

HOW CHINA'S ENVIRONMENTAL PROTECTION TAX SHAPES ESG GREENWASHING IN HIGH-POLLUTION FIRMS

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With global momentum behind sustainability and green finance, regulators and investors are paying closer attention to the credibility of Environmental, Social, and Governance (ESG) disclosures. At the same time, “ESG greenwashing”—where firms rely on symbolic or cosmetic reporting—has become more widespread, weakening capital-market allocation efficiency and blurring the intended impact of policy signals. This study treats the rollout of China’s 2018 Environmental Protection Tax Law as an external policy shock and, using data from Chinese A-share listed firms, applies a Difference-in-Differences (DID) design to examine whether the tax reduces ESG greenwashing. The results show that the environmental protection tax significantly suppresses greenwashing, and this conclusion remains stable across multiple robustness tests. Mechanism tests further suggest that the tax restrains greenwashing by increasing analyst scrutiny, alleviating financing constraints, and motivating firms to cut back on purely symbolic disclosure. Heterogeneity analyses indicate that the governance effect is particularly pronounced in the eastern region, in areas with heavier tax burdens, and among firms with higher ESG scores. By interpreting the tax’s economic consequences through signal transmission and compliance channels, the paper extends research on external governance tools for ESG greenwashing. It also introduces an NLP-based text similarity index to quantify greenwashing intensity, offering a new measurement approach for ESG studies.

Index Terms — environmental protection tax, esg greenwashing, symbolic disclosure, text similarity, heavy-polluting enterprises

INTRODUCTION

With the expansion of global environmental initiatives, ESG ratings have increasingly become a central metric for assessing corporate sustainability performance. Nevertheless, widespread ESG greenwashing has emerged in recent years alongside the growth of ESG information disclosure. Through practices such as ambiguous reporting, selective disclosure, and exaggerated narratives, firms may distort investors' perceptions of their genuine sustainability performance. Such behavior not only results in inefficient allocation of capital but also undermines the credibility of green finance within capital markets. Hassan (2024) [1] emphasizes that the absence of standardized regulatory frameworks and compulsory third-party verification weakens ESG rating systems' ability to distinguish authentic corporate performance, thereby intensifying market-wide skepticism and eroding investor confidence in ESG investment instruments. Consequently, ESG greenwashing has not only misled investors regarding firms' actual environmental outcomes but has also diminished the legitimacy of ESG ratings themselves, potentially triggering a systemic trust crisis in green finance.

Empirical evidence further indicates that ESG disclosures among Chinese listed companies exhibit a high degree of textual homogeneity. In many cases, firms repeatedly rely on near-identical disclosure templates across multiple reporting periods when presenting social responsibility content [2]. As ESG greenwashing becomes increasingly prevalent, traditional governance mechanisms—largely dependent on voluntary corporate disclosure and reputational oversight—have proven insufficient to deter symbolic compliance. As a result, scholarly attention has shifted toward examining the effectiveness of external institutional constraints in regulating corporate environmental behavior.

Among such policy instruments, environmental protection taxes occupy a pivotal role. By internalizing pollution costs through the polluter-pays principle, environmental taxes directly raise firms' environmental governance expenditures and may therefore influence incentives for ESG disclosure [3]. In China, the formal implementation of the Environmental Protection Tax Law in 2018 marked a significant transition from a fee-based system to a statutory tax regime. The law imposes explicit taxes on pollutant emissions, aiming to encourage firms to engage in substantive environmental governance via economic incentives while simultaneously enhancing market scrutiny of environmental behavior through strong policy signals. This institutional shift provides an ideal quasi-natural experiment for examining whether environmental protection taxes can mitigate symbolic ESG disclosure practices and suppress greenwashing.

Existing literature presents two contrasting perspectives on the relationship between environmental protection taxes and ESG greenwashing. One stream of research suggests that the introduction of environmental taxes may initially intensify greenwashing. When tax-induced compliance costs rise and complementary resources or incentive mechanisms remain underdeveloped, firms may resort to superficial disclosure strategies—such as repetitive or formalistic reporting—to create an illusion of compliance [4]. Berrone et al. (2017) [5] similarly argue that under combined regulatory and social pressures, firms with weak environmental performance may seek legitimacy through greenwashing, potentially generating adverse outcomes. Empirical findings indicate that, following the implementation of environmental protection taxes, some firms increased their greenwashing levels by 13.16%, particularly large enterprises and those operating in regions with stringent regulation, suggesting a preference for symbolic responses to cost pressures [6]. Moreover, environmental taxes may incentivize firms to pursue green mergers and acquisitions to improve ESG ratings; however, such activities often involve cross-regional acquisitions in areas with weaker governance, effectively reflecting pollution transfer and formal compliance rather than substantive environmental improvement [7].

Conversely, another body of research contends that environmental protection taxes strengthen environmental governance by increasing both cost pressure and institutional oversight, thereby enhancing the credibility of ESG disclosures and reducing greenwashing. Early studies demonstrate that government environmental regulation, particularly when coupled with robust enforcement and disclosure requirements, effectively

discourages symbolic compliance through punitive mechanisms [8]. Additionally, firms facing environmental tax burdens or receiving environmental subsidies exhibit stronger incentives to improve environmental performance and reduce greenwashing tendencies, especially among state-owned enterprises [9]. More recent evidence confirms that environmental protection taxes promote genuine ESG improvement by stimulating green innovation, reinforcing governance structures, and curbing strategic compliance behaviors through heightened external monitoring, such as increased analyst attention [10]. Furthermore, environmental taxes encourage firms to undertake substantial environmental investments, thereby lowering incentives for deceptive disclosure practices [11].

