

Public Environmental Attention and Corporate Greenwashing in China

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Abstract

Corporate greenwashing is increasingly posing a severe threat to effective implementation and evaluation of the United Nations Sustainable Development Goals. Apart from regulatory pressure, active participation of the public in environmental governance is essential in this regard. Through a theoretical and empirical lens, this study systematically examines the impact of public environmental attention (PEA) on corporate greenwashing and its underlying mechanism in the Chinese context. The data from A-share firms and the Baidu search index for prefecture-level cities from 2011 to 2020 are gathered and analysed using 2SLS and various robustness tests. Results show that PEA can significantly suppress corporate greenwashing. The effect is more significant in high-polluting industries, regions with better rule of law, firms with non-political connections and older executives with environmental backgrounds. Further analysis shows that PEA reduces greenwashing by inhibiting management's short-sighted behaviour and increasing analyst attention. Expanding the government's ecological concerns and strengthening environmental regulations enhance the inhibiting effect of PEA on greenwashing. The findings remain robust after a series of robustness and endogenous tests.

Keywords: Public environmental attention, corporate greenwashing, management myopia, government environmental regulation

JEL Classification: Q01, Q28, G34, M14

1. Introduction

In the context of the United Nations Sustainable Development Goals and Carbon Neutrality Targets, green development has become an inevitable choice for the corporate sector to transform, upgrade and gain competitive advantages (UN Sustainable Development Group, 2023). As a fundamental unit of socio-economic activities, firms must pay attention to society and the environment while focusing on profits. Studies on corporate social responsibility (CSR) demonstrate that it can enhance a company's reputation, market share, cash reserves and overall value (Porter and Kramer, 2006; Sprinkle and Maines, 2010). Consequently, the number of firms issuing social and environmental reports has seen a marked increase (Cannon *et al.*, 2020). Simultaneously, the growing recognition of social responsibility has also increased the risk of strategic and manipulative disclosure by firms seeking environmentally friendly postures. This phenomenon is called greenwashing and leads firms to selectively disclose positive environmental actions while deliberately concealing negative ones to create an inaccurately positive impression of their environmental performance (Seele and Gatti, 2017; Lyon and Maxwell, 2011). Due to the widespread nature of greenwashing and its potential benefits for companies, such as increased social capital, improved product sales and reduced risk, the corporate greenwashing trend is concerning (Y. Wu *et al.*, 2020).

China has undergone remarkable economic growth over the past three decades as the world's largest developing country and the second-largest economy; environmental challenges such as air and water pollution and other forms of contamination have emerged as most pressing issues (Z. Liu *et al.*, 2022). To reduce the adverse effects of pollution and safeguard the environment, the government has been implementing increasingly stringent environmental regulations since 2014. Unfortunately, the ongoing construction of environmental protection laws and the weak enforcement of existing regulations have incentivized companies to engage in excessive greenwashing (Q. He *et al.*, 2020). Since 2008, the State Environmental Protection Administration has mandated companies to proactively disclose ecological information, creating institutional pressure to communicate their environmental practices (Yon. Li *et al.*, 2021). However, companies mainly disclose positive and difficult-to-verify information, concealing negative information and increasing greenwashing (S. Hu *et al.*, 2023). This is a serious concern as China has recently overtaken the USA as the top emitter worldwide¹. Therefore, it merits studying the Chinese market to provide valuable recommendations that reduce greenwashing.

1 China accounts for 29% of all GHG emissions worldwide, becoming the top emitter (Statista, 2024a).

The public is a crucial driver of China's green development, and the government has implemented policies to foster public engagement in environmental protection and social governance. For example, the 14th Five-year Plan greatly emphasizes public supervision and reporting mechanisms while promoting collaboration between social organizations and the public in environmental governance (National People's Congress of the People's Republic of China, 2021). As demand for environmental quality continues to rise, public participation in ecological protection has propelled these efforts to a more profound level. Public environmental attention (PEA) is an externalized embodiment of people's ownership. For instance, the public expresses their environmental demands to local governments through letters, visits and reports, urging the government to respond by strictly regulating and investing more in environmental governance (Chu *et al.*, 2022). On the other hand, the masses can reduce purchases of environmentally harmful products, engage in environmental conservation and adopt sustainable practices (Soneryd and Ugglä, 2015). In this way, the public can make companies change their business philosophy, pressure them to protect the environment and be consistent in their words and actions (J. Wu *et al.*, 2019; Y. Gu *et al.*, 2022). Therefore, as an informal system, PEA is crucial in promoting environmental governance by effectively exerting pressure on governments and businesses to prioritize environmental protection.

In 2012, Southern Weekly published a list of the top ten signs of greenwashing on China's market after compiling two years of greenwashing lists (Huang and Zhao, 2018). Most research into corporate greenwashing has been qualitative, with limited quantitative analysis. The driving factors behind greenwashing are categorized into external and internal factors based on the literature. Firstly, from an external environment perspective, government regulations, media exposure and supervision, consumer awareness and capital market governance can influence a company's greenwashing level (Wedari *et al.*, 2021; Ruiz-Blanco *et al.*, 2021). Secondly, from an internal perspective, corporate characteristics, the performance gap between management expectations and actual results, integration capabilities of a company's green resources and executive characteristics affect greenwashing (Kim and Lyon, 2011; Marquis *et al.*, 2016; Lin *et al.*, 2024). On the other hand, scholars have also explored greenwashing governance strategies, but the literature concerning the relationship between PEA and greenwashing remains limited.

As public education rises, compared to formal environmental regulation (A. Wang *et al.*, 2021), informal systems that focus on public environmental awareness must become a key area of focus for scholars. The surge in public environmental awareness can stimulate governments to enhance their environmental governance (H. M. Wang *et al.*, 2018). PEA has significant impacts on corporate emissions (X. Li *et al.*, 2022), enterprise green technology innovation (Yi *et al.*, 2022), ESG and asset prices (Wang and Zhao, 2018). Therefore,

compared to mandatory government regulation, PEA is an informal system in the context of high-quality development. Can public participation in environmental governance curb corporate greenwashing behaviour? A practical evaluation of the impact of PEA on enterprise greenwashing and its mechanism is of essential theoretical and practical significance.

Studies on PEA, in this regard, mainly revolve around measurement methods and influence effects, leaving several gaps. Firstly, the existing literature on PEA measurement comes from official statistics such as the number of environmental letters and petitions or CPPCC proposals (H. M. Wang and H. Wang, 2018; Dasgupta and Wheeler, 1997); however, environmental letters and petitions are inefficient, costly and unable to achieve comprehensive public participation in governance. As the internet advances rapidly, online communities can use search engines to raise public awareness about environmental issues. In this way, public environmental demands are revealed, and it is scientific and reasonable to measure PEA through keyword searches on the internet (Zheng *et al.*, 2013). Due to the rise in the availability of online information, search indexes are widely used in academia (W. Yu *et al.*, 2022; Guo *et al.*, 2020).

