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RESEARCH ARTICLE

Voting by mouth: media attention and environmental governance

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Abstract
External regulation is crucial for environmental protection. This study investigates the impact of media attention on corporate environmental governance from 2011 to 2021, using China's public companies as our samples. The empirical results indicate that media attention consistently and significantly enhances corporate environmental governance. This effect remains robust across endogeneity considerations and alternative tests. Additionally, in regions with higher marketization and stronger rule of law frameworks, the efficacy of media attention in improving corporate environmental performance becomes remarkably pronounced. Further analysis unveils that media attention positively impacts environmental governance by elevating public awareness, refining internal management efficiency, and fostering innovative strategies for minimizing environmental impact. These results offer empirical backing for the reinforcement of external oversight and corporate governance practices.

Keywords Media coverage · Corporate environmental governance · External supervision · Sustainable development

Introduction

A variety of environmental challenges have considerably affected human survival in diverse ways, including health and social security implications, which raise concerns in both scholarly circles and the broader public (Seroka-Stolka and Fijorek 2020), particularly in the wake of digitization (Ramos-Meza et al. 2021). While companies shoulder the primary responsibility for pollutant emissions, they often refrain from voluntarily adopting pollution reduction measures due to potential additional costs. In this context, designing appropriate environmental institutions to strengthen corporate environmental governance becomes a determinant to confront environmental decline (Seroka-Stolka and Fijorek 2020; Zyglidopoulos et al. 2012). Prior studies primarily explore methods for enhancing corporate environmental governance within formal institutions, such as legal regulation (Du et al. 2022) and environmental auditing (Xu et al. 2022). From a theoretical standpoint, the informal system also imposes various constraints on corporate environmental governance via disciplinary supervision and internalization of transmission (Gao et al. 2021; Miller 2006), which is poorly documented in the literature.

Media, as a typical informal institution, plays a pivotal role in conveying the increasing public expectations for environmental governance in the context of digitization (Dutta et al. 2021; Shan et al. 2021). Extensive research within the media realm substantiates that media attention effectively contributes to mitigating information asymmetry, exerting public pressure through reputation, and triggering administrative intervention (Deephouse 2000; Gentzkow and Shapiro 2006; Su et al. 2022). In addition, some literature explores diverse dimensions illuminated by media attention within corporate governance, including corporate compliance (Khan and Sukhotu 2020), corporate social responsibility (Berkan et al. 2021), and green innovation (Chen et al. 2022). In light of the media attention on environmental governance, related studies focus on perspectives of regional governance (Gao and Lee 2017), corporate resource provision (Chae et al. 2020), and industrial change (Ning 2022).

However, existing literature concerning media attention and environmental governance still exhibits certain limitations. On the one hand, existing research fails to evaluate the

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mitigation of environmental pollution, particularly focusing on environmental governance practices (Burke 2022; Tang and Tang 2016). On the other hand, previous findings lack empirical evidence from developing countries. The existing body of work in this realm predominantly stems from the perspective of developed nations (Bansal and Clelland 2004; Desai 2014; Hoffman and Ocasio 2001). Accelerating industrialization in developing countries is dramatically accompanied by salient environmental pollution (Das 2020), and even some lower pollution costs lead to severe environmental degradation when integrated into the global economic framework (Das 2020; Dispensa and Brulle 2003). To a large extent, investigating the influence of media attention on environmental governance in developing countries holds vital implications for enhancing the global environment.

To bridge the research gaps, we empirically explore the impact of media attention on environmental governance, utilizing samples from China's public companies spanning from 2011 to 2021. Our primary research questions are whether and how media attention affects environmental governance and what determinants influence the relationship between media attention and environmental governance.

Our paper has three potential contributions to the existing literature. Firstly, it expands the body of knowledge concerning the impact of media on environmental governance in developing countries. While previous literature has examined how media attention influences environmental protection, such as toxic fumes (Hamilton 1995), marine pollution (Otero et al. 2021), and plastic waste (De Fano et al. 2022), there remains a need for more research investigating the governance effects of media coverage in developing nations. Thus, this paper advances the exploration of external regulation's role in corporate environmental governance.

Secondly, our work contributes to the growing body of research on media attention. While an increasing body of literature has scrutinized how media attention diminishes information asymmetry and engenders public pressure via reputation (Berkan et al. 2021; Deephouse 2000; Gentzkow and Shapiro 2006; Su et al. 2022), limited investigation has been conducted into the innovation and efficiency-enhancing impacts of media attention. In this paper, we explore whether media attention affects environmental governance by enhancing innovation and efficiency pathways, which enriches the knowledge and understanding of informal institutions in corporate governance.

Thirdly, we provide a comprehensive evaluation of the relationship between media attention and environmental governance by using a quantitative model to focus on both environmental governance practices and pollution reduction. To our current knowledge thus far, studies similar to ours, such as Tang and Tang (2016) and Kong et al. (2020), provide empirical findings of the interactions between media attention and environmental governance behavior, yet they do not consider governance inputs in corporate environmental protection. In this paper, we investigate the impact of media attention on environmental governance, focusing not solely on pollution control behavior, but also on pollutant abatement.

The remainder of this paper is organized as follows: the second section reviews the literature and develops research hypotheses based on relevant theories. The third section is the research design, including sample selection, variable settings, and model construction. The fourth section reports empirical findings, including baseline results, robustness check, and cross-sectional analysis. The fifth section provides further analysis to explore the possible implication mechanisms. The last section is a brief conclusion and provides policy implications.

Literature review and research hypothesis

Literature review

Literature study on environmental governance

Environmental governance is accompanied by positive externalities and needs to involve stakeholder cooperation to correct market failures. Environmental regulation is a pivotal way to upgrade environmental governance and address the negative externalities of pollution. According to the nature of the stakeholders, environmental regulation is divided into formal and informal environmental regulation.

Numerous studies have analyzed the impact of formal environmental regulation on environmental governance, including government auditing, economic growth targets, and other strict emission standards on the books, while the study does not reach a consistent conclusion. In particular, some research argues that formal environmental regulation has a short-term impact and that the effect of environmental governance is not linear. Hao et al. (2022) investigate that there is an inverted U-shaped relationship between economic growth targets and local ecological efficiency, together with neighboring regions. Jiang et al. (2021), Lv et al. (2023), and Razzaq et al. (2023) document that environmental regulation shows a significant and positive influence on green growth, and the marginal contribution is more substantial if the environmental regulation score is higher than 0.604. In addition, there are also some studies on the environmental impact of certain policy shocks. Cao et al. (2022) discover that the vertical management reform of auditing institutions significantly curb the intensity of pollutant emissions. Following the line of thought, Yu et al. (2022) estimate the effect of the EAS on corporate emissions and find that plants significantly reduced their sulfur dioxide (SO2) emissions under the regulatory intensity of local governments.

Regarding the impact of informal environmental regulation, the literature primarily emphasizes the governance effects of national culture, environmental information disclosure, environmental awareness, etc. Dasgupta and Roy (2023) indicate that national cultures at the country level, such as power distance, collectivism, low uncertainty avoidance, short-term orientation, and restraint dimensions, can moderate an international corporate ESG performance. Shifting focus to the micro-level, Bu et al. (2022) ascertain that the divulgence of environmental information (referred to as EID), as an informal environmental regulation involving external parties, holds the potential to not just decline pollution but also markedly improve corporate EE, especially for exporting, privately owned, and growing firms. In a similar vein, Zhang et al. (2023) emphasize that public participation in environmental governance has a significant decrease in the number of corporate environmental violations.