Given these divergent findings, the effectiveness of environmental protection taxes in addressing ESG greenwashing remains theoretically contested and empirically unresolved. This study responds to this gap by leveraging China's 2018 Environmental Protection Tax Law as a quasi-natural experiment to identify its impact on corporate greenwashing behavior. Using a difference-in-differences (DID) framework and data from heavily polluting Chinese firms, we assess ESG greenwashing by applying TF-IDF-based text similarity analysis to corporate social responsibility reports, constructing a Greenwash score following prior studies [2], [12]. The results indicate that environmental protection taxes significantly reduce ESG greenwashing. These findings remain robust across multiple tests, including parallel trend verification, placebo analysis, and propensity score matching.

Mechanism analysis further reveals that environmental protection taxes suppress greenwashing by increasing analyst attention, easing financing constraints, and discouraging symbolic disclosure practices. Heterogeneity analysis shows that the suppressive effect of environmental protection taxes is particularly pronounced in eastern China, in regions with higher tax burdens, and among firms exhibiting stronger ESG performance. These findings suggest that both regional institutional quality and firm-level characteristics condition the effectiveness of environmental taxation in curbing greenwashing.

This study contributes to the literature in several important ways. Theoretically, it directly addresses ongoing academic debates regarding the governance role of environmental protection taxes in ESG disclosure, thereby extending research on the economic consequences of environmental taxation and ESG compliance. While prior studies have examined the impact of environmental protection taxes on ESG outcomes or disclosure behavior [6], [10], consensus has yet to be reached on their effectiveness in mitigating greenwashing. Some scholars argue that increased governance costs and stronger regulatory signals discourage symbolic compliance [9], [11], whereas others suggest that policy pressure may exacerbate formalistic disclosure in contexts lacking adequate resource support [4], [5]. By integrating legitimacy theory with signaling theory, this study systematically identifies multiple channels through which environmental protection taxes can curb greenwashing, offering a micro-level reconciliation of these competing perspectives and bridging the literature on environmental taxation and ESG governance.

Methodologically, this paper advances greenwashing measurement by employing text similarity analysis of corporate social responsibility reports to quantify symbolic ESG disclosure. By constructing a natural language processing-based framework to identify template-driven and generic disclosures, this approach mitigates the subjectivity and data limitations inherent in traditional ESG greenwashing metrics [2], [12]. Previous research has largely relied on third-party ESG ratings or discrepancies between ESG scores and financial performance to infer greenwashing [13], [14], approaches often constrained by rating biases and data availability. In contrast, analyzing intertemporal textual similarity captures firms' tendencies toward repetitive and non-substantive disclosure more directly, thereby improving measurement objectivity and analytical precision. This text-mining approach also offers a scalable methodological paradigm for future ESG research.

BACKGROUND AND HYPOTHESIS DEVELOPMENT

Background

Amid escalating environmental degradation, China formally enacted the Environmental Protection Tax Law on January 1, 2018, marking a decisive shift from the former pollution discharge fee system to a legally binding tax-based environmental governance framework. Rooted in the polluter-pays principle, the tax targets air and water pollutants, solid waste, and noise emissions, aiming to promote corporate environmental responsibility and advance ecological civilization through market-based incentives. Compared with the previous fee system, the environmental protection tax features stronger legal authority, clearer tax collection procedures, and reduced discretionary intervention by local governments, thereby enhancing the institutionalization and standardization of environmental governance [3]. In addition to raising the direct operating costs of polluting firms, the tax transmits a strong policy signal that elevates environmental compliance as a strategic priority within the market.

From a theoretical standpoint, legitimacy theory suggests that firms seek social acceptance and operational legitimacy by aligning their behavior with prevailing institutional norms, often through environmental information disclosure. As a national regulatory instrument, the environmental protection tax intensifies legitimacy pressure, motivating firms to improve ESG performance to maintain institutional approval [15]. Meanwhile, signaling theory posits that companies convey their compliance commitment and long-term sustainability capacity to investors and regulators through disclosures related to environmental performance, green investment, and ESG ratings. The introduction of the environmental protection tax heightens the importance of such signals, as misleading disclosure may expose firms to reputational damage and regulatory penalties [16].

Environmental protection tax internalizes pollution costs into firms' production decisions, thereby encouraging transitions toward sustainable practices [17]. Early studies indicate that environmental taxation effectively reduces pollutant emissions and generates joint environmental and economic benefits [18, 19, 20]. China's 2018 reform strengthened legal enforcement and significantly increased pollution-related costs for enterprises [21]. Empirical evidence shows that this policy has stimulated corporate environmental investment through combined punitive and incentive mechanisms [21, 22]. Moreover, environmental protection taxes have improved ESG performance and green innovation, particularly among state-owned and large enterprises, underscoring their role in discouraging inefficient resource use while fostering proactive environmental engagement [3, 23].