Therefore, we examine the economic logic underlying the impact of PEA on corporate greenwashing by matching prefecture-level Baidu search indexes with firm-level data. We include A-share listed companies on Shanghai and Shenzhen exchanges from 2011 to 2020 and analyse the impact of PEA on the greenwashing level. The empirical results show that PEA can significantly inhibit corporate greenwashing, especially in heavily polluting industries, regions with a suitable rule of law, non-political connections and companies with elderly executives with environmental backgrounds. PEA mainly inhibits greenwashing by restraining management's short-sighted behaviour and increasing analyst attention. Increasing government environmental attention and strengthening ecological regulations promote this inhibitory effect.

We expect to make several contributions to the existing literature. Firstly, we explore the impact of PEA from a greenwashing perspective, which is new in the relevant literature. Previous research has mainly focused on the effects of PEA on urban environmental governance (Y. Z. Wang *et al.*, 2018) and corporate ecological innovation (Yi *et al.*, 2022) and used environmental letters and petitions to measure PEA (Wang and Wang, 2018). We explore the influence of PEA on corporate environmental governance at a micro-level. We measure PEA by analysing the frequency of Baidu search indexes for keywords related to "environmental pollution". The elevation of public environmental awareness reflects the public's emphasis on issues such as the environment and people's well-being. Therefore, exploring corporate environmental governance in response to the increase in PEA is crucial. Secondly,

we enrich the research into dealing with corporate greenwashing. Only a few studies discuss devising strategies to reduce greenwashing. Such studies mainly focus on formal mechanisms, such as external environments (government, media and market (Ruiz-Blanco *et al.*, 2021) and internal characteristics, ignoring the crucial role of informal institutions such as PEA.

We assess the impact of greenwashing behaviour on ESG issues by developing peer-equivalent “greenwashing scores”. Including the informal institution of PEA within the framework of corporate greenwashing provides a beneficial supplement to the research into greenwashing elimination. Thirdly, we reveal how PEA affects the extent of greenwashing. On the one hand, as the primary entity in strategic decision-making and resource allocation, the management can be influenced by PEA in restraining short-sightedness and increasing analyst attention, alleviating the principal-agent issues. Utilizing the principal-agent theory, we explore the impact of management on the relationship between PEA and greenwashing. On the other hand, the government’s environmental concerns and regulations are external governance mechanisms that serve as crucial institutional forces to supervise and regulate corporate greenwashing. So, we choose government ecological concerns and regulations as external governance factors and explore their role in moderating the relationship between PEA and greenwashing. The findings can help improve government policy coordination and implementation. PEA represents public pressure regarding environmental governance and applies to all other countries. Regardless of the political or economic system, PEA is expected to pressure firms into a green transition, arising from consumers’ awareness, and governments to make stringent environmental policies, arising from netizen posts.

2. Model, Variables and Strategy

2.1 Model setting

To examine Hypothesis 1, this paper employs the following model to investigate the influence of PEA on corporate greenwashing levels:

$$greenwash_{it} = \alpha + \beta Baidu_index_{ct} + \gamma X_{ict} + \mu_j + \eta_t + \varepsilon_{ict} \quad (1)$$

where the subscript i represents the corporation, c represents the city where the corporation is located, t represents the year and j represents the industry. The dependent variable $greenwash_{it}$ denotes the level of corporate greenwashing; the explanatory variable $Baidu_index_{ct}$ denotes PEA; and X_{ict} is a collection of control variables including corporate-level and region-level controls. This paper controls for industry fixed effects μ_j and time fixed effects

η_t and clusters robust standard errors in the city-time dimension, with ε_{ict} being the random error term. The estimated coefficient β is the focus of this paper. According to Hypothesis 1, it is expected to be significantly less than 0, meaning that PEA reduces greenwashing.

2.2 Variable selection

2.2.1 Dependent variable

Companies engaging in greenwashing present a transparent public image by disclosing significant ESG data yet have subpar ESG performance. In other words, corporate greenwashing focuses on excessively exaggerating their sustainability achievements through green communication rather than making genuine efforts to improve their environmental performance. Drawing on E. P. Y. Yu *et al.* (2020), we quantify the extent of greenwashing behaviour by comparing peers' relative greenwashing scores to quantify the extent of greenwashing behaviour of corporations on ESG issues. Bloomberg's composite disclosure score for each company on the environment, social responsibility and corporate governance is used as the ESG disclosure score, which varies in the range [0, 100], reflecting the amount of ESG data disclosed to the public and the degree of ESG disclosure by companies. The Huazheng ESG rating system covers a wide range of areas, is updated frequently and can combine the characteristics of China's capital market. Constructing an industry-weighted average of 26 key indicators to obtain an ESG evaluation, the ratings have nine grades from AAA to C to measure ESG performance. In this paper, we define corporate greenwashing as the discrepancy between the standardized ESG disclosure score and the standardized ESG performance score (D. Zhang, 2022; D. Zhang, 2023) and construct the following formula to measure it:

$$greenwash_{it} = \left[\frac{(ESG_{Disclosure_{it}} - \overline{ESG_{Disclosure_{it}}})}{\sigma_{ESG_{Disclosure}}} \right] - \left[\frac{(ESG_{Rating_{it}} - \overline{ESG_{Rating_{it}}})}{\sigma_{Rating}} \right] \quad (2)$$

where $\overline{ESG_{Disclosure}}$ and $\sigma_{ESG_{Disclosure}}$ are the mean and standard deviation of ESG disclosure scores. $\overline{ESG_{Rating}}$ and σ_{Rating} are the mean and standard deviation of ESG performance scores.

2.2.2 Core explanatory variables

As the internet continues to evolve, the public's needs and concerns can be recorded in internet searches. Baidu Search, with a market share of over 60% considering all platforms, is the largest search engine in China (Statista, 2024b). Its extensive coverage and reliable data availability enable it to promptly capture users' concerns about specific events. Therefore, drawing on Wang and Zhao (2018), Guo *et al.* (2020), B. Zhou and Ding (2023) and

G. Xu *et al.* (2025), this paper takes “environmental pollution” as the keyword in the Baidu search index, weights the statistical analysis according to the frequency of search, and takes the natural logarithm of it by adding 1 to get the PEA in sub-region and year (*Baidu_index*). Baidu’s total search index is divided into PC and mobile search indexes, which can not only effectively represent the public’s environmental preferences and behavioural intentions but also reflect the potential efforts the public may need to make to improve their living environment and quality.

2.2.3 Control variables

To eliminate the interference of other factors on the greenwashing level of enterprises, this paper draws on the research by D. Zhang (2023) and controls for variables related to the enterprise’s basic characteristics, internal governance and regional levels. The control variables are (1) size of the enterprise (*Size*); (2) leverage (*Lev*); (3) return on assets (*ROA*); (4) cash flow ratio (*Cashflow*); (5) Tobin’s q (*TobinQ*); (6) board size (*Board*); (7) independent director ratio (*Indep*); (8) dual situation (*Dual*) is assigned a value of 1 if the same person is the chairman and the general manager, otherwise it is 0; (9) the management shareholding ratio (*Mshare*) is measured as the ratio of the number of shares held by the management to the total number of shares of the company; and finally (10) GDP per capita ($\ln pgdp$).