Literature study on media attention

As a significant manifestation of external non-institutional oversight, media attention, marked by its acute responsiveness and timeliness, can address the deficiencies in institutional oversight and assume an essential function in overseeing corporate governance. In accordance with prior scholarly investigations, there is a widespread consensus that the media plays a prominent role in the reporting and disclosure of internal corporate activities (Benton and Frazier 1976; Deephouse 2000), which serves to alleviate the opacity and information asymmetry inherent in internal corporate behavior (Durand and Vergne 2015; Fang et al. 2014). Building upon this mechanism, an extensive array of literature elucidates the pivotal significance of media attention in the realm of corporate governance, which encompasses facets such as unveiling corporate fraud (Dyck et al. 2010; Miller 2006), compelling corporate managers to adopt conduct that aligns with established norms (Farrell and Whidbee 2002), and exerting influence on decisions pertaining to governance (Ang et al. 2021), etc. Specifically, Liu and Mcconnell (2013) underscore that both the intensity and tenor of media attention possess the capacity to prompt managers to be attuned to the responsiveness of their firms' stock price fluctuations. Dang et al. (2019) reveal a correlation between positive news sentiment conveyed by the media and heightened rates of leverage adjustment. As a consequence, the findings presented in these papers have catalyzed a multitude of investigations on whether and how media coverage affects corporate governance within capital markets.

In a recent strand of literature concerning media attention, a notable focus has emerged on examining the influence of green performance, encompassing aspects such as corporate social responsibility (Yu and Chi 2021; Zyglidopoulos et al. 2012) and development efficiency (Gao et al. 2021; Sarbu 2017), as well as green innovation (Chen et al. 2022; Dai et al. 2021). A small subset of research endeavors has investigated the role of media attention within environmental governance, serving as an information disseminator and a catalyst for corrective measures. Within this domain, Tang and Tang (2016) ascertain that the media exerts an influence on corporate pollution-related actions via government and public reactions. Additionally, Kong et al. (2020) demonstrate that media attention possesses the capability to stimulate increased corporate endeavors in the realm of environmental protection. Burke (2022) discerns that the media plays a role in encouraging CEOs to address ESG issues by offering cues regarding the significance of these issues. Combined, a collection of literature underscores how media attention, as an external governance mechanism, wields an influence over environmental governance behavior.

Literature summary

While previous literature has raised awareness regarding the role of media in corporate governance, it is crucial to note that there is a lack of emphasis on the media's role in addressing environmental pollution. Despite the growing consensus that the media plays a role in shaping corporate environmental governance and behavior, there is still a lack of precise understanding regarding the exact mechanisms through which this influence occurs. Many researchers acknowledge that the media can act as a disciplinary tool for managers, bridging information gaps and exerting pressure on firms to improve their environmental practices. In addition, the majority of previous findings have predominantly concentrated on developed countries, thus necessitating the inclusion of empirical research evidence from developing countries. To address the existing research gaps, this study aims to analyze the influence of media attention on environmental governance in developing countries, considering both environmental behavior and pollution emissions.

Research hypothesis

Based on the existing literature, it is evident that media attention plays a significant role in governance by mitigating information asymmetry, enhancing reputation, and creating market pressure (Pollock and Rindova 2003). We argue that media attention, in addition to the mechanisms mentioned above, serves to amplify corporate environmental governance by boosting corporate management efficiency and fostering innovation.

Media-focused management enhancement mechanism First, media attention, coupled with extensive information disclosure, can facilitate corporate emissions reduction by addressing the issue of proxy engagement between management and major shareholders (Aerts and Cormier 2009; Bonsall Iv et al. 2020). To uphold a favorable public image and secure the backing of stakeholders, companies are motivated to enhance corporate governance, bolster management efficiency, and consequently decrease environmental pollutant emissions (Gao et al. 2021). Second, the media constrains the behavior of corporate internal controllers via revealing environmental hazards. Adverse media coverage of environmental governance results in a decrease in share price and impacts operational performance. To mitigate public crises stemming from environmental pollution, companies adopt tangible measures to enhance the quality of their corporate environmental governance and minimize pollutant emissions. An et al. (2022) reveal that in the face of negative media coverage, professional managers strategically respond to public opinion pressure while upholding their public image via conscientious and reliable disclosure of timely information, thereby securing support from stakeholders. Third, drawing from the reputation mechanism, media scrutiny of a company's environmental concerns affects the personal reputations of shareholders and managers, yielding adverse ramifications for their daily social engagements and the market competitiveness of professional managers. In pursuit of sustainable growth prospects, adept professional managers proactively adopt measures focused on diminishing pollutant emissions and fortifying corporate environmental governance, thus mitigating potential reputational harm.

Innovation mechanisms for media attention Effective environmental governance entails mitigating the risks associated with pollutant emissions in production processes while concurrently boosting innovation capacity to create new production functions that optimize resource efficiency and minimize pollutant emissions (Chen et al. 2022; Zhou et al. 2022). One of the factors that shapes innovation is media attention, which mitigates financial constraints, attracts skilled individuals, and instills a degree of confidence in enterprise innovation. On one hand, extensive media coverage diminishes the formidable risk of estimation for investors and amplifies external stakeholders' assessment of enterprises through the aggregated impact of information, consequently resulting in heightened share prices. This, in turn, aids in reducing financing costs and alleviating the capital constraints on enterprise innovation (Dang et al. 2021; Miller 2006). In this context, the infusion of significant capital empowers enterprises to bolster their innovation capabilities, thus facilitating the innovation process. On the other hand, media attention has the potential to initiate a synergistic effect in conjunction with administrative sanctions. Media coverage of violations captures regulators' attention, leading to subsequent administrative intervention that ultimately escalates administrative costs for companies (Heyes and Zhu 2019; Liu and Mcconnell 2013). This prompts the companies to prioritize technological innovation, optimize resource utilization, and minimize environmental impact.

Additionally, media attention may result in a delayed impact on corporate behavior, leading to a time lag in reflecting environmental governance performance. Stone and Mccombs (1981) and Wanta and Hu (1994) explore the time gap between media coverage and corporate governance oversight, discovering that newspapers wield a substantial and enduring agenda-setting influence. Therefore, the media, as an external entity, possesses the capacity to effectively oversee corporate conduct and play an active role in environmental governance, thereby partially mitigating the constraints of judicial protection (Dang et al. 2019; Desai 2014; Jiang et al. 2022). Building on the aforementioned analysis, this paper sets forth the following assumptions:

Hypothesis 1**:** Media attention plays a pivotal role in advancing corporate environmental governance.
Hypothesis 2: The media focuses on the role of corporate governance and exerts a delayed impact on environmental governance.

The media's involvement in corporate governance is shaped by institutional factors, including the market environment and legal framework (Nissani 1999; Su et al. 2022). Institutional factors are pivotal in molding the evolution of media organizations and institutions, ultimately shaping the caliber of news coverage (Dispensa and Brulle 2003). High-quality media attention functions as an external regulatory mechanism, influencing information dissemination, reputation management, and administrative intervention mechanisms (Kim et al. 2014). Government intervention and market competition significantly amplify the role of the media in corporate governance. Despite the development of the rule of law and marketization, particularly in developing countries, regional disparities in institutional provision persist, resulting in varying institutional environments faced by public companies in different areas.