Environmental Protection Tax and ESG Greenwashing

As global environmental concerns intensify, firms increasingly rely on ESG disclosure to enhance corporate reputation and competitiveness [24, 25]. While transparent and credible ESG reporting improves environmental and social outcomes [24], ESG greenwashing has become increasingly prevalent. Firms with weak actual ESG performance may engage in selective or misleading disclosure to conceal deficiencies [26, 27]. Such behavior distorts market information, exacerbates information asymmetry, and undermines long-term sustainability [28, 29]. Some firms prioritize symbolic environmental actions over substantive improvements to secure higher ESG ratings, thereby eroding both corporate credibility and ESG rating reliability [28, 29, 30, 31].

Environmental protection tax raises environmental compliance costs and strengthens regulatory pressure. Higher costs incentivize firms to invest in genuine environmental improvements rather than rely on greenwashing [8, 32]. Legitimacy pressure further motivates firms to enhance disclosure authenticity and reduce

symbolic reporting [33]. Consequently, firms tend to improve the accuracy and differentiation of ESG disclosures to mitigate regulatory and reputational risks. Accordingly, we propose:

Hypothesis 1. *Environmental protection tax can effectively curb ESG greenwashing.*

Environmental Protection Tax, Analyst Attention, and ESG Greenwashing

Analysts serve as key information intermediaries and play an important monitoring role in capital markets [38, 39]. Environmental protection tax may initially induce some firms to exaggerate positive disclosures to alleviate perceived risk [40]. In response, analysts intensify scrutiny of environmental performance and green investments, constraining managerial opportunism through forecasts and investment recommendations [41, 42, 43]. By incorporating environmental performance into valuation frameworks, analysts reduce information bias and promote disclosure transparency [29].

Environmental protection tax also transmits a strong policy signal, increasing external oversight of corporate environmental behavior [44, 45]. Under heightened institutional pressure, firms enhance ESG disclosure quality to preserve legitimacy [46]. Analysts amplify this governance effect by monitoring policy impacts and communicating regulatory information to the market [47]. To maintain reputation and investor trust, firms disclose information more truthfully [2, 48]. Thus, we hypothesize:

Hypothesis 2. *Environmental protection tax can effectively curb ESG greenwashing by enhancing analyst attention.*

Environmental Protection Tax, Financing Constraints, and ESG Greenwashing

Financing constraints pose challenges for firms undertaking long-term environmental investments under information asymmetry. One motivation for greenwashing lies in firms' attempts to avoid costly compliance through symbolic disclosure. While environmental protection tax may initially increase financing pressure [48], it can also improve financing conditions by encouraging better environmental performance and disclosure quality [49]. Green finance and tax incentives alleviate financing constraints, improve ESG performance, and reduce greenwashing tendencies [50]. Creditors further discipline selective disclosure by increasing financing costs [51]. Hence, we propose:

Hypothesis 3. *Environmental protection tax can effectively curb ESG greenwashing by alleviating financing constraints.*

Environmental Protection Tax, Symbolic Disclosure, and ESG Greenwashing

Environmental protection tax increases compliance costs and regulatory pressure, leading firms to reduce excessive symbolic disclosure. Although disclosure volume may decline, this reflects diminished greenwashing and improved authenticity. Firms adopt concise and substantive disclosure strategies under resource constraints [48]. Moreover, reducing information overload limits opportunities for greenwashing [52, 53]. Therefore, we propose:

Hypothesis 4. *Environmental protection tax can effectively curb ESG greenwashing by encouraging firms to reduce symbolic disclosure.*

RESEARCH DESIGN

Sample and Data Selection

Following the implementation of China's Environmental Protection Tax Law in 2018, this study selects A-share listed firms on the Shanghai and Shenzhen Stock Exchanges as the research sample over the period from 2013 to 2022. This ten-year window enables a comprehensive comparison of corporate behavior before and after the policy intervention. The sample is screened using the following criteria. First, financial institutions are excluded due to their distinct regulatory and accounting characteristics. Second, firms labeled as ST or PT are removed to avoid bias arising from abnormal operating conditions. Third, observations with missing or anomalous values are eliminated. After these procedures, the final sample comprises 6,810 firm-year observations.

To mitigate the influence of extreme values, all continuous variables are standardized and winsorized at the 1st and 99th percentiles. Data on ESG greenwashing are obtained from the WinGo Database, while all other firm-level variables are sourced from the China Stock Market & Accounting Research (CSMAR) Database.

Model Specification and Variable Definition

To examine the impact of the environmental protection tax on ESG greenwashing among heavily polluting enterprises, this study adopts a difference-in-differences (DID) approach. Firms classified as heavily polluting constitute the treatment group, whereas all remaining firms serve as the control group. The baseline regression model is specified as follows:

$$Greenwash_{it} = \alpha_0 + \alpha_1 Tax_{it} + \lambda X_{it} + \mu_i + \omega_t + \varepsilon_{it}, \quad (1)$$

where i denotes the firm and t denotes the year.

The dependent variable $Greenwash_{it}$ measures the degree of ESG greenwashing exhibited by firm i in year t . ESG greenwashing reflects the inconsistency between ESG disclosure and substantive ESG investment, often manifested as a divergence between stated commitments and actual actions. Firms with limited ESG investment tend to rely on symbolic disclosure, such as qualitative narratives or repetitive statements, whereas firms with stronger ESG engagement provide more quantitative and factual information.