2.3 Identification strategy

Due to the large number of missing values in the Baidu search index data before 2010 and the large-scale outbreak of haze and other environmental pollution problems in China in 2011, this paper selects the data of A-share listed companies from 2011 to 2020 as the initial sample. The following processing is applied: (1) excluding ST, PT, *ST, financial and real estate enterprises; (2) excluding enterprises with abnormal and missing data; and (3) shrinking the tail of all continuous variables by 1%. We finally obtain 26,719 valid observations at the enterprise-year level. Among them, the PEA data come from the search index disclosed on the Baidu website; the enterprise greenwashing level data and enterprise-level control variables come from the Wind database and CSMAR database, and the missing data are filled in manually by checking the annual reports of listed enterprises. The regional-level data come from the China City Statistical Yearbook.

Table 1 presents descriptive statistics of the variables. The mean value of *Greenwashing* is 0.0405, with a standard deviation of 1.2202, indicating significant variations in the greenwashing levels among enterprises. The mean value of *Baidu_index* is 2.7516, with a standard deviation of 1.9261, and the maximum value reaches 4.9513. These figures demonstrate

that there are significant variations in PEA across different cities. The rest of the variables are within a reasonable range.

Table 1: Descriptive statistics

Variable	N	Mean	Std. dev.	Min	Max
Greenwash	26,719	0.0405	1.2202	−3.5320	6.7600
Baidu_index	26,719	2.7516	1.9261	0	4.9513
Size	26,719	22.1848	1.2523	19.3048	25.9357
Lev	26,719	0.4201	0.2039	0.0569	0.8919
ROA	26,719	0.0423	0.0599	−0.2466	0.2286
Cashflow	26,719	0.0957	0.1812	−0.7392	0.7149
TobinQ	26,719	2.0181	1.1935	0.8754	8.1364
Board	26,719	8.5927	1.6304	0	18
In dep	26,719	37.5244	5.1455	16.6700	57.1400
Dual	26,719	0.2690	0.4197	0	1
Mshare	26,719	13.4827	18.66988	0	69.8272
ln pgdp	26,719	10.1223	3.6974	0	13.0557

Source: Authors' own calculations

Table 2 shows the Pearson correlation coefficient test. The correlation coefficient between PEA and the level of greenwashing of enterprises is markedly negative at the 1% significance level, suggesting a strong inverse relationship between these variables. Furthermore, the VIF is 1.34, considerably lower than the commonly used threshold of 5. This result indicates no significant multicollinearity issues among the variables in this study.

Table 2: Correlation analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<i>Green-wash</i>	1	–	–	–	–	–	–	–	–	–	–	–
<i>Baidu_index</i>	–0.058***	1	–	–	–	–	–	–	–	–	–	–
<i>Size</i>	0.338***	–0.056***	1	–	–	–	–	–	–	–	–	–
<i>Lev</i>	0.222***	0.012**	0.514***	1	–	–	–	–	–	–	–	–
<i>ROA</i>	–0.127***	0.006	–0.052***	–0.358***	1	–	–	–	–	–	–	–
<i>Cashflow</i>	0.029***	0.015**	0.071***	–0.154***	0.229***	1	–	–	–	–	–	–
<i>TobinQ</i>	0.021***	0.022***	–0.397***	–0.264***	0.153***	0.035***	1	–	–	–	–	–
<i>Board</i>	0.140***	–0.026***	0.286***	0.164***	–0.006	0.046***	–0.148***	1	–	–	–	–
<i>In dep</i>	–0.051***	–0.003	0.004	–0.009	–0.013**	–0.005	0.048***	–0.488***	1	–	–	–
<i>Dual</i>	–0.081***	0.001	–0.190***	–0.139***	0.062***	–0.016***	0.076***	–0.176***	0.112***	1	–	–
<i>Mshare</i>	–0.255***	0.028***	–0.369***	–0.328***	0.197***	0.005	0.030***	–0.196***	0.072***	0.252***	1	–
<i>ln pgdp</i>	0.008	0.493***	0.052***	0.021***	0.005	–0.018***	0.022***	–0.002	0.024***	–0.029***	–0.022***	1

Note: ** and *** denote statistical significance at the 5% and 10% levels, respectively.

Source: Authors' own calculations

3. Empirical Analysis

3.1 Benchmark regression analysis

Table 3 shows the results of the benchmark regression. Column (1) presents the estimation results without including control variables, while columns (2) and (3) present the estimation results after adding control variables at the corporate and regional levels, respectively. The regression results all show that PEA reduces greenwashing at the 1% statistical level. In terms of column (3), with each standard deviation increase in PEA, the level of greenwashing decreases by 6.12% ($= 0.0388 \times 1.9261/1.2202$). This is a fairly substantial margin for reducing greenwashing in enterprises. Therefore, the inhibitory effect of PEA on the level of corporate greenwashing revealed in Hypothesis 1 is statistically and economically significant. The reason behind this is that increasing PEA encourages enterprises to voluntarily participate in environmental action and make more effort to reduce carbon and energy consumption but also stimulates enterprises to make green production decisions and suppresses enterprises' greenwashing behaviour.

Table 3: Benchmark regression results

	<i>Greenwash</i>		
	(1)	(2)	(3)
<i>Baidu_index</i>	−0.0348*** (0.0049)	−0.0258*** (0.0044)	−0.0388*** (0.0045)
<i>Size</i>	–	0.3129*** (0.0083)	0.3085*** (0.0084)
<i>Lev</i>	–	0.4060*** (0.0440)	0.4223*** (0.0437)
<i>ROA</i>	–	−2.1426*** (0.1600)	−2.1385*** (0.1599)
<i>Cashflow</i>	–	−0.0266 (0.0419)	−0.0138 (0.0416)
<i>TobinQ</i>	–	0.1803*** (0.0077)	0.1783*** (0.0078)
<i>Board</i>	–	−0.0003 (0.0051)	−0.0004 (0.0051)
<i>In dep</i>	–	−0.0128*** (0.0014)	−0.0130*** (0.0014)
<i>Dual</i>	–	0.0474*** (0.0165)	0.0498*** (0.0165)
<i>Mshare</i>	–	−0.0056*** (0.0004)	−0.0056*** (0.0004)
<i>In pgdp</i>	–	–	0.0136*** (0.0023)
<i>Cons</i>	0.1364*** (0.0170)	−6.7240*** (0.1785)	−6.7286*** (0.1790)
<i>Industry FE</i>	Yes	Yes	Yes
<i>Year FE</i>	Yes	Yes	Yes
<i>N</i>	26,719	26,719	26,719
<i>R</i> ²	0.1323	0.2515	0.2527

Notes: The brackets indicate the robust standard errors of clusters at the city-time level.

*** denotes statistical significance at the 1% level. The same notes apply to the tables below.

Source: Authors' own calculations

3.2 Endogeneity concerns

The presence of endogeneity problems may interfere with the results of the benchmark regression. Endogeneity sources: although urban-level variables generally do not correlate with corporate-level characteristics, missing variables that vary over time at both the city and corporate levels may lead to underestimation or overestimation of the OLS model (Fu *et al.*, 2021). Furthermore, measurement errors and reverse causality problems may also cause endogeneity issues. Therefore, in this paper, we follow Lewbel's (2012) approach to construct the cubic difference between PEA and the mean PEA in the same year and province as instrumental variables and use 2SLS to re-estimate. Theoretically, the heteroscedastic instrumental variable positively correlates with the core explanatory variable, satisfying the correlation requirement. On the other hand, constructing the instrumental variable using the cubic difference of variables does not need external factors, as it is an objective feature and has good exogeneity with business decision-making, so it will not directly affect the level of greenwashing in enterprises and meet the exclusivity requirement.

