hypothesis" have found some support in research. The actual effects depend on factors such as the time horizon, industry characteristics, and the institutional environment. Short-term cost increases and long-term innovation compensation effects can potentially coexist. Additionally, while ESG performance is generally positively correlated with financial performance, this relationship tends to be weaker in heavily polluting industries and sectors with overcapacity. The economic returns on ESG investments rely on the support of market mechanisms and an enabling policy environment. There may be synergistic effects between environmental regulations and the ESG framework. Policy combinations are often more effective than single policies in promoting corporate green transformation. Future research should focus more on the systematic design and dynamic optimization of policy instruments.

3 Empirical Analysis

3.1 Data

The data used in this study are sourced from the financial statements of Chinese listed companies, covering the period from 2009 to 2023. Heavily polluting industries—specifically manufacturing; production and supply of electricity, heat, gas, and water; and mining—are designated as the treatment group, while all other industries constitute the control group. Accordingly, a binary variable *treat* is defined, where *treat* = 1 if a company belongs to a heavily polluting industry, and *treat* = 0 otherwise. The China's environmental protection law was enacted in 2018. Thus, a binary variable *after* is assigned, with *after* = 1 for observations in years after 2018, and *after* = 0 for observations in 2018 and earlier. Descriptive statistics of the data used in the regression analysis are presented in Table 1.

Table 1. Descriptive Statistics

VarName	Obs	Mean	SD	Min	Median	Max
treat	49284	0.567	0.496	0.000	1.000	1.000
after	49284	0.636	0.481	0.000	1.000	1.000
Avg.ESG Score	40255	4.090	0.886	1.500	4.000	6.000

R_Dlog	43469	17.808	1.469	13.732	17.745	21.851
Return on Equity	40628	3.374	20.716	-138.758	6.524	34.082
Operating Revenue-log	40097	12.231	1.494	8.826	12.090	16.481
Tobin's Q	40213	2.051	1.387	0.833	1.605	9.207
Price-to-Earnings Ratio	34403	78.487	134.657	4.551	37.993	960.100
Divergence of Control Rights	38836	4.493	7.063	0.000	0.005	28.292
Asset-Liability Ratio	40889	42.825	21.892	5.402	41.204	95.958

3.2 Empirical Results

$$y_{i,t} = \alpha + \beta treat_i \times after_t + X_{i,t} + \tau_t + \tau_p + \tau_j + \epsilon_{i,t}$$

$y_{i,t}$ represents the dependent variables of interest in this study, which are influenced by environmental regulation. These include firm operating revenue, ESG score, and R&D investment. $X_{i,t}$ denotes the relevant control variables. Time (year), province, and industry fixed effects are controlled for by, τ_t , τ_p , τ_j , respectively. The coefficient of primary interest is β , which captures the impact of environmental regulation. The specific regression results are presented in Table 2.

Table 2. Regression Results

	Revenue	ESG	Research Input
β	-0.119***	-0.057***	0.023
standard error	(0.032)	(0.020)	(0.039)
Controls	YES	YES	YES
Year Fixed Effect	YES	YES	YES
Province Fixed Effect	YES	YES	YES
Industry Fixed Effect	YES	YES	YES
R ²	0.2692	0.1186	0.2097
Observations	32,213	32,158	28,625

Notes: The standard errors are in parentheses. ***, **, and * stand for the significance level of 1%, 5% and 10%, respectively.

Based on the regression results, it can be observed that environmental regulation has, in fact, reduced the ESG performance of heavily polluting firms. Following policy implementation, the ESG scores of firms in the treatment group decreased significantly by approximately 0.057 units. This may be attributed to companies cutting back on voluntary ESG disclosure and investment due to cost pressures. Furthermore, the policy also led to a reduction in firms' operating revenue: compared to the control group, firms in the treatment group (polluting industries) experienced an average decrease of about 11.9% in operating revenue after the policy took effect. However, no significant impact

was observed on R&D investment. This finding supports the "compliance cost hypothesis" discussed in the literature. The implementation of the environmental protection tax law has directly increased the tax burden and compliance costs for polluting firms (e.g., costs for purchasing environmental protection equipment, paying emission fees, etc.). These additional costs may have eroded corporate profits, constrained resources available for R&D investment, and potentially been passed on to product prices, thereby weakening market competitiveness. Consequently, these factors collectively hinder the improvement of corporate ESG ratings.