Based on this distinction, higher textual similarity in ESG disclosures indicates stronger symbolic disclosure tendencies and more severe greenwashing. Accordingly, this study conducts textual analysis of firms' social responsibility reports using the TF-IDF method to calculate intertemporal text similarity. The resulting similarity score is defined as the Greenwash index, with higher values indicating greater ESG greenwashing.

The key explanatory variable Tax_{it} is defined as the interaction term between an industry-based treatment dummy and a post-policy time dummy ($Treat \times Post$). Firms operating in 15 pollution-intensive industries, including thermal power, steel, coal, metallurgy, chemicals, petrochemicals, papermaking, textiles, leather, and mining, are classified as heavily polluting enterprises, for which $Treat$ equals 1; otherwise, $Treat$ equals 0. The time dummy $Post$ equals 1 for the years 2018 and thereafter, and 0 otherwise. Thus, Tax_{it} equals 1 if a heavily polluting firm is subject to the environmental protection tax in year t , and 0 otherwise.

The vector X_{it} represents a set of firm-level control variables, including firm size (Size), firm age (Age), leverage (Lev), return on equity (ROE), revenue growth rate (Growth), board size (Board), CEO-chairman duality (Dual), largest shareholder ownership (Top1), Tobin's Q (Tobin Q), and management shareholding

ratio (Mshare). To further control for unobserved heterogeneity, the model includes firm fixed effects (μ_i) and year fixed effects (ω_t).

Table 1: Definitions of Control Variables

Variable Name	Symbol	Measurement
Company size	Size	Natural logarithm of total assets
Company age	Age	Natural logarithm of years since listing
Debt-to-equity ratio	Lev	Total liabilities divided by total assets
Return on equity	ROE	Net profit divided by total equity
Revenue growth rate	Growth	Year-on-year revenue growth rate
Board size	Board	Natural logarithm of number of board members
CEO-chairman duality	Dual	1 if CEO and chairman are the same person, 0 otherwise
Largest shareholder ownership	Top1	Shareholding ratio of the largest shareholder
Tobin's Q	Tobin Q	Ratio of market value to replacement cost
Management shareholding ratio	Mshare	Shares held by executives divided by total shares

EMPIRICAL ANALYSIS

Descriptive Statistics

Table 2 reports the descriptive statistics of the main variables. The minimum value of *Greenwash* is 0.016 and the maximum value is 0.679, indicating substantial variation in ESG greenwashing behavior among Chinese A-share listed companies. The mean value of *Tax* is 0.148, suggesting that approximately 15% of the observations are affected by the environmental protection tax policy. The distributions of the remaining control variables are consistent with prior literature, indicating reliable data quality.

Table 2: Descriptive statistics

Variable	Obs	Mean	SD	Min	Median	Max
Greenwash	6810	0.231	0.052	0.016	0.229	0.679
Tax	6810	0.148	0.355	0.000	0.000	1.000
Size	6810	23.215	1.395	19.639	23.102	26.430
Age	6810	2.990	0.312	0.000	3.045	3.611
Lev	6810	0.468	0.195	0.046	0.475	0.925
Growth	6810	0.144	0.328	-0.653	0.097	3.808
ROE	6810	0.080	0.116	-0.962	0.082	0.414
Board	6810	2.166	0.204	1.609	2.197	2.708
Dual	6810	0.204	0.403	0.000	0.000	1.000
Top1	6810	0.366	0.157	0.081	0.354	0.757
TobinQ	6810	1.861	1.285	0.802	1.430	16.647
Mshare	6810	6.890	14.373	0.000	0.027	69.750

Baseline Regression Results

Table 3 presents the baseline DID regression results. Column (1) reports the regression without control variables, while column (2) includes the full set of controls. The coefficient of *Tax* is significantly negative

at the 1% level in all specifications, indicating that the implementation of the environmental protection tax significantly reduces ESG greenwashing among heavily polluting enterprises. These findings provide strong empirical support for Hypothesis 1.

Table 3: Baseline regression results

Variables	(1) Greenwash	(2) Greenwash
Tax	-0.008*** (0.002)	-0.008*** (0.002)
Size		0.010***
Age		0.029**
Lev		-0.006
ROE		-0.011**
Growth		0.001
Board		-0.006
Dual		0.003
Top1		0.008
TobinQ		0.002***
Mshare		0.001***
Constant	0.232***	-0.078
Company FE	Yes	Yes
Year FE	Yes	Yes
Observations	6,810	6,810
R ²	0.747	0.751

Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Robustness Tests

Parallel Trend Test

A dynamic DID specification is employed to test the parallel trend assumption. Figure 1 shows that the coefficients before policy implementation are statistically insignificant, while the post-policy coefficients are significantly negative, confirming that the treatment and control groups satisfy the parallel trend assumption.

Placebo Test

A placebo test is conducted by randomly assigning treatment groups and policy implementation years and repeating the estimation 500 times. As shown in Figure 2, the estimated coefficients are centered around zero and follow a normal distribution, indicating that the baseline results are not driven by unobserved shocks.

Propensity Score Matching

To alleviate sample selection bias, propensity score matching (PSM) is applied using firm characteristics as matching variables. The matched sample regression results are reported in Table 4. The coefficient of *Tax* remains significantly negative, confirming the robustness of the baseline findings.