Table 4 reports the results of the instrumental variable estimation. Among them, the first-stage results show that the coefficient of IV is significantly positive and the *F*-value is far greater than 10, indicating a significant positive correlation between IV and PEA. The second stage results in column (2) show that the coefficient of *Baidu_index* is significantly harmful. Meanwhile, the Kleibergen–Paap rank LM statistic is significant, which rejects the underidentification assumption. The Cragg–Donald Wald *F*-statistic and Kleibergen–Paap Wald rank *F*-statistic exceed the critical values for weak instrumentation identified by Stock–Yogo at the 10% significance level, thus rejecting the weak instrumentation assumption. To further mitigate concerns about the exogeneity of the instrumental variable, we estimate the instrumental variable and PEA simultaneously in the model, as shown in column (3). The results show that the coefficient of *Baidu_index* is significantly negative. In contrast, the coefficient of the instrumental variable is not significant, indicating no other paths between the heteroscedastic instrumental variable and the current greenwashing level. Therefore, the instrumental variable meets the exogeneity requirement. Our conclusion remains robust after alleviating potential endogenous problems through instrumental variables.

Table 4: Instrumental variable estimation

	<i>Baidu_index</i>	<i>Greenwash</i>	<i>Greenwash</i>
	<i>First stage</i>	<i>Second stage</i>	<i>FE</i>
	(1)	(2)	(3)
<i>Baidu_index</i>	–	–0.0357** (0.0180)	–0.0389*** (0.0046)
<i>IV</i>	0.0726*** (0.0067)	–	0.0002 (0.0014)
Controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
F-value	116.32	–	–
Kleibergen–Paap rank LM statistic	–	97.516 [0.0000]	–
Cragg–Donald Wald F-statistic	–	1337.998	–
Kleibergen–Paap Wald rank F-statistic	–	116.316 {16.38}	–
Hansen J statistic	–	0.000	–

Note: Values in [] are *p*-values for the test statistic and values in { } are critical values for the Stock–Yogo test at the 10% level (***), and at the 5% level (**), respectively.

Source: Authors' own calculations

3.3 Robustness checks

To further verify the reliability of the relationship between PEA and corporate greenwashing level, this paper adopts methods such as variable substitution, fixed effect change, PSM test and Heckman two-stage regression for robustness testing.

3.3.1 Substituting core explanatory variables

Haze receives a high degree of environmental awareness and the public can easily observe the severity of haze through air visibility. This draws attention to the public's environmental concerns, making it more appealing to them (Guo *et al.*, 2020). Therefore, this paper replaces the keyword “pollution” with “haze” in the previous search and analyses and calculates

the weighted frequency of the keyword “haze” as a level index of PEA. In addition, the “pollution” search index can be divided into mobile-end and PC-end according to different search sources. This paper re-examines the search indexes from two different sources. It is found that after replacing the core explanatory variable, the conclusion remains unchanged. $\ln Smog$ represents the natural logarithm of the total daily search volume for the keyword “smog” on Baidu index, aggregated at the prefecture-level city level. *Baidu_index_PC* denotes the PC-based search index from Baidu index and *Baidu_index_PH* denotes the mobile-based (Phone/Mobile) search index from Baidu index.

Table 5: Replacing variables

	<i>Greenwash</i>		
	(1)	(2)	(3)
<i>ln Smog</i>	−0.0369*** (0.0042)	–	–
<i>Baidu_index_PC</i>	–	−0.0445*** (0.0051)	–
<i>Baidu_index_PH</i>	–	–	−0.0385*** (0.0048)
Cons	−6.7234*** (0.1786)	−6.7299*** (0.1788)	−6.7559*** (0.1781)
Controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
<i>N</i>	26,719	26,719	26,719
<i>R</i>²	0.2528	0.2529	0.2524

Note: Please refer to Tables 3 and 4 for abbreviations.

Source: Authors’ own calculations

3.3.2 Changing sample interval

Due to the possible unobservable factors at the regional level that may affect the relationship between PEA and corporate greenwashing, we control for province-level fixed effects to mitigate their impact on the model. Considering that different industries may have

experienced different cyclical changes during the sample period and that macroeconomic factors may have affected the mitigation behaviour of enterprises in different industries, leading to biased regression results, we add an interaction term between industry and time trends to the baseline regression model to control the impact of various macroeconomic factors. We conduct clustering analysis at the firm level, and the estimated coefficients remain significant and negative without much change.

Table 6: Changing fixed effects (FE)

	<i>Greenwash</i>	<i>Greenwash</i>	<i>Greenwash</i>
	(1)	(2)	(3)
<i>Baidu_index</i>	−0.0345*** (0.0109)	−0.0386*** (0.0045)	−0.0388*** (0.0086)
Cons	−7.4123*** (0.1768)	−6.7336*** (0.1802)	−6.7286*** (0.3488)
Controls	Yes	Yes	Yes
Industry FE	No	Yes	Yes
Province FE	Yes	No	No
Industry × Year Trend FE	No	Yes	No
Year FE	Yes	Yes	Yes
<i>N</i>	26,719	26,719	26,719
<i>R</i> ²	0.1899	0.2598	0.2527

Note: Please refer to Tables 3 and 4 for abbreviations.

Source: Authors' own calculations

3.3.3 Controlling macro factors and industry trends

Propensity score matching (PSM) can alleviate the problem of sample selection bias to a certain extent. In this paper, according to the median of PEA, the samples were divided into two groups: the high PEA group (treated group) and the low PEA group (control group). The enterprise control variables were set as matching variables, the logit model was used to estimate propensity scores and the 1:1 nearest neighbour matching method was adopted for sample screening. Columns (1) and (2) of Table 7 show the regression results for cross-

-sectional PSM and year-by-year PSM, respectively. The results are not significantly different from the benchmark regression, validating its robustness.

The greenwashing behaviour of enterprises is a voluntary choice, but it may have a sample selection bias. Therefore, this paper uses the Heckman two-stage model for estimation. In the first stage, a probit model is used for estimation and in the second stage, the Inverse Mills Ratio (*imr*) is added to control specific selection bias effects. The *imr* is not significant, indicating that there is no severe selection bias problem. The research conclusion remains robust after considering sample selection bias issues.

Table 7: PSM test and Heckman two-stage regression

	<i>Greenwash</i>		
	Cross-sectional PSM	Year-by-year PSM	Heckman two-stage model
	(1)	(2)	(3)
<i>Baidu_index</i>	−0.0393*** (0.0044)	−0.0407*** (0.0044)	−0.0388*** (0.0045)
<i>imr</i>	–	–	0.1242 (0.1335)
Cons	−6.7999*** (0.1798)	−6.8965*** (0.2025)	−6.7054*** (0.1846)
Controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
<i>N</i>	26,263	23,288	26,635
<i>R</i> ²	0.2530	0.2628	0.2507

Note: Please refer to Tables 3 and 4 for abbreviations.