On one hand, regions with robust legal systems demonstrate greater legal awareness and enforcement efficiency. Media organizations are inclined to proactively assume the role of agenda-setters, disseminating information to the public and shaping the perceptions of individuals and organizations. Thus, the legal framework promotes the autonomy of

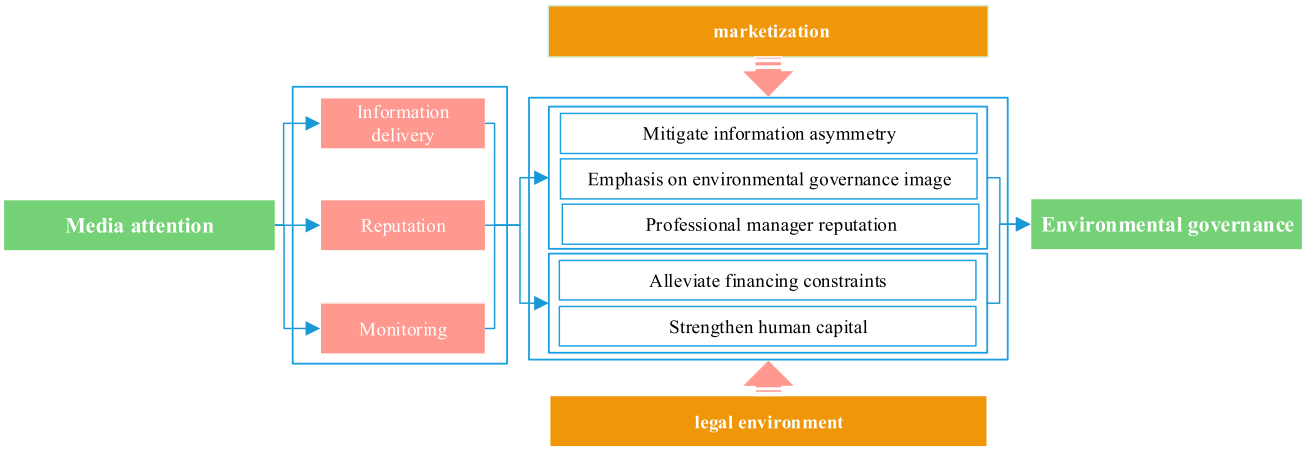


Fig. 1 Analysis framework

media institutions and improves the accuracy of their reporting content (Su et al. 2022). Media attention plays a significant role in governance, particularly in regions with favorable legal environments.

On the other hand, in regions with a higher degree of market orientation, government intervention in economic activities tends to be lower. In such circumstances, it is improbable that the government resorts to administrative measures to manipulate media coverage. Furthermore, the media in regions with substantial marketization quickly disseminates information, leading to a more pronounced market response (Gentzkow and Shapiro 2006). The institutional environment in developing countries is characterized by significant variations in marketization across regions, which, in turn, influence the role of the media. Drawing upon the analysis, the subsequent assumptions are postulated:

Hypothesis 3a: In regions with pronounced marketization, media attention exerts a more significant impact on corporate environmental governance.
Hypothesis 3b: In regions with a favorable legal environment, media attention has a greater impact on corporate environmental governance.

Figure 1 depicts the theoretical framework of the thesis.

Research design

This section provides an outline of the data sources, introduces the empirical models used, presents the specified model variables, and summarizes the key variables employed in our empirical analysis.

Sample selection

This study examines public enterprises in China as the research subject for the period from 2011 to 2021[1]. The data on media attention and environmental governance is obtained from the Chinese Research Data Services (CNRDS) database. All financial indicators and corporate governance data utilized in this study originated from the China Stock Market & Accounting Research Database (CSMAR). The CSMAR and CNRDS databases provide extensive coverage of data on the Chinese stock market. Due to the reliability of their data sources and extensive coverage, they are widely used in the academic community to support research on various aspects of the Chinese financial market, economic development, and company performance. Moreover, environmental regulation data are taken from the China City Statistical Yearbook.

To ensure the reliability of conclusions, we employ a rigorous sample screening process, as follows: (1) excluding observations from the financial industry; (2) excluding samples of companies with ST, * ST in their names; (3) excluding samples of delisted firms and firms in their first year of public listing; and (4) excluding missing values that cannot be completed using alternative methods. Additionally, we apply winsorization to the main continuous variables by trimming the top and bottom 1% of extreme values. As a result, we obtain a total of 17,156 observations.

Model specification

To investigate the causal effect of media attention on environmental governance, we draw upon the studies of Deephouse (2000) and Heyes and Zhu (2019) and formulate the following specification:

[1] The reason for choosing 2011–2021 period is that environmental responsibility variable data is collected only in 2011.

$$Environ_{it} = a_0 + a_1 Emedia_{it} + \sum Controls + \delta_i + \lambda_t + \mu_{ct} + \tau_{jt} + \varepsilon_{it} \quad (1)$$

where i represents a plant, t denotes a specific year, c denotes a province in China, and j denotes the National Standard Industrial Classification (NSIC) industries (such as textiles, food manufacturing, paper and paper products, chemical fiber manufacturing). *Environ* stands for environmental governance. *Emedia* denotes media attention, which is the explanatory variable of interest. *Controls* are a variety of variables controlling for other factors affecting environmental governance (e.g., firm size, profitability, and so on). Similarly, δ are plant fixed effects that capture time-invariant plant heterogeneity, while λ are industry-specific time fixed effects that control for industry-specific shocks at a given year. Likewise, μ are the joint fixed effect of provinces and years, and τ are the joint fixed effect of industries and years, which control for time-varying industry and regional factors on environmental governance. ε is the random perturbation term. a_1 is the core parameter of interest that capturing the governance effect of the media attention.

Variable measurements

Environmental governance

We take advantage of three indicators to assess corporate environmental governance. (1) We utilize the variable *Emiredu* to determine if a firm has implemented measures to mitigate emissions of wastewater, air pollutants, and solid waste. *Emiredu* is assigned a value of 1 if such initiatives are in place, and 0 if not. (2) *Encert* indicates whether a company holds environmental certification. When a company possesses such certification, *Encert* takes 1; otherwise, it takes 0. (3) *Inves* signifies the ratio of environmental investment to gross operating income. It encompasses expenses associated with environmental protection, such as investments in environmental protection technology and reform projects, pollution control inputs, renovation of environmental protection facilities, operation and management costs, sewage charges payment, and clean production. From a theoretical standpoint, a multitude of scholars employ the aforementioned dataset to investigate environmental governance (Liu et al. 2022).

Media attention

Following Chen et al. (2022), media attention is judged by quantifying the occurrence of terms related to corporate environmental governance in a specific newspaper[2]. From the practical side, media attention related to corporate environmental matters is described by explicit terms in the headlines. These terms cover various topics, including environmental regulations, suspected pollution, environmental protection, environmental investment, cases of environmental pollution, governmental environmental actions, circular economy practices, environmental insurance, and environmental taxes. To mitigate potential heteroskedasticity, the logarithm of the media report count plus one is employed to denote media attention (*Emedia*).

Control variables

Referring to previous literature (Du et al. 2022; Liu et al. 2022; Xu and Zheng 2022), we include controls for variables pertaining to firm characteristics, corporate governance, and macro-environmental regulations. The specific control variables considered are as follows: enterprise size (*Lnasset*), asset–liability ratio (*Leverage*), return on total assets (*Roa*), growth rate of fixed assets (*PPE*), cash flow from operating activities (*Cash*), operating revenue growth rate (*Ope*), shareholdings of the top ten shareholders (*Topten*), ratio of independent directors (*Indep*), presence of a combined chairman and general manager (*Dual*), firm ownership structure (*State*), and environmental regulation (*ER*). Table 1 displays the detailed definitions of these variables in the model specification.