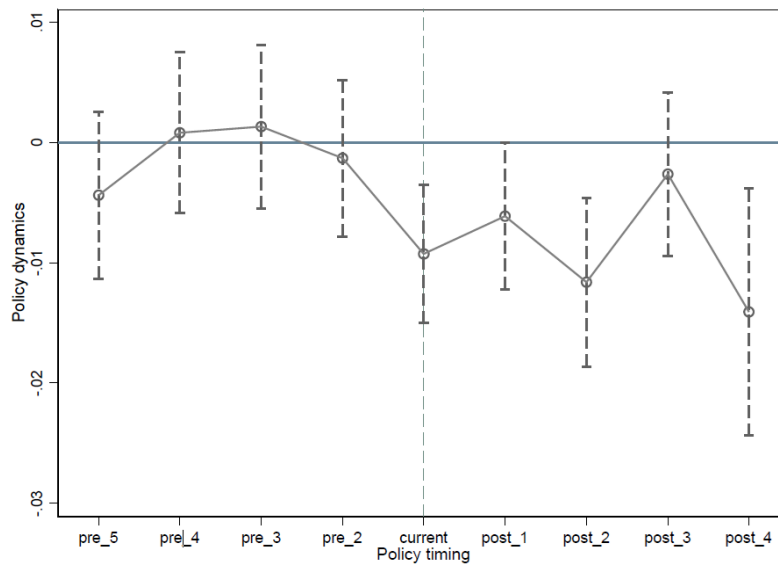


Figure 1: Parallel trend test

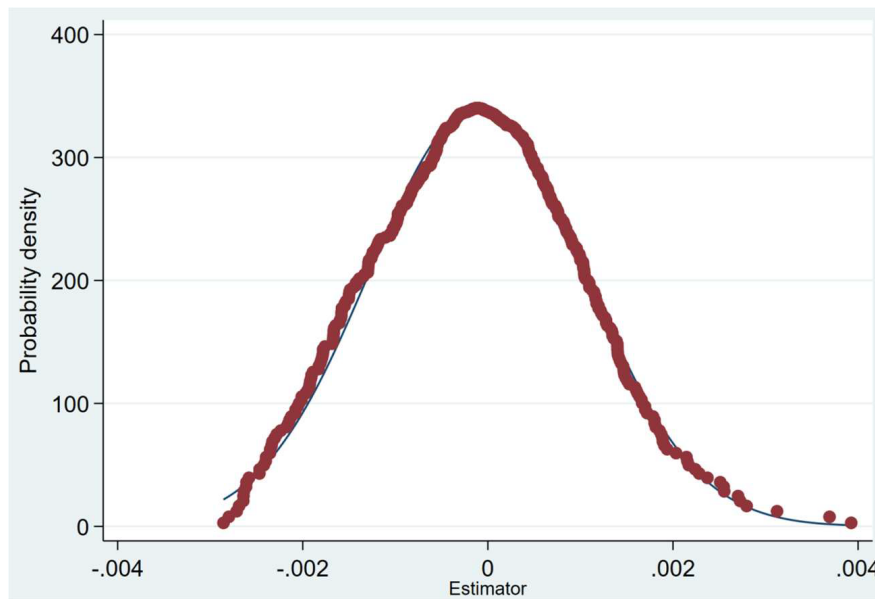


Figure 2: Placebo test

Eliminating Policy Interference

To exclude interference from other concurrent environmental policies, additional policy dummy variables are introduced into the regression model. The results (not reported for brevity) show that the coefficient of *Tax* remains significantly negative, indicating that the main conclusion is robust to alternative policy controls.

Table 4: PSM-DID and lagged explanatory variable tests

Variables	(1) Greenwash	(2) Greenwash	(3) Greenwash	(4) Greenwash
Tax	-0.008*** (0.002)	-0.010*** (0.003)	-0.008*** (0.002)	-0.006** (0.002)
Controls	Yes	Yes	Yes	Yes
Company FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	6,810	3,602	5,148	4,243
R^2	0.751	0.798	0.759	0.767

Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

DISCUSSION

The empirical findings of this study provide clear evidence that the implementation of China's Environmental Protection Tax has a significant inhibitory effect on ESG greenwashing behavior among heavily polluting enterprises. This result contributes to the ongoing debate on whether stricter environmental regulation encourages substantive corporate transformation or merely induces symbolic compliance. Contrary to concerns that firms may respond to regulatory pressure through superficial disclosure, the results indicate that a well-designed and enforceable environmental tax system can effectively restrain opportunistic ESG reporting behavior.

From a regulatory perspective, the findings suggest that environmental protection tax functions not only as a pollution-control instrument but also as an information-governance mechanism. By increasing compliance costs and strengthening external supervision, the policy raises the reputational and legal risks associated with misleading ESG disclosure. As a result, firms face stronger incentives to reduce template-based and repetitive disclosure practices, thereby improving the credibility of ESG information provided to the market.

The mechanism analysis further deepens the understanding of how environmental protection tax influences corporate disclosure behavior. First, increased analyst attention plays a crucial monitoring role. Environmental tax reform heightens market sensitivity toward high-pollution firms, encouraging analysts to intensify scrutiny of corporate environmental and social disclosures. Enhanced analyst coverage reduces information asymmetry and limits managerial discretion in manipulating ESG narratives. This finding aligns with information-intermediary theory, highlighting the importance of capital market participants in amplifying the governance effects of environmental regulation.