Source: Authors' own calculations

3.3 Heterogeneity analysis

The previous results have confirmed that PEA negatively influences corporate greenwashing. However, these analyses focused on the overall level and did not reveal whether there are differences between different types of enterprises. To address this issue, we further con-

duct heterogeneity tests from four dimensions: industry pollution level, regional rule of law environment, political connectedness and characteristics of corporate executives. The aim is to provide more empirical evidence for the core conclusions of this paper.

3.3.1 Degree of pollution in the industry

Due to the different properties of different industries, the pressure on companies affected by pollution control may vary. Generally, companies in heavily polluting industries are more susceptible to stringent pollution control measures than those in non-heavy industries. Therefore, heavily polluting industries must conduct environmental technology research and development to avoid high environmental penalties (Flammer, 2021). This paper categorizes companies into heavily polluting industries based on the National Environmental Protection Department's list. If a company is identified as being in a heavily polluting industry, a virtual variable is assigned a value of 1; otherwise, it is assigned a value of 0. The interaction term *Baidu_index_heavy_group* was added to the model for testing. The regression coefficient of the interaction term is significantly negative, indicating that the impact of PEA on corporate greenwashing varies depending on industry category. Compared with non-heavily polluting industries, PEA has a more significant inhibitory effect on corporate greenwashing in heavily polluting industries.

3.3.2 Regional rule of law environment

The different rule-of-law environments can affect the degree of legal construction and enforcement efficiency in various regions and the effectiveness of government actions in addressing PEA. A good rule-of-law environment means that institutions such as legal intermediaries and trade associations are well developed, effectively supervising the exercise of government power and improving the efficiency of PEA-related actions. This paper examines the impact of PEA on corporate greenwashing levels in regions with different levels of the rule of law based on the marketization index compiled by G. Fan *et al.* (2011). Specifically, if the region where the enterprise is located has a marketization index above the median, the dummy variable is set to 1; if it is below the median, the dummy variable is set to 0. The interaction term *Baidu_index_legal_group* is added to the model for testing. The regression coefficient of the interaction term is significantly negative, indicating that PEA significantly affects enterprises' greenwashing in areas with a better rule of law environment.

3.3.3 Political connections

Previous research has demonstrated that political connections enable companies to evade social responsibility, distort environmental performance and provide a legitimate cover for

engaging in rent-seeking activities between government and enterprises (De Villiers *et al.*, 2011; H. Liu *et al.*, 2025). In general, companies with political connections tend to be less sensitive to the regulatory pressure on production processes and ignore the impact of their operations on the social environment. In this paper, we use the method of political connection measurement proposed by J. P. Fan *et al.* (2007) to manually organize the employment of company directors, executives and supervisors. If the CEO has served as or is currently a government official, NPC member, CPPCC member, etc., the CEO has political connections. We set the virtual variable value to 1 if the condition is met. Otherwise, it is set to 0. We also generate the *Baidu_index_PC* interaction term to add to the model for testing. The regression coefficient of the interaction term is significantly positive, indicating that PEA has a more substantial inhibitory effect on greenwashing in companies without political connections.

3.3.4 Characteristics of corporate executives

The high-order theory posits that the personal characteristics of executives can significantly influence corporate behaviour and decision-making (Hambrick and Mason, 1984). This paper examines whether the two features of executive age and environmental background can influence corporate greenwashing behaviour. According to Maslow's hierarchy of needs theory, executives with a higher average age may pay more attention to corporate social reputation and be more inclined to increase investment in environmental protection, assume social responsibility and reduce corporate greenwashing. This article divides executives into groups based on the median age and sets a virtual variable to 1 if the executive's age is higher than the median age; otherwise, it is set to 0. The interaction term *Baidu_index_AGE_group* is added to the model for testing. The coefficient of the interaction term is significantly negative, indicating that when executives are relatively older, PEA has a more substantial inhibitory effect on corporate greenwashing levels.

In addition, executives with environmental backgrounds tend to have more environmental awareness and a green development philosophy. They also understand environmental policies better and are more willing to change their companies' extensive development models and promote green, sustainable development. Executive environmental background refers to the early work that executives have done in environmental protection-related fields. We manually organize data and set up virtual variables for the administrative environmental experience. If an executive has an environmental background, it is set to 1; otherwise, it is set to 0. The interaction term *Baidu_index_EP_group* was added to the model for testing. The regression coefficient of the interaction term is significantly negative, indicating that PEA has a more substantial inhibitory effect on the greenwashing level of companies with environmental background executives compared to those without such backgrounds.

Table 8: Heterogeneity test

	<i>Greenwash</i>				
	Industry pollution	Rule of law environment	Political connectedness	Age of executives	Environmental background of executives
	(1)	(2)	(3)	(4)	(5)
<i>Baidu_index</i>	−0.0304*** (0.0046)	−0.0321*** (0.0049)	−0.0435*** (0.0048)	−0.0236*** (0.0049)	−0.0322*** (0.0047)
<i>Baidu_index_heavy_group</i>	−0.0400*** (0.0086)	–	–	–	–
<i>Baidu_index_legal_group</i>	–	−0.0147*** (0.0054)	–	–	–
<i>Baidu_index_PC</i>	–	–	0.0171*** (0.0049)	–	–
<i>Baidu_index_AGE_group</i>	–	–	–	−0.0279*** (0.0042)	–
<i>Baidu_index_EP_group</i>	–	–	–	–	−0.0639*** (0.0102)
<i>_cons</i>	−6.7420*** (0.1796)	−6.7427*** (0.1792)	−6.7035*** (0.1794)	−6.7030*** (0.1783)	−6.8289*** (0.1900)
Controls	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
<i>N</i>	26,719	26,719	26,719	26,719	26,719
<i>R</i> ²	0.2531	0.2534	0.2531	0.2541	0.2623

Note: Please refer to Tables 3 and 4 for abbreviations.

Source: Authors' own calculations

4. Further Analysis

The above empirical analysis has verified a significant inhibitory effect of PEA on corporate greenwashing. In theoretical analysis, we believe that PEA will inhibit corporate greenwashing by restraining management's short-sighted behaviour, increasing analyst attention and exerting government regulatory effects.

4.1 Curbing management short-sightedness and increasing analyst attention

The awareness of sustainable development in enterprises is a reflection of long-term thinking. This paper uses text analysis and machine learning techniques to define short-sighted vocabulary sets in management reports' analysis and discussion sections in corporate annual reports. We also construct index indicators of management short-sighted behaviour based on the dictionary method (N. Hu *et al.*, 2021). The larger the numerical value, the more serious the management's short-sightedness is and the more they focus on short-term interests while ignoring long-term sustainable development capabilities.

Column (1) reports the impact of PEA on management short-sightedness and the regression results show that PEA effectively inhibits management short-sighted behaviour. Column (2) reports the impact of management short-sightedness on enterprises' greenwashing level. This implies that the higher the degree of management short-sightedness, the greater the likelihood of an enterprise engaging in greenwashing behaviour. Therefore, increasing PEA can effectively reduce information asymmetry, relieve agency problems and reduce the possibility of management taking radical measures to satisfy their self-interest, thereby reducing corporate greenwashing.