Summary statistics and correlations

Table 2 displays the descriptive statistics for the variables in Eq. (1). The median of *Emiredu* is 1, with an average value of 0.806, indicating that a substantial number of plants are implementing measures to reduce wastewater, air, and solid waste emissions. The median of *Encert* surpasses the mean, indicating a growing trend of enterprises prioritizing environmental certification for the sake of environmental protection. *Inves* exhibits a median and mean of 0.067 and 0.038, respectively, along with a standard deviation of 0.084, suggesting that most companies do not significantly invest in environmental protection and exhibit considerable variability across different companies. As for *Emedia*, the mean is 4.307, and the median is 4.382, implying that China's listed companies from various industries receive widespread media attention, while the sample distribution in this study remains relatively uniform. Lastly, the remaining control variables align with prior research (Xu & Zheng 2022).

Table 3 presents the Pearson and Spearman correlation matrices for the main variables. The results reveal that the anticipated associations between media attention (*Emedia*) and corporate environmental governance (*Emiredu*, *Encert*, *Inves*) are significantly positive, providing preliminary support for hypothesis 1 of this paper. Moreover, the findings reveal that enterprises demonstrating heightened profitability and business prowess, as evidenced by *Cash*, *Ope*, *Indep*, and *Dual*, tend to accord greater precedence to environmental governance.

[2] We focus on eight highly authoritative business newspapers, including Securities Daily, China Securities Journal, Shanghai Securities News, Securities Times, and China Business News.

Table 1 The definition of variables

Variables	Definitions
Dependent variables	
Emiredu	Emiredu equals 1 means that a plant implements measures to reduce the emissions of wastewater, air, and solid waste; otherwise it equals 0
Encert	Encert equals 1 represents that a plant has environmental certification and equals 0 otherwise
Inves	The ratio of environmental investment to gross operating income
Core explanatory variable	
Emedia	The logarithm of the total number of environment-related stories published by firms in given newspapers each year plus one
Controls	
Lnasset	The logarithm of assets
Leverage	The book value of total liabilities divided by lagged total assets
Roa	Net profit divided by total assets
PPE	Capital expenditures divided by assets
Cash	The ratio of cash flow from operations to total assets at the end of each year
Ope	The ratio of operating income from operations to total assets at the end of each year
Topten	Top 10 shareholders' shareholdings divided by total shares
Indep	The number of independent directors divided by the total number of directors
Dual	Dual equals 1, which means that the chairman and the general manager are the same person. Otherwise, dual equals 0
State	For the state-owned firm, it takes 1; otherwise, it takes 0
ER	Industrial sulfur dioxide removal ratio in prefecture-level cities

Table 2 Descriptive statistics

Variables	*N*	Mean	SD	P10	Median	P90
Emiredu	17156	0.806	0.395	0.000	1.000	1.000
Encert	17156	0.746	0.436	0.000	1.000	1.000
Inves	17156	0.067	0.084	0.013	0.038	0.183
Emedia	17156	4.307	1.161	2.996	4.382	5.606
Lnasset	17156	22.249	1.538	20.611	21.967	24.234
Leverage	17156	0.423	0.250	0.140	0.408	0.715
Roa	17156	0.036	0.148	0.001	0.039	0.103
PPE	17156	0.202	0.166	0.023	0.164	0.440
Cash	17156	0.170	0.137	0.041	0.131	0.356
First	17156	0.349	0.152	0.162	0.331	0.559
Ope	17156	0.351	5.742	−0.054	0.106	0.571
Topten	17156	0.600	0.155	0.386	0.612	0.779
Indep	17156	0.378	0.057	0.333	0.364	0.429
Dual	17156	0.292	0.455	0.000	0.000	1.000
State	17156	0.440	0.496	0.000	0.000	1.000
ER	17156	0.651	0.062	0.227	0.667	0.703

Empirical results

In this section, we present empirical assessments of the interplay between media attention and environmental governance using data from Chinese publicly traded firms. Our analysis commences by scrutinizing the magnitude of media attention. Subsequently, we investigate the potential delayed impact of media attention on environmental governance by incorporating a lagged variable of interest. Finally, we apply a series of robustness tests to ensure the reliability of the baseline estimation results.

Benchmark regression

Table 4 exhibits the coefficients of media attention on corporate environmental governance in Eq. (1). The results in

Table 3 Correlation coefficients for the main variables

	Emiredu	Encert	Inves	Emedia	Lnasset	Leverage	Roa	PPE	Cash	First	Ope	Topten	Indep	Dual	State	ER
Emiredu	1	0.832***	-0.166***	0.097***	-0.322***	-0.175***	0.049***	-0.072***	0.069***	-0.115***	0.061***	-0.016**	0.042***	0.129***	-0.244***	-0.083***
Encert	0.832***	1	-0.233***	0.126***	-0.435***	-0.236***	0.062***	-0.066***	0.104***	-0.135***	0.075***	-0.047***	0.025***	0.157***	-0.302***	-0.124***
Inves	-0.200***	-0.304***	1	0.446***	0.335***	0.163***	0.031***	-0.050***	-0.010	0.100***	0.090***	0.110***	0.030***	-0.045***	0.098***	0.137***
Emedia	0.066***	0.098***	0.495***	1	0.193***	0.122***	0.011	-0.045***	-0.003	-0.025***	0.118***	0.006	0.022***	-0.019**	-0.033***	0.025***
Lnasset	-0.304***	-0.455***	0.527***	0.237***	1	0.555***	-0.156***	0.067***	-0.280***	0.178***	-0.026***	0.042***	-0.040***	-0.249***	0.425***	0.189***
Leverage	-0.137***	-0.191***	0.187***	0.080***	0.438***	1	-0.467***	0.040***	-0.427***	0.044***	-0.050***	-0.126***	-0.009	-0.178***	0.345***	0.016**
Roa	-0.005	0.007	0.026***	0.006	-0.015**	-0.207***	1	-0.054***	0.338***	0.112***	0.397***	0.286***	-0.009	0.093***	-0.256***	0.127***
PPE	-0.111***	-0.114***	-0.036***	-0.049***	0.109***	0.075***	-0.016**	1	-0.294***	0.112***	-0.143***	0.020***	-0.073***	-0.083***	0.114***	0.080***
Cash	0.084***	0.119***	-0.022***	-0.004	-0.272***	-0.385***	0.150***	-0.314***	1	0.031***	0.183***	0.142***	0.022***	0.093***	-0.141***	0.030***
First	-0.117***	-0.138***	0.148***	-0.018**	0.221***	0.020***	0.085***	0.122***	0.022***	1	0.031***	0.594***	0.032***	-0.053***	0.174***	0.557***
Ope	0.014*	0.018**	-0.009	-0.007	0.013*	0.016**	0.014*	-0.016**	0.009	0.015**	1	0.222***	0.002	0.102***	-0.210***	0.050***
Topten	-0.020***	-0.057***	0.168***	0.029***	0.153***	-0.118***	0.129***	0.027***	0.148***	0.616***	0.040***	1	0.038***	0.055***	-0.071***	0.659***
Indep	0.038***	0.021***	0.066***	0.037***	0.007	0.009	-0.015**	-0.061***	0.017**	0.046***	-0.001	0.028***	1	0.106***	-0.053***	0.042***
Dual	0.129***	0.157***	-0.069***	-0.002	-0.229***	-0.154***	0.016**	-0.107***	0.107***	-0.064***	0.006	0.046***	0.098***	1	-0.291***	-0.031***
State	-0.244***	-0.302***	0.146***	-0.043***	0.418***	0.294***	-0.073***	0.182***	-0.156***	0.185***	-0.004	-0.058***	-0.043***	-0.291***	1	0.106***
ER	-0.099***	-0.149***	0.238***	0.059***	0.300***	0.052***	0.043***	0.082***	-0.001	0.510***	0.014*	0.545***	0.038***	-0.045***	0.138***	1