Second, the alleviation of financing constraints emerges as another important transmission channel. While environmental taxes may initially increase operational costs, firms that respond by improving disclosure credibility and environmental performance may gain better access to green finance and external capital. Reduced financing pressure lowers firms' incentives to rely on symbolic ESG disclosure as a reputational substitute, promoting more substantive sustainability strategies instead.

Third, the reduction in symbolic disclosure provides direct evidence that the policy reshapes firms' disclosure strategies. The results indicate that under stronger regulatory constraints, firms tend to streamline ESG reports by reducing redundant, low-information content. This finding suggests that a decline in disclosure quantity does not necessarily imply weaker transparency; instead, it may reflect a shift toward higher-quality and more meaningful ESG communication.

The heterogeneity analysis also offers important insights. The stronger effects observed in eastern regions and high-tax-burden areas suggest that institutional environment and enforcement intensity matter for policy effectiveness. Regions with more developed markets and stronger regulatory capacity are better positioned to translate environmental tax pressure into improved disclosure quality. Similarly, firms with higher ESG performance exhibit more pronounced reductions in greenwashing, implying that environmental tax reinforces existing incentives for genuinely sustainability-oriented firms rather than imposing uniform effects across all enterprises.

Overall, these findings underscore the complementary relationship between environmental fiscal policy and ESG governance. Environmental protection tax does not operate in isolation; instead, its effectiveness depends on interaction with capital market monitoring, financing mechanisms, and regional institutional quality. The results highlight the importance of integrating environmental taxation with broader ESG disclosure standards and market-based supervision to curb greenwashing and promote credible corporate sustainability practices.

CONCLUSION

Using the implementation of China's Environmental Protection Tax Law as a quasi-natural experiment, this study provides robust evidence that environmental protection tax significantly curbs ESG greenwashing behavior among heavily polluting enterprises. Based on a difference-in-differences framework and text-based measures of symbolic disclosure, the results show that the policy effectively improves the credibility of ESG information, and these findings remain stable across multiple robustness tests. Further analysis indicates that the policy operates through increased analyst attention, alleviated financing constraints, and reduced symbolic disclosure, highlighting the role of information and financial channels in shaping corporate disclosure behavior. The effect is more pronounced in regions with stronger institutional environments, higher tax burdens, and among firms with better ESG performance. Overall, the findings demonstrate that environmental fiscal policy can serve not only as a tool for pollution control but also as an effective governance mechanism for improving ESG disclosure quality and restraining opportunistic greenwashing.

REFERENCES

- [1] Hassan S M. Greenwashing in ESG: Identifying and Addressing False Claims of Sustainability. *Journal of Business and Strategic Management*, 2024, 9(8): 90-105, <https://ideas.repec.org/a/bhx/ojbsm/v9y2024i8p90-105id2390>.
- [2] Hu P, Li X, Li N, et al. Peeking into corporate greenwashing through the readability of ESG disclosures. *Sustainability*, 2024, 16(6): 2571, <https://doi.org/10.3390/su16062571>.
- [3] He Y, Zhao X, Zheng H. How does the environmental protection tax law affect firm ESG? Evidence from the Chinese stock markets. *Energy Economics*, 2023, 127: 107067, <https://doi.org/10.1016/j.eneco.2023.107067>.
- [4] Hu S, Wang A, Du K. Environmental tax reform and greenwashing: evidence from Chinese listed companies. *Energy Economics*, 2023a, 124: 106873, <https://doi.org/10.1016/j.eneco.2023.106873>.
- [5] Berrone P, Fosfuri A, Gelabert L. Does greenwashing pay off? Understanding the relationship between environmental actions and environmental legitimacy. *Journal of Business Ethics*, 2017, 144: 363-379, <https://doi.org/10.1007/s10551-015-2816-9>.