In addition, as essential supervisors and participants in the market, analysts can provide professional and independent reports for external information users. The increase in analyst attention not only puts more supervision pressure on enterprises to make rational use of resources but also helps enterprises win external trust and obtain innovative resources, thereby reducing enterprise greenwashing (H. Li *et al.*, 2022). Building on the research of M. Hu *et al.* (2021), this paper employs the number of analysts who track and report on firms as a proxy variable for analyst attention, treating it by adding 1 to obtain the natural logarithm. Column (3) discusses the impact of PEA on analyst attention, and the regression results show that as PEA continues to increase, they help attract analysts to follow and pay attention. Column (4) reports the impact of analyst attention on the greenwashing level, and the regression results show that higher analyst attention can increase media exposure, reduce opportunistic behaviour by management and inhibit corporate greenwashing.

Table 9: Curbing management short-sightedness and increasing analyst attention

	<i>myopia</i>	<i>Greenwash</i>	<i>In attention</i>	<i>Greenwash</i>
	Management short-sightedness		Analyst attention	
	(1)	(2)	(3)	(4)
<i>Baidu_index</i>	−0.1106*** (0.0424)	–	0.0140** (0.0065)	–
<i>myopia</i>	–	0.0101*** (0.0009)	–	–
<i>In attention</i>	–	–	–	−0.0341*** (0.0091)
Cons	20.0139*** (1.3279)	−7.1026*** (0.1767)	−10.7986*** (0.2567)	−8.8455*** (0.2699)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
<i>N</i>	26,719	26,719	17,578	17,578
<i>R</i> ²	0.1224	0.2539	0.3654	0.2946

Note: Please refer to Tables 3 and 4 for abbreviations.

Source: Authors' own calculations

4.2 Analysis of moderating effect of government regulation

PEA is an essential factor that affects enterprises' greenwashing levels. Other stakeholders may also influence the suppression effect of PEA on enterprises' greenwashing level. This paper examines the impact of government regulatory mechanisms on the relationship between PEA and the greenwashing level of enterprises. We divide government regulatory mechanisms into government environmental concerns and government environmental regulations. First, we conducted a text analysis of the government work report to identify keywords related to environmental protection and calculated the frequency of government environmental concerns in prefecture-level cities. Then, the ratio of government environmental concern word frequency to total word frequency was used as a government environmental concern indicator (Z. Chen *et al.*, 2018). Furthermore, environmental regulation

is a manifestation of the government's environmental concern. Environmental regulation is the system of arrangements for governments to impose environmental responsibility on enterprises and regulate their behaviour. We used the industrial pollution control investment in listed companies' provinces as a proportion of industrial added value to indicate environmental regulation intensity.

Table 10: Analysis of moderating effect of government regulation

	<i>Greenwash</i>			
	Government environmental concerns		Government environmental regulation	
	(1)	(2)	(3)	(4)
<i>Baidu_index</i>	−0.0406*** (0.0046)	−0.0010 (0.0151)	−0.0390*** (0.0045)	−0.0297*** (0.0062)
<i>Gea</i>	−0.0955 (0.0684)	0.2216 (0.1411)	–	–
<i>Regul</i>	–	–	0.1089*** (0.0391)	0.2220*** (0.0609)
<i>Baidu_index_Gea</i>	–	−0.1030*** (0.0383)	–	–
<i>Baidu_index_Regul</i>	–	–	–	−0.0446** (0.0213)
<i>_cons</i>	−6.7289*** (0.1788)	−6.7346*** (0.1787)	−6.7616*** (0.1794)	−6.7898*** (0.1800)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
<i>N</i>	26,719	26,719	26,719	26,719
<i>R</i> ²	0.2528	0.2531	0.2530	0.2531

Note: Please refer to Tables 3 and 4 for abbreviations.

Source: Authors' own calculations

Table 10 presents the regression results of the government regulation effect analysis. Columns (1) and (2) report the estimates of government environmental concern as a mod-

erating variable. The first column reports the regression results of *Baidu_index* and *Gea* on the corporate greenwashing level. In contrast, the second column is based on the first column and adds the cross-product of PEA and government environmental concern (*Baidu_index_Gea*). The regression coefficient of *Baidu_index_Gea* is significantly negative, indicating that government environmental concern strengthens the suppression effect of PEA on the corporate greenwashing level. Columns (3) and (4) report the estimates of government environmental regulation as a moderating variable. The regression coefficient of *Baidu_index_Regul* is significantly negative, indicating that increasing government environmental regulation prompts enterprises to strengthen environmental governance and regulate their environmental behaviour. It also increases the costs of greenwashing for enterprises by enhancing the government's supervision of environmental issues. Therefore, increasing government environmental attention and environmental regulation can improve the restraining effect of PEA on corporate greenwashing.

5. Conclusions, Policy Implications and Limitations

Using data from Chinese A-share listed companies and the Baidu search index in prefecture-level cities from 2011 to 2020, this paper empirically investigated the impact of public environmental attention on corporate greenwashing. The findings show that firstly, PEA can significantly inhibit corporate greenwashing. Secondly, there are significant variations in the impact of PEA on greenwashing levels in terms of industry pollution level, regional rule of law, firms' political connections and characteristics of firm executives. In heavily polluting industries, regions with sound rule of law, firms with non-political connections and older and environmentally conscious executives, the impact of PEA on greenwashing is more pronounced. Thirdly, PEA inhibits greenwashing by curbing management myopia and increasing analyst attention. Increasing government environmental attention and strengthening government environmental regulations enhance the inhibitory effect of PEA on greenwashing.

Based on the above conclusions, this paper draws several insights: Firstly, from a government perspective, it is essential to strengthen supervision, raise public awareness of environmental protection and foster public participation in environmental governance. The government can effectively curb greenwashing by strengthening the formulation and implementation of environmental protection regulations, strictly regulating polluting behaviour and increasing penalties for such illegal conduct. The government can promote public awareness and knowledge of environmental protection through education, media campaigns and other initiatives that act as an informal institution. Doing so can promote public awareness of environmental behaviour and push companies to take environmental issues

more seriously to avoid business losses. In addition, the government can encourage public participation in environmental action by organizing volunteer activities and establishing platforms for reporting environmental violations. This allows the public to monitor and expose companies that engage in undesirable practices. The government can also promote whistle blowing to improve environmental performance by creating a platform for reporting environmental violations and organizing volunteer activities. These measures can help companies prioritize environmental protection and work towards a healthier environment.

Firms must value long-term goals over short-term benefits. It can strengthen internal management, establish sound environmental protection systems, regulate environmental behaviour and avoid adverse environmental impacts by investing in ecological R&D. It is necessary to enhance environmental awareness, actively fulfil social responsibilities, proactively disclose environmental information, accept public supervision and improve environmental image and credibility, thus enhancing public trust and increasing market value. In addition, firms can also improve public identification and belonging by carrying out environmental education and CSR activities. This can promote interaction and cooperation between the public and corporate sectors. To fulfil the public's demand for environmental protection, increasing investment in this area is imperative, enhancing the quality of environmental infrastructure and technology and stopping myopic behaviour. In addition, firms should listen to public opinions and suggestions and promptly solve environmental issues of concern. Effective monitoring mechanisms should be established to accept public supervision and reporting on environmental behaviour, understand public evaluation and feedback and adjust environmental measures promptly to improve public trust.