Table 3 reports Pearson and Spearman correlations for variables in Eq. (1). Lower triangular cells report Pearson's correlation coefficients, and upper triangular cells are Spearman's rank correlation. The variable definitions are presented in Table 1. ***, **, and * indicate the statistical significance at the 1%, 5%, and 10% significance levels, respectively

columns (1)–(2) manifest substantially positive coefficients for *Emedia*, with a remarkable 1% level of statistical significance, suggesting that media attention plays a pivotal role in diminishing pollutant emissions like wastewater, pollutant gases, and solid waste. In the same vein, the results are in line with those of Tang and Tang (2016). Moreover, column (3) showcases a notably positive coefficient for *Emedia* at the significant 1% statistical level, indicating that a 1% upswing in media attention corresponds to an 18.6% escalation in environmental investments. To conclude, media attention possesses considerable potential to significantly contribute to environmental remediation endeavors, thus lending substantial support to hypothesis 1.

A plausible explanation stems from the unique role of the media in China's capital market, where it functions as an independent "fourth power," distinct from legislative, administrative, and judicial authorities. Through timely, accurate, and impartial reporting (Jacobson et al. 2020), the media assumes a supervisory role in the capital market (Hossain and Javakhadze 2020). Under the influence of external oversight (Marchand et al. 2021), plants are compelled to take on the responsibility of environmental protection.

Concerning the control variables, corporate operations (*Ope*) yield a statistically significant positive impact, suggesting that higher profitability cultivates the adoption of social and environmental practices. Furthermore, in the majority of the proposed models, *Topten* exerts a statistically substantial influence on environmental governance, implying that leveraging diversified shareholdings to strengthen corporate oversight can effectively enhance environmental governance performance.

Table 5 presents the estimations of the lagged effects of media attention on corporate environmental governance to explore delayed impacts. Columns (1)–(3) display the extent of media attention on corporate environmental governance in the preceding period. The coefficients of *L1Emedia* are statistical significance at the 5% and 1% levels, respectively. However, the coefficient of *L1Emedia* does not exhibit a statistically significant response to *Encert*. One plausible explanation is that plants need to comply with stringent environmental standards for implementing environmental certification, and over time, the impact of media attention tends to decrease, leading to the insignificance of the coefficient. In a similar vein, columns (4)–(6) depict the extent of media attention across two previous periods of environmental governance. The coefficients remain statistical significance with a lag of one period, except for column (4) where it is statistically insignificant.

Environmental investment represents the allocation of corporate resources for environmental governance, playing a pivotal role in ecological governance (De Fano et al. 2022; Gao et al. 2021; Liu et al. 2022). The magnitudes of *L1Emedia* and *L2Emedia* consistently exhibit significant positive

Table 4 Media attention and the environmental governance

Variables	(1) Emiredu	(2) Encert	(3) Inves
Emedia	0.010***	0.013***	0.186***
	(2.690)	(4.011)	(25.147)
Lnasset	–0.059***	–0.067***	0.076***
	(–7.727)	(–8.712)	(6.349)
Leverage	–0.019	–0.006	0.025
	(–1.241)	(–0.359)	(0.928)
Roa	–0.017	0.007	–0.003
	(–1.091)	(0.562)	(–0.081)
PPE	0.002	–0.079*	–0.010
	(0.040)	(–1.930)	(–0.145)
Cash	0.028	–0.017	0.129***
	(1.003)	(–0.656)	(2.748)
First	–0.089	–0.094	–0.061
	(–1.378)	(–1.591)	(–0.672)
Ope	0.001**	0.001**	0.002***
	(2.391)	(2.555)	(3.398)
Topten	0.197***	0.146***	0.057
	(4.384)	(3.572)	(0.806)
Indep	0.123*	0.098*	–0.029
	(1.739)	(1.683)	(–0.286)
Dual	–0.002	–0.005	0.010
	(–0.216)	(–0.586)	(0.693)
State	–0.039***	–0.032***	–0.015
	(–3.997)	(–3.283)	(–0.923)
ER	–0.048	0.149	0.258
	(–0.411)	(1.484)	(1.536)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes
Province × Year FE	Yes	Yes	Yes
Cluster by firm	Yes	Yes	Yes
Intercept	1.999***	2.034***	–2.022***
	(11.031)	(11.036)	(–7.213)
Adj-R^2	0.607	0.771	0.792
F	7.744	9.224	51.60

Table 4 (continued)

Variables	(1) Emiredu	(2) Encert	(3) Inves
N	17,156	17,156	17,156

Reports estimated results based on Eq. (1). The variables are listed in Table 1. Robust *t*-statistics are reported in parentheses. All variables are defined in Table 1. ***, **, and * indicate the statistical significance at the 1%, 5%, and 10% significance levels, respectively

effects, indicating a lasting impact of media attention on environmental governance. By and large, media attention demonstrates a long-term impact on corporate environmental governance, validating our hypothesis 2.

Robustness checks

Instrumental variables

An identification concern arises regarding the possible presence of reverse causation between media attention and environmental governance. On one hand, media attention has the capacity to amplify environmental governance by exerting external pressure. On the other hand, plants that prioritize environmental governance are likely to receive significant media attention, benefiting from a demonstration effect. Hence, our study is susceptible to empirical estimation bias resulting from reverse causality.

In response to endogenous interference, guided by the works of Goldsmith-Pinkham et al. (2020) and Imbert et al. (2022), we utilize the interaction between the lagged one-period difference term of media attention and real-time media attention as the instrumental variable. Furthermore, we employ the two-stage least squares method (2SLS) for estimation. On one hand, media attention offers real-time tracking capabilities, and the one-period lagged variable exhibits a correlation with media attention in the current period, thereby satisfying the conditions of instrumental variable correlation. On the other hand, the lagged media attention from the preceding period coincides with the time interval of environmental governance, meeting the exogeneity requirement for instrumental variables.

Prior to conducting regression analysis, we initiate instrumental variable testing. Relevance and exogeneity are two essential prerequisites for a proficient instrumental variable. The Anderson LM test yields a *p*-value of 0.000, leading to the substantial rejection of the null hypothesis. This signifies the absence of identification issues in the model and the relevance of the instrumental variable to the endogenous explanatory variables. The *p*-value resulting from the Sargan test is 0.386, suggesting the suitability of the chosen instrumental variable in this study. As the count of instrumental variables matches the number of core explanatory variables, an unidentifiability test is unnecessary for the empirical examination.

Table 6 presents the coefficients of the 2SLS regression for media attention and environmental governance across columns (1)–(3). The coefficients for *Emedia* are all significantly positive. Preliminary findings suggest that the impact of media attention on environmental governance remains evident even after accounting for endogeneity.