- [6] Jiang C, Li X, Xu Q, et al. Does environmental protection tax impact corporate ESG greenwashing? A quasi-natural experiment in China. *Economic Analysis and Policy*, 2024a, 84: 774-786, <https://doi.org/10.1016/j.eap.2024.09.029>.
- [7] Wang D, Wang Y, Zhou M. Can environmental tax promote green M&A in emerging market firms? Evidence from China's heavy polluters. *Business Ethics, the Environment & Responsibility*, 2024, <https://doi.org/10.1111/beer.12721>.
- [8] Sun Z, Zhang W. Do government regulations prevent greenwashing? An evolutionary game analysis of heterogeneous enterprises. *Journal of Cleaner Production*, 2019, 231: 1489-1502, <https://doi.org/10.1016/j.jclepro.2019.05.335>.
- [9] Zhang K, Pan Z, Janardhanan M, et al. Relationship analysis between greenwashing and environmental performance. *Environment, Development and Sustainability*, 2023, 25(8): 7927-7957, <https://doi.org/10.1007/s10668-022-02381-9>.
- [10] Lin C, Lu S, Su X, et al. RETRACTED ARTICLE: Can the greening of the tax system improve enterprises' ESG performance? Evidence from China. *Economic Change and Restructuring*, 2024, 57(3): 127, <https://doi.org/10.1007/s10644-024-09687-w>.
- [11] Peng D, Kong Q. Corporate green innovation under environmental regulation: The role of ESG ratings and greenwashing. *Energy Economics*, 2024, 140: 107971, <https://doi.org/10.1016/j.eneco.2024.107971>.
- [12] Li H, Zhao, X. Investor attention and corporate ESG disclosure greenwashing. *Journal of Accounting and Communication*, 2023, (23), 51-56, (in Chinese) <https://doi.org/10.16144/j.cnki.issn1002-8072.2023.23.021>.
- [13] Treepongkaruna S, Au Yong H H, Thomsen S, et al. Greenwashing, carbon emission, and ESG. *Business Strategy and the Environment*, 2024, 33(8): 8526-8539, <https://doi.org/10.1002/bse.3929>.
- [14] Kathan M C, Utz S, Dorfleitner G, et al. What you see is not what you get: ESG scores and greenwashing risk. *Finance Research Letters*, 2025, 74: 106710, <https://doi.org/10.1016/j.frl.2024.106710>.
- [15] Guo X, Li M, Liu Q, et al. Impact and Mechanism Analysis of Environmental Protection Fee and Tax Reform on the ESG Performance of Heavy Polluting Enterprises. *Sustainability*, 2024, 16(24): 10800, <https://doi.org/10.3390/su162410800>.
- [16] Duan Y, Rahbarimanesh A. The Impact of Environmental Protection Tax on Green Innovation of Heavily Polluting Enterprises in China: A Mediating Role Based on ESG Performance. *Sustainability*, 2024, 16(17): 7509, <https://doi.org/10.3390/su16177509>.
- [17] Pigou A. *The economics of welfare*. Routledge, 2017, <https://doi.org/10.4324/9781351304368>.
- [18] Zhang Q, Zhang Y, Liao Q, et al. Effect of green taxation on pollution emissions under ESG concept. *Environmental Science and Pollution Research*, 2023, 30(21): 60196-60211, <https://doi.org/10.1007/s11356-023-26699-7>.
- [19] Hu X, Liu J, Yang H, et al. Impacts of potential China's environmental protection tax reforms on provincial air pollution emissions and economy. *Earth's Future*, 2020, 8(4): e2019EF001467, <https://doi.org/10.1029/2019EF001467>.
- [20] Deng Y, Dong K, Taghizadeh-Hesary F, et al. How does environmental regulation affect the double dividend for energy firms? Evidence from China's EPT policy. *Economic Analysis and Policy*, 2023, 79: 807-820, <https://doi.org/10.1016/j.eap.2023.07.001>.

- [21] Liu G, Yang Z, Zhang F, et al. Environmental tax reform and environmental investment: A quasi-natural experiment based on China's Environmental Protection Tax Law. *Energy Economics*, 2022, 109: 106000, <https://doi.org/10.1016/j.eneco.2022.106000>.
- [22] Hu J, Fang Q, Wu H. Environmental tax and highly polluting firms' green transformation: evidence from green mergers and acquisitions. *Energy Economics*, 2023b, 127: 107046, <https://doi.org/10.1016/j.eneco.2023.107046>.
- [23] Wang J, Zhang S. Environmental protection tax, green innovation, and environmental, social, and governance performance. *Finance Research Letters*, 2024, 65: 105592, <https://doi.org/10.1016/j.frl.2024.105592>.
- [24] Alsayegh M F, Abdul Rahman R, Homayoun S. Corporate economic, environmental, and social sustainability performance transformation through ESG disclosure. *Sustainability*, 2020, 12(9): 3910, <https://doi.org/10.3390/su12093910>.
- [25] Krueger P, Sautner Z, Tang D Y, et al. The effects of mandatory ESG disclosure around the world. *Journal of Accounting Research*, 2024, 62(5): 1795-1847, <https://doi.org/10.1111/1475-679X.12548>.
- [26] Spicer B H. Investors, corporate social performance and information disclosure: An empirical study. *Accounting review*, 1978, 94-111, <https://www.jstor.org/stable/245728>.
- [27] Tsang A, Frost T, Cao H. Environmental, social, and governance (ESG) disclosure: A literature review. *The British Accounting Review*, 2023, 55(1): 101149, <https://doi.org/10.1016/j.bar.2022.101149>.
- [28] Zhang D. Green financial system regulation shock and greenwashing behaviors: Evidence from Chinese firms. *Energy Economics*, 2022, 111: 106064, <https://doi.org/10.1016/j.eneco.2022.106064>.
- [29] Yu E P, Van Luu B, Chen C H. Greenwashing in environmental, social and governance disclosures. *Research in international business and finance*, 2020, 52: 101192, <https://doi.org/10.1016/j.ribaf.2020.101192>.
- [30] Chen P, Dagestani A A. Greenwashing behavior and firm value—From the perspective of board characteristics. *Corporate Social Responsibility and Environmental Management*, 2023, 30(5): 2330-2343, <https://doi.org/10.1002/csr.2488>.
- [31] Utz S. Corporate scandals and the reliability of ESG assessments: Evidence from an international sample. *Review of Managerial Science*, 2019, 13: 483-511, <https://doi.org/10.1007/s11846-017-0256-x>.
- [32] Krass D, Nedorezov T, Ovchinnikov A. Environmental taxes and the choice of green technology. *Production and operations management*, 2013, 22(5): 1035-1055, <https://doi.org/10.1111/poms.12023>.
- [33] Zhang C, Zou C F, Luo W, et al. Effect of environmental tax reform on corporate green technology innovation. *Frontiers in Environmental Science*, 2022, 10: 1036810, <https://doi.org/10.3389/fenvs.2022.1036810>.
- [34] Jin Y, Wang S, Cheng X, et al. Can environmental tax reform curb corporate environmental violations? A quasi-natural experiment based on China's "environmental fees to taxes". *Journal of Business Research*, 2024, 171: 114388, <https://doi.org/10.1016/j.jbusres.2023.114388>.
- [35] Zhao A, Wang J, Sun Z, et al. Environmental taxes, technology innovation quality and firm performance in China—A test of effects based on the Porter hypothesis. *Economic Analysis and Policy*, 2022, 74: 309-325, <https://doi.org/10.1016/j.eap.2022.02.009>.