4 Conclusion

Based on financial data from Chinese listed companies spanning 2009 to 2023, this study examines the impact of environmental regulation on corporate ESG and financial performance. The findings indicate that environmental regulation has reduced both ESG performance and operating revenue among heavily polluting firms, without stimulating an increase in R&D investment. These empirical results align with the compliance cost hypothesis, suggesting that environmental regulations may crowd out resources for R&D, thereby hindering improvements in corporate environmental efficiency. Based on these findings, the following policy recommendations are proposed:

First, environmental policies should be formulated in a gradual and sequential manner to avoid excessive disruption to normal business operations. Stringent environmental regulations can significantly increase operational costs for firms and even disrupt their routine decision-making processes in R&D and production, which may ultimately hinder sustained improvements in environmental efficiency. Environmental protection measures should therefore balance ecological goals with the need for operational stability. Regulatory requirements should not exceed firms' capacity to adapt, and enhancements in environmental efficiency should be achieved through a phased and manageable transition.

Second, providing subsidies for corporate green R&D can help mitigate the constraining effect of high compliance costs on improvements in environmental efficiency. Environmental regulations have been found to reduce the resources available for firms' research and development, which in turn limits their capacity to enhance environmental performance. Therefore, complementing environmental regulations with targeted subsidies for corporate investments can incentivize R&D expenditures, improve environmental efficiency, and reduce the decline in ESG scores associated with the crowding-out of innovation funding.

References

1. Wang, D. (2024). Environmental Protection Tax Law, Investment Level, and Environmental Performance of Heavy Polluting Enterprises. *Operations Research and Fuzziology*, 14(01), 514–526.
2. Li, Y., & Hua, Z. (2024). Environmental Protection Tax Law and Corporate ESG Performance. *Finance Research Letters*, 105423–105423.

3. Li, F., Na, P., Wang, X., & Li, X. (2024). Environmental protection taxes, audit fees and corporate ESG performance. *Finance Research Letters*, 69, 106058. <https://doi.org/10.1016/j.frl.2024.106058>
4. Bao, X., & Yu, B. (2022). The impact of environmental regulation on corporate financial performance: an empirical study from China. *Environment Development and Sustainability*, 25(12), 15003–15023.
5. He, W., Tan, L., Liu, Z., & Zhang, H. (2020). Property rights protection, environmental regulation and corporate financial performance: Revisiting the Porter Hypothesis. *Journal of Cleaner Production*, 264, 121615–121615.
6. Chu, T. (2025). Environmental tax reform roles and strategies of local governments: A quasi-natural experiment from China.
7. Tang, H. (2022). The Effect of ESG Performance on Corporate Innovation in China: The Mediating Role of Financial Constraints and Agency Cost. *Sustainability*, 14(7), 3769.
8. Noor, Razman, A., Noor, M., & Sajeed Alshdaifat. (2023). ESG AND CORPORATE GOVERNANCE: A SYSTEMATIC REVIEW. *Advanced International Journal of Business, Entrepreneurship and SMEs*, 5(18), 185–204.
9. Aydogmus, M., Gulay, G., & Ergun, K. (2022). Impact of ESG Performance on Firm Value and Profitability. *Borsa Istanbul Review*, 22(2), S119–S127.
10. Gillan, S. L., Koch, A., & Starks, L. T. (2021). Firms and Social responsibility: a Review of ESG and CSR Research in Corporate Finance. *Journal of Corporate Finance*, 66(101889), 101889.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