Table 5 Media attention and the lagging effect of the environmental governance

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Emiredu	Encert	Inves	Emiredu	Encert	Inves
L1Emedia	0.012**	0.003	0.070***			
	(2.271)	(0.735)	(10.543)			
L2Emedia				0.005	−0.000	0.032***
				(0.807)	(−0.114)	(5.064)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Province × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster by firm	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	−0.127	2.124***	−1.766***	0.232	2.080***	−1.524***
	(−0.412)	(11.072)	(−5.809)	(0.673)	(9.979)	(−4.369)
Adj-R^2	0.335	0.773	0.770	0.364	0.774	0.775
F	2.858	7.602	12.64	1.175	6.780	6.091
N	14,843	14,843	14,843	12,685	12,685	12,685

Robust *t*-statistics are reported in parentheses. The controls include Lnasset, Leverage, Roa, PPE, Cash, First, Ope, Topten, Indep, Dual, State, and ER. All variables are defined in Table 1. ***, **, and * indicate the statistical significance at the 1%, 5%, and 10% significance levels, respectively

Table 6 Endogenous treatment between media attention and environmental governance

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Emiredu	Encert	Inves	Emiredu	Encert	Inves
Emedia	0.010*	0.010**	0.405***	0.011***	0.013***	0.177***
	(1.818)	(2.097)	(24.826)	(2.882)	(3.747)	(23.588)
IMR				−0.124**	−0.095**	0.165**
				(−2.359)	(−2.068)	(2.071)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Province × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster by firm	Yes	Yes	Yes	Yes	Yes	Yes
Adj-R^2	−0.0176	−0.0106	−0.0718	0.614	0.769	0.755
F	7.390	8.419	55.11	6.271	7.289	42.20
N	17,156	17,156	17,156	17,156	17,156	17,156

Robust *t*-statistics are reported in parentheses. The controls include Lnasset, Leverage, Roa, PPE, Cash, First, Ope, Topten, Indep, Dual, State, and ER. All variables are defined in Table 1. ***, **, and * indicate the statistical significance at the 1%, 5%, and 10% significance levels, respectively

Heckman two-stage analysis

Addressing the selection bias in our study samples is imperative, as it compromises the reliability of the estimated coefficient of the variable of interest. Some unobservable latent variables may also influence media attention and corporate environmental responsibility performance. To account for this potential problem, we utilize the Heckman model to examine the influence of media attention on environmental governance.

Table 6 displays the coefficients derived from the Heckman model estimation across columns (4)–(6). More specifically, the coefficients of *IMR* in columns (4)–(6) are each statistically significant at the 5% level, underscoring the importance of accounting for sample selection bias in our empirical analysis. Furthermore, upon integrating *IMR* into the model, the coefficients of *Emedia* in columns (4)–(6) exhibit significant positive effects at the 1% level of statistical significance, signifying the media's ability to augment environmental governance despite

Table 7 Other robustness check

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variables	Emiredu	Encert	Inves	Emiredu	Encert	Inves	Lnpollute
Netmedia	0.009**	0.007**	0.265***				
	(2.148)	(2.020)	(28.253)				
Emedia				0.012***	0.012***	0.170***	−0.032**
				(3.117)	(3.476)	(21.175)	(−2.516)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster by firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	1.988***	2.134***	−1.500***	1.974***	2.003***	−1.825***	0.253
	(11.448)	(12.041)	(−5.860)	(9.076)	(8.962)	(−5.511)	(0.444)
Adj-R^2	0.610	0.767	0.789	0.697	0.853	0.780	0.0762
F	7.540	8.412	65.57	4.280	4.579	36.00	2.927
N	17,156	17,156	17,156	12,756	12,756	12,756	17,156

Robust *t*-statistics are reported in parentheses. The controls include Lnasset, Leverage, Roa, PPE, Cash, First, Ope, Topten, Indep, Dual, State, and ER. All variables are defined in Table 1. ***, **, and * indicate the statistical significance at the 1%, 5%, and 10% significance levels, respectively

the sample bias. In summary, the coefficient of media attention on environmental governance remains consistent with the core findings even after addressing the sample selection bias.

Remeasuring media attention

To ensure the robustness of our findings, we quantify media attention using the natural logarithm of the annual count of plants covered by online media plus one (*Netmedia*). This approach is motivated by the fact that the Internet has emerged as the predominant platform for information dissemination and communication in the digital age. Given the swift diffusion of online reports, these reports concerning business activities can exert external pressures that influence corporate activities. The findings are displayed in columns (1)–(3) of Table 7. Notably, the estimates for *Netmedia* are statistically significant and positive, indicating that media attention exerts a significant impact on environmental governance, regardless of variations in the metric used to quantify media attention.

Excluding the impact of network regulatory policy

China's government places significant emphasis on its regulatory role in the market and, as a result, implements policies that reshape the trajectory of business management. In July 2020, China's government promulgated the Inter-Ministerial Joint Conference System on Internet Market Supervision with the aim of bolstering the rule of law in the online market. To eliminate the influence of this policy, we excluded the data samples from 2020, the year when the policy was enacted, and subsequent years. The results are depicted in columns (4)–(6) of Table 7. After excluding the samples, the coefficient of media attention on environmental governance remains statistically significant and positive at the 1% level. This outcome underscores the robustness of our empirical findings.

Measuring environmental governance from the emissions side

In the benchmark regression, our primary focus is the input side of environmental governance, encompassing environmental governance behavior and eco-friendly investments. Nonetheless, the ultimate objective of environmental governance lies in achieving emission reduction, which can also serve as a valid proxy for assessing its effectiveness. Subsequently, we utilize the logarithm of pollutant emissions plus 1 (*Lnpollute*) as an evaluative metric to assess the effectiveness of environmental governance. The data is sourced from the CNRDS database. Column (7) in Table 7 provides the reported estimate. The coefficient of *Emedia* exhibits a notably negative association at the 1% statistical significance level, indicating the potential of media attention to mitigate pollutant emissions. Hence, our testing procedure has reaffirmed the robustness of the foundational findings.

Heterogeneity analysis

In the fourth section, we establish that media attention has a substantial impact on environmental governance. Furthermore, this conclusion remains robust even after addressing endogeneity concerns through treatment and conducting an array of rigorous tests for validity. Within this section, we investigate the diverse factors that impact media attention toward environmental

Table 8 Heterogeneity analysis

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Emiredu	Encert	Inves	Emiredu	Encert	Inves
Emedia	−0.003	0.006	0.171***	−0.004	0.005	0.177***
	(−0.622)	(1.439)	(17.581)	(−0.519)	(0.846)	(22.582)
Marabi	−0.076***	−0.052***	−0.077*			
	(−3.054)	(−2.711)	(−1.939)			
Marabi×Emedia	0.018***	0.010**	0.016*			
	(3.292)	(2.382)	(1.717)			
Legal				−0.085***	−0.058**	−0.086*
				(−2.653)	(−2.035)	(−1.865)
Legal×Emedia				0.019***	0.012*	0.019*
				(2.681)	(1.959)	(1.789)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Province × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster by firm	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	2.026***	2.152***	−1.862***	2.043***	2.175***	−1.907***
	(11.532)	(12.130)	(−6.775)	(11.413)	(12.220)	(−6.924)
Adj-R^2	0.611	0.767	0.778	0.611	0.767	0.778
F	7.190	8.096	44.28	7.378	8.496	44.80
N	17,156	17,156	17,156	17,156	17,156	17,156

Given that the latest version of China's provincial marketization index is available until 2020, we use the linear difference method to complement the missing values. Robust *t*-statistics are reported in parentheses. The controls include Lnasset, Leverage, Roa, PPE, Cash, First, Ope, Topten, Indep, Dual, State, and ER. All variables are defined in Table 1. ***, **, and * indicate the statistical significance at the 1%, 5%, and 10% significance levels, respectively

governance. This exploration encompasses the significant influence exerted by regional marketization and the rule of law.