- [36] Hu S, Wang M, Wu M, et al. Voluntary environmental regulations, greenwashing and green innovation: Empirical study of China's ISO14001 certification
- [37] . Environmental Impact Assessment Review, 2023c, 102: 107224, <https://doi.org/10.1016/j.eiar.2023.107224>.
- [38] Womack K L. Do brokerage analysts' recommendations have investment value?. The journal of finance, 1996, 51(1): 137-167, <https://doi.org/10.1111/j.1540-6261.1996.tb05205.x>.
- [39] Brauer M, Wiersema M. Analyzing analyst research: A review of past coverage and recommendations for future research. Journal of Management, 2018, 44(1): 218-248, <https://doi.org/10.1177/0149206317734900>.
- [40] Lokuwaduge C S, De Silva K M. ESG risk disclosure and the risk of green washing. Australasian Accounting, Business and Finance Journal, 2022, 16(1): 146-159, <https://doi.org/10.14453/aabfj.v16i1.10>.
- [41] Luo X, Wang H, Raithel S, et al. Corporate social performance, analyst stock recommendations, and firm future returns. Strategic Management Journal, 2015, 36(1): 123-136, <https://doi.org/10.1002/smj.2219>.
- [42] Stickel S E. Reputation and performance among security analysts. The Journal of Finance, 1992, 47(5): 1811-1836, <https://doi.org/10.1111/j.1540-6261.1992.tb04684.x>.
- [43] Zhi H, Chi Y, Peng R, et al. Does Investor Attention Affect Corporate Greenwashing? Evidence from China. Advances in Management and Applied Economics, 2024, 14(4): 1-6, <https://doi.org/10.47260/amae/1446>.
- [44] Asif M, Searcy C, Castka P. ESG and Industry 5.0: The role of technologies in enhancing ESG disclosure. Technological Forecasting and Social Change, 2023, 195: 122806, <https://doi.org/10.1016/j.techfore.2023.122806>.
- [45] Wai-Khuen W, Boon-Heng T, Siow-Hooi T. The influence of external stakeholders on environmental, social, and governance (ESG) reporting: Toward a conceptual framework for ESG disclosure. Foresight and STI Governance, 2023, 17(2): 9-20, <https://doi.org/10.17323/2500-2597.2023.2.9.20>.
- [46] Del Gesso C, Lodhi R N. Theories underlying environmental, social and governance (ESG) disclosure: a systematic review of accounting studies. Journal of Accounting Literature, 2025, 47(2): 433-461, <https://doi.org/10.1108/JAL-08-2023-0143>.
- [47] Sun Z, Sun X, Wang W, et al. Digital transformation and greenwashing in environmental, social, and governance disclosure: Does investor attention matter?. Business Ethics, the Environment & Responsibility, 2025, 34(1): 81-102, <https://doi.org/10.1111/beer.12585>.
- [48] Jiang L, Chang Z, Yao W, et al. Transcend local for global: ESG as a legitimacy signal in the global expansion of emerging multinational enterprises. Finance Research Letters, 2024b, 69: 106174, <https://doi.org/10.1016/j.frl.2024.106174>.
- [49] Liu A, Dai S, Wang Z. Environmental protection tax on enterprise environmental, social and governance performance: A multi-perspective analysis based on financing constraints. Journal of Asian Economics, 2023, 89: 101671, <https://doi.org/10.1016/j.asieco.2023.101671>.
- [50] Zhang D. Does green finance really inhibit extreme hypocritical ESG risk? A greenwashing perspective exploration. Energy Economics, 2023, 121: 106688, <https://doi.org/10.1016/j.eneco.2023.106688>.

- [51] Attig N, Rahaman M, Trabelsi S. Creditors at the gate: Effects of selective environmental disclosure on the cost of debt. *Corporate Governance: An International Review*, 2025, 33(2): 202-230, <https://doi.org/10.1111/corg.12599>.
- [52] Sneideriene A, Legenzova R. Greenwashing prevention in environmental, social, and governance (ESG) disclosures: A bibliometric analysis. *Research in International Business and Finance*, 2025, 74: 102720, <https://doi.org/10.1016/j.ribaf.2024.102720>.
- [53] Liao F, Sun Y, Xu S. Financial report comment letters and greenwashing in environmental, social and governance disclosures: Evidence from China. *Energy Economics*, 2023, 127: 107122, <https://doi.org/10.1016/j.eneco.2023.107122>.
- [54] Baron R M, Kenny D A. The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of personality and social psychology*, 1986, 51(6): 1173, <https://doi.org/10.1037/0022-3514.51.6.1173>
- [55] Hadlock C J, Pierce J R. New evidence on measuring financial constraints: Moving beyond the KZ index. *The review of financial studies*, 2010, 23(5): 1909-1940, <https://doi.org/10.1093/rfs/hhq009>.

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