The COVID-19 pandemic brought several disruptions to corporate operations in China and the world after 2020, leading to inconsistent views of the public and policymakers depending on the unprecedented situations and uncertainties. Due to this factor, we restricted our sample to 2020 and have included this limitation in the conclusion section. In our future work, we plan to check the impact of COVID-19 on the intricacies of the association between PEA and greenwashing.

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References

- Anthoff, D., Hahn, R. (2010). Government failure and market failure: on the inefficiency of environmental and energy policy. *Oxford Review of Economic Policy*, 26(2), 197–224.
<https://doi.org/10.1093/oxrep/grq004>
- Aroui, M., El Ghoul, S., Gomes, M. (2021). Greenwashing and product market competition. *Finance Research Letters*, 42, 101927. <https://doi.org/10.1016/j.frl.2021.101927>
- Brunen, A. C., Laubach, O. (2022). Do sustainable consumers prefer socially responsible investments? A study among the users of robo advisors. *Journal of Banking & Finance*, 136, 106314.
<https://doi.org/10.1016/j.jbankfin.2021.106314>
- Chen, Z., Kahn, M. E., Liu, Y., et al. (2018). The consequences of spatially differentiated water pollution regulation in China. *Journal of Environmental Economics and Management*, 88, 468–485.
<https://doi.org/10.1016/j.jeem.2018.01.010>
- Chen, S., Sun, S. Y., Wu, D. (2010). Client importance, institutional improvements, and audit quality in China: An office and individual auditor level analysis. *The Accounting Review*, 85(1), 127–158.
<https://doi.org/10.2308/accr.2010.85.1.127>
- Chu, Z., Bian, C., Yang, J. (2022). How can public participation improve environmental governance in China? A policy simulation approach with multi-player evolutionary game. *Environmental Impact Assessment Review*, 95, 106782. <https://doi.org/10.1016/j.eiar.2022.106782>
- Dasgupta, S., Wheeler, D. (1997). *Citizen complaints as environmental indicators: evidence from China*. WB Policy Research Working Paper 1704.
- Cannon, J. N., Ling, Z., Wang, Q., et al. (2020). 10-K disclosure of corporate social responsibility and firms' competitive advantages. *European Accounting Review*, 29(1), 85–113.
<https://doi.org/10.1080/09638180.2019.1670223>
- De Villiers, C., Naiker, V., Van Staden, C. J. (2011). The effect of board characteristics on firm environmental performance. *Journal of Management*, 37(6), 1636–1663.
<https://doi.org/10.1177/0149206311411506>
- Fan, G., Wang, X. L., Ma, G. R. (2011). The contribution of China's marketisation process to economic growth. *Economic Research Journal*, 46(9), 4–16.

- Fan, J. P., Wong, T. J., Zhang, T. (2007). Politically connected CEOs, corporate governance, and Post-IPO performance of China's newly partially privatized firms. *Journal of Financial Economics*, 84(2), 330–357. <https://doi.org/10.1016/j.jfineco.2006.03.008>
- Five-Year Plan (2021–2025) for National Economic and Social Development and the Long-Range Objectives Through the Year 2035. [Retrieved 2026-08-05] Available at: https://www.npc.gov.cn/npc/c2/kgfb/202103/t20210313_310753.html
- Flammer, C. (2021). Corporate green bonds. *Journal of Financial Economics*, 142(2), 499–516. <https://doi.org/10.1016/j.jfineco.2021.01.010>
- Fu, S., Viard, V. B., Zhang, P. (2021). Air pollution and manufacturing firm productivity: Nationwide estimates for China. *The Economic Journal*, 131(640), 3241–3273. <https://doi.org/10.1093/ej/ueab033>
- Gu, Y., Ho, K. C., Xia, S., et al. (2022). Do public environmental attentions promote new energy enterprises' development? Evidence from a quasi-natural experiment. *Energy Economics*, 109, 105967. <https://doi.org/10.1016/j.eneco.2022.105967>
- Guo, M., Kuai, Y., Liu, X. (2020). Stock market response to environmental policies: Evidence from heavily polluting firms in China. *Economic Modelling*, 86, 306–316. <https://doi.org/10.1016/j.econmod.2019.09.028>
- Hambrick, D. C., Mason, P. A. (1984). Upper echelons: The organization as a reflection of its top managers. *Academy of Management Review*, 9(2), 193–206. <https://doi.org/10.2307/258434>
- He, Q., Wang, Z., Wang, G., et al. (2020). To be green or not to be: How environmental regulations shape contractor greenwashing behaviors in construction projects. *Sustainable Cities and Society*, 63, 102462. <https://doi.org/10.1016/j.scs.2020.102462>
- Hu, M., Xiong, W., Xu, C. (2021). Analyst coverage, corporate social responsibility, and firm value: Evidence from China. *Global Finance Journal*, 50, 100671. <https://doi.org/10.1016/j.gfj.2021.100671>
- Hu, N., Xue, F. J., Wang, H. N. (2021). Does managerial myopia affect long-term corporate investment? Based on text analysis and machine learning. *Journal of Management World*, 37(5), 139–156.
- Hu, S., Wang, A., Du, K. (2023). Environmental tax reform and greenwashing: Evidence from Chinese listed companies. *Energy Economics*, 124, 106873. <https://doi.org/10.1016/j.eneco.2023.106873>
- Huang, R. B., Zhao, Q. (2018). Research on corporate greenwash under evolutionary perspective: a case study based on China's greenwash list. *Accounting Research*, 4, 11–19.
- Kim, E. H., Lyon, T. P. (2011). Strategic environmental disclosure: Evidence from the DOE's voluntary greenhouse gas registry. *Journal of Environmental Economics and Management*, 61(3), 311–326. <https://doi.org/10.1016/j.jeem.2010.11.001>
- Lewbel, A. (2012). Using heteroscedasticity to identify and estimate mismeasured and endogenous regressor models. *Journal of Business & Economic Statistics*, 30(1), 67–80. <https://doi.org/10.1080/07350015.2012.643126>