Heterogeneity in marketization

To test hypothesis 3, we utilize the marketability index as a surrogate for marketability (*Marabi*), a variable widely used in empirical studies (Zeng et al. 2021). Columns (1)–(3) in Table 8 illustrates the impact of media attention on environmental governance varying across different levels of marketability. The coefficients related to the interaction term (*Marabi*×*Emedia*) all exhibit significant positive values, indicating that media possesses a heightened capacity to bolster environmental initiatives, amplify environmental certifications, and facilitate environmentally sustainable development in regions characterized by elevated degrees of marketization. In essence, the media functions as a monitoring mechanism that augments environmental amelioration, fostering a more liberal market economy, in alignment with hypothesis 3 of our study. We argue that there is a complementary relationship between media attention and marketization. In regions with heightened market viability and greater responsiveness to information, firms allocate more attention to their social reputation—a dimension significantly impacted by media regulation.

Heterogeneity in the legal environment

To test hypothesis 4, we adopt the ratio of closed cases to total annual trials in courts where firms are located as an indicator of the normative strength of the social rule of law environment. The number of court cases is manually collected using the comprehensive database maintained by Peking University, which compiles information on court proceedings across all regions of China. Columns (4)–(6) in Table 8 demonstrate the impact of media attention on environmental governance across diverse legal contexts. The coefficients of the interaction term (*Legal*×*Emedia*) are statistically positive, suggesting that media plays a role in intensifying environmental efforts and promoting environmental certification, particularly in more strictly regulated legal environments. From the theoretical side, this can be attributed to the higher opportunity costs faced by plants in regions with stricter legal enforcement, which compel them to proactively address environmental concerns under media scrutiny. These empirical results support hypothesis 4.

Table 9 Mechanism analysis

	(1)	(2)	(3)
Variables	Awareness	ADF	Invention
Emedia	0.015***	0.002***	0.009***
	(3.249)	(2.652)	(4.036)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes
Province × Year FE	Yes	Yes	Yes
Cluster by firm	Yes	Yes	Yes
Intercept	−3.491***	0.672***	1.467***
	(−15.729)	(11.513)	(12.004)
Adj-R^2	0.397	0.999	0.767
F	79.72	13415	9.022
N	17,156	17,156	17,156

Robust *t*-statistics are reported in parentheses. The controls include Lnasset, Leverage, Roa, PPE, Cash, First, Ope, Topten, Indep, Dual, State, and ER. All variables are defined in Table 1. ***, **, and * indicate the statistical significance at the 1%, 5%, and 10% significance levels, respectively

The hypothesis posits that media attention has the capacity to heighten public consciousness regarding environmental preservation, consequently exerting external pressure on corporate governance. To uphold favorable public perceptions, corporate leaders implement diverse strategies to enhance environmental management, boost operational efficiency, and curtail pollutant emissions. Moreover, executives prioritize augmenting innovation capabilities to mitigate production risks and foster sustainable growth. In essence, the potential mechanisms by which media attention impacts environmental governance include promoting public environmental awareness, improving corporate governance, and fostering innovation.

The mechanism variables are established as follows: firstly, we employ text analysis to formulate indicators of corporate environmental awareness (*Awareness*). In particular, we utilize the count of environmental-related terms present in annual reports to reflect the emphasis on corporate environmental protection. These terms encompass "energy saving and emission reduction," "environmental protection strategy," "environmental protection concept," "environmental management organization," "environmental education," "environmental training," "environmental technology development," and "environmental audit." The tally of environmental terms in the reports of the listed companies is detailed in the Appendix. Secondly, following Ackerberg et al. (2015), we utilize total factor productivity as a gauge of operational efficiency (*ADF*). Furthermore, we quantify innovation prowess through annual company patent applications for inventions. To account for heteroscedasticity,

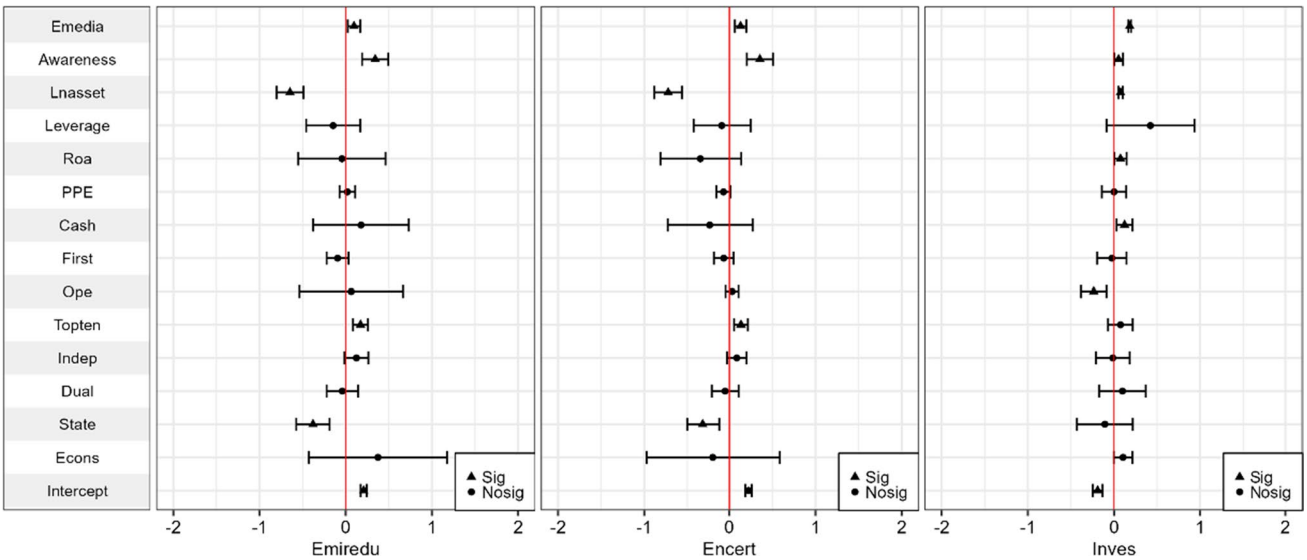


Fig. 2 Awareness and environmental governance

Further discussions

Preceding sections have presented evidence indicating that media attention holds the potential to augment environmental governance, particularly in regions marked by higher levels of marketization and a more robust rule of law framework. In this section, we explore how media attention contributes to enhancing environmental governance.