- Li, H., Zhang, X., Zhao, Y. (2022). ESG and firm's default risk. *Finance Research Letters*, 47, 102713. <https://doi.org/10.1016/j.frl.2022.102713>
- Li, X., Gu, Z. H., Xu, Y. J. (2022). The impact of public environmental demands on corporate pollution emissions. *Journal of Finance and Economics*, 48(1), 34–48.
- Li, Yaoq., Xu, X., Zhu, Y., et al. (2021). CEO decision horizon and corporate R&D investments: an explanation based on managerial myopia and risk aversion. *Accounting & Finance*, 61(4), 5141–5175. <https://doi.org/10.1111/acfi.12752>
- Li, Yon., Zhang, X., Yao, T., et al. (2021). The developing trends and driving factors of environmental information disclosure in China. *Journal of Environmental Management*, 288, 112386. <https://doi.org/10.1016/j.jenvman.2021.112386>
- Lin, P. T., Li, P., Akbar, A. (2024). Examining the influence of institutional investors on the readability of environmental disclosure in CSR reports of Chinese listed firms. *Corporate Social Responsibility and Environmental Management*, 31(2), 1254–1267. <https://doi.org/10.1002/csr.2629>
- Liu, H., Wang, Q., Li, J. (2025). Political connections and greenwashing: Chinese evidence. *Applied Economics*, 57(37), 5661–5679. <https://doi.org/10.1080/00036846.2024.2365455>
- Liu, H., Zhang, Z. (2023). The impact of managerial myopia on environmental, social and governance (ESG) engagement: Evidence from Chinese firms. *Energy Economics*, 122, 106705. <https://doi.org/10.1016/j.eneco.2023.106705>
- Liu, Z., Deng, Z., He, G., et al. (2022). Challenges and opportunities for carbon neutrality in China. *Nature Reviews Earth & Environment*, 3(2), 141–155. <https://doi.org/10.1038/s43017-021-00244-x>
- Lyon, T. P., Maxwell, J. W. (2011). Greenwash: Corporate environmental disclosure under threat of audit. *Journal of Economics & Management Strategy*, 20(1), 3–41. <https://doi.org/10.1111/j.1530-9134.2010.00282.x>
- Marquis, C., Toffel, M. W., Zhou, Y. (2016). Scrutiny, norms, and selective disclosure: A global study of greenwashing. *Organization Science*, 27(2), 483–504. <https://doi.org/10.1287/orsc.2015.1039>
- Mola, S., Rau, P. R., Khorana, A. (2013). Is there life after the complete loss of analyst coverage? *The Accounting Review*, 88(2), 667–705. <https://doi.org/10.2308/accr-50330>
- Porter, M. E., Kramer, M. R. (2006). The link between competitive advantage and corporate social responsibility. *Harvard Business Review*, 84(12), 78–92.
- Ruiz-Blanco, S., Romero, S., Fernandez-Feijoo, B. (2021). Green, blue or black, but washing – What company characteristics determine greenwashing? *Environment, Development and Sustainability*, 24, 4024–4045. <https://doi.org/10.1007/s10668-021-01602-x>
- Seele, P., Gatti, L. (2017). Greenwashing revisited: In search of a typology and accusation-based definition incorporating legitimacy strategies. *Business Strategy and the Environment*, 26(2), 239–252. <https://doi.org/10.1002/bse.1912>

- Sprinkle, G. B., Maines, L. A. (2010). The benefits and costs of corporate social responsibility. *Business Horizons*, 53(5), 445–453. <https://doi.org/10.1016/j.bushor.2010.05.006>
- Statista (2024a). *Distribution of greenhouse gas emissions worldwide in 2022, by major emitter*. [Retrieved 2024-11-09] Available at: <https://www.statista.com/statistics/500524/worldwide-annual-carbon-dioxide-emissions-by-select-country/>
- Statista (2024b). *Market share of leading search engines in China*. [Retrieved 2024-11-09] Available at: <https://www.statista.com/statistics/253340/market-share-of-search-engines-in-china-pageviews/>
- Soneryd, L., Ugglå, Y. (2015). Green governmentality and responsabilization: New forms of governance and responses to “consumer responsibility”. *Environmental Politics*, 24(6), 913–931. <https://doi.org/10.1016/j.bushor.2010.05.006>
- UN Sustainable Development Group (2023). *Six Transitions: Investment Pathways to Deliver the SDGs*. New York: United Nations Sustainable Development Group.
- Wang, A., Hu, S., Lin, B. (2021). Can environmental regulation solve pollution problems? Theoretical model and empirical research based on the skill premium. *Energy Economics*, 94, 105068. <https://doi.org/10.1016/j.eneco.2020.105068>
- Wang, H. M., Wang, H. (2018). Public Participation, Environmental Regulatory Policies and Firms’ Technological Innovation. *Ecological Economy*, 34(7), 88–93.
- Wang, Y. Z., Zhao, J. (2018). “Voting with money”: the impact of public environmental attention on asset prices across industries. *Journal of Management World*, 9, 46–57.
- Wedari, L. K., Jubb, C., Moradi-Motlagh, A. (2021). Corporate climate-related voluntary disclosures: Does potential greenwash exist among Australian high emitters reports? *Business Strategy and the Environment*, 30(8), 3721–3739. <https://doi.org/10.1002/bse.2836>
- Wu, H., Li, Y., Hao, Y., et al. (2020). Environmental decentralization, local government competition, and regional green development: Evidence from China. *Science of the Total Environment*, 708, 135085. <https://doi.org/10.1016/j.scitotenv.2019.135085>
- Wu, J., Liao, H., Wang, J. W., et al. (2019). The role of environmental concern in the public acceptance of autonomous electric vehicles: A survey from China. *Transportation Research Part F: Traffic Psychology and Behaviour*, 60, 37–46. <https://doi.org/10.1016/j.trf.2018.09.029>
- Wu, Y., Zhang, K., Xie, J. (2020). Bad greenwashing, good greenwashing: Corporate social responsibility and information transparency. *Management Science*, 66(7), 3095–3112. <https://doi.org/10.1287/mnsc.2019.3340>
- Xu, G., Liu, H., Jia, C., et al. (2025). Spatiotemporal patterns and drivers of public concern about air pollution in China: Leveraging online big data and interpretable machine learning. *Environmental Impact Assessment Review*, 114, 107897. <https://doi.org/10.1016/j.eiar.2025.107897>

- Yi, Z. H., Chen, X., Tian, L. (2022). The impact of public environmental attention on corporate green innovation. *Economic Theory and Business Management*, 42(7), 32–48.
- Yu, E. P. Y., Van Luu, B., Chen, C. H. (2020). Greenwashing in environmental, social and governance disclosures. *Research in International Business and Finance*, 52, 101192.
<https://doi.org/10.1016/j.ribaf.2020.101192>
- Yu, W., Jin, X. (2022). Does environmental information disclosure promote the awakening of public environmental awareness? Insights from Baidu keyword analysis. *Journal of Cleaner Production*, 375, 134072. <https://doi.org/10.1016/j.jclepro.2022.134072>
- Zhang, D. (2022). Are firms motivated to greenwash by financial constraints? Evidence from global firms' data. *Journal of International Financial Management & Accounting*, 33(3), 459–479.
<https://doi.org/10.1111/jifm.12153>
- Zhang, D. (2023). Subsidy expiration and greenwashing decision: Is there a role of bankruptcy risk? *Energy Economics*, 118, 106530. <https://doi.org/10.1016/j.eneco.2023.106530>
- Zheng, S. Q., Wan, G. H., Sun, W. Z., et al. (2013). Public demand and urban environmental governance. *Journal of Management World*, 6, 72–84.
- Zhou, B., Ding, H. (2023). How public attention drives corporate environmental protection: Effects and channels. *Technological Forecasting and Social Change*, 191, 122486.
<https://doi.org/10.1016/j.techfore.2023.122486>