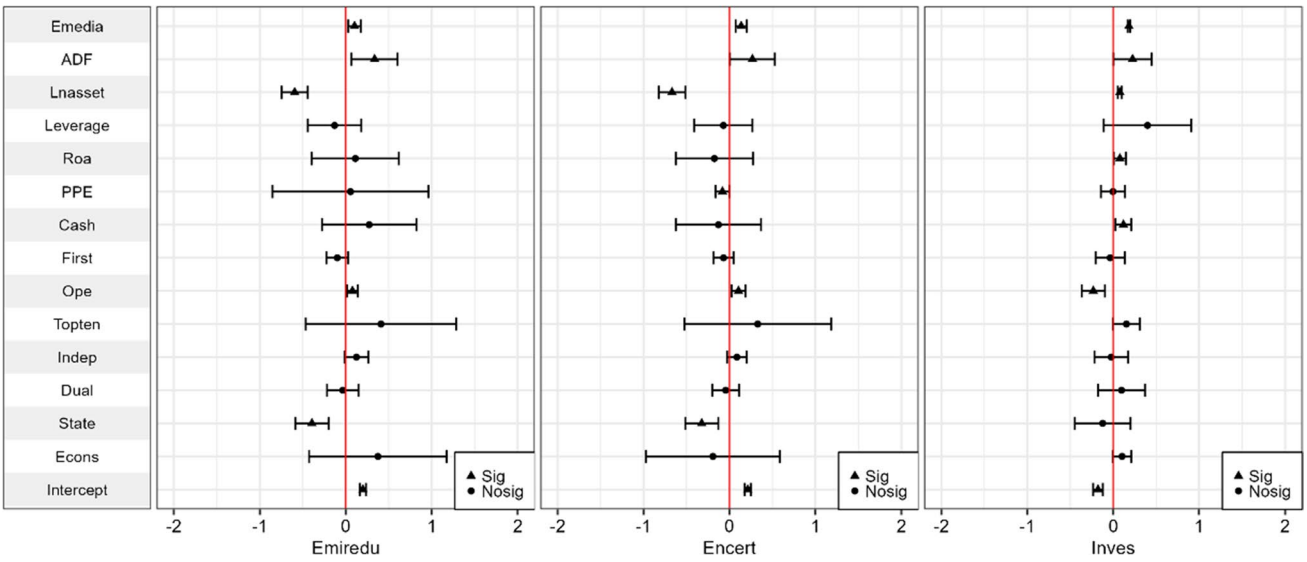
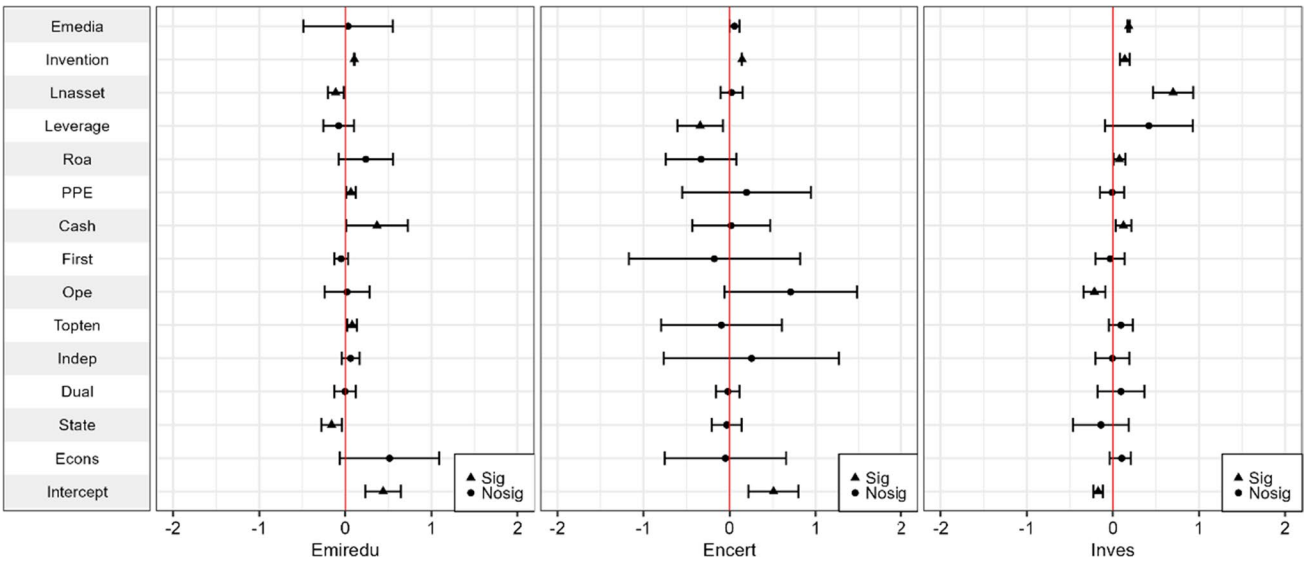


Fig. 3 ADF and environmental governance



Notes: Fig 2-4 illustrate the magnitudes of mechanism variables (*Awareness, ADF, Invention*) on environmental governance (*Emiredu, Encert, Inves*), respectively, after accounting for media attention. The results incorporate Firm FE, Year FE, Industry×Year FE, Province×Year FE. Notably, the coefficients of the mechanism variables (Awareness, ADF, Invention) are positive, thus providing initial validation of our theoretical analysis.

Fig. 4 Innovation and environmental governance

we apply the logarithm transformation to patent counts (*Invention*).

Table 9 presents the estimates illustrating the influence of media attention on mechanism variables. The *Emedia* estimates for *Awareness*, *ADF*, and *Invention* all exhibit significant positive associations at the 1% statistical significance level. This implies that media attention exerts external pressure on corporate governance by disseminating environmental information to the public. Moreover, it enhances corporate operational efficiency to bolster environmental governance performance and extends technological support for reinforcing environmental governance. To sum up, the foregoing outcomes underscore media attention's constructive impact on heightening public awareness of environmental protection, amplifying operational efficiency, and augmenting innovation capabilities.

To validate the mechanism, it is imperative to examine the relationship between the mechanism variables and the core explanatory factors. Figures 2, 3, and 4 depict the impact of mechanism variables on environmental governance, taking into account the influence of media attention. As illustrated in Figs. 2, 3, and 4, the mechanism variables

(*Awareness*, *ADF*, *Invention*) all exhibit statistically significant positive effects. These effects coincide with a reduction in the estimate of media attention's impact on environmental governance and, in some cases, even with lack of statistical significance. Aligning with the findings in Table 9, it is evident that enhancing public environmental awareness, optimizing operational efficiency, and fostering innovation constitute the underlying mechanisms through which media attention impacts environmental governance.

Conclusions and policy implications

Conclusions

This research leverages comprehensive datasets from publicly traded Chinese enterprises between 2011 and 2021 to rigorously examine the role of media attention in shaping corporate environmental stewardship. The findings yield the following conclusions: (1) media attention significantly influences governance behavior, environmental investment, and overall environmental governance. This conclusion maintains its robustness even after considering endogeneity and conducting various supplementary tests. (2) Analysis of heterogeneity reveals that media in regions with more advanced market development have a greater ability to boost environmental governance performance than those in regions with less developed business structures. Furthermore, the influence of media attention on environmental governance is more pronounced in regions known for their adherence to the rule of law. (3) The analysis of mechanisms indicates that the media serves as an "oversight instrument" in championing environmental governance. Specifically, in the face of external oversight, media attention augments environmental governance by heightening public awareness, refining internal management procedures, and fostering innovative approaches to diminish environmental damage.

Policy implications

Companies should not prioritize profit maximization exclusively but should also focus on environmental enhancement. Media attention consistently applies pressure on businesses, driving them to embrace the path of sustainable development. In light of these findings, we put forth the following recommendations.

(1) The media plays a pivotal role in promoting ecological progress and advocating for environmentally conscious production. Primarily, it is advisable to establish a transparent communication environment that encourages the media to highlight corporate environmental initiatives and disclose environmentally harmful activities. Furthermore, the media should proactively raise public awareness about the importance of environmental preservation. By evaluating corporate environmental efforts, plants can be encouraged to pursue sustainable development.

(2) Plants should take a proactive approach to adopting environmental protection strategies and strengthening their commitment to technological innovation. More precisely, plants should increase investment in environmental protection and strive to transition from a wasteful economy to a more efficient and sustainable one through innovation. Moreover, it is necessary to establish internal norms in accordance with the ISO 14001 standard and embrace sustainable development practices. Adhering to strict environmental standards not only reduces environmental impacts, but also fosters employees' environmental awareness and enhances their reputation in the public sphere. As a final point, the media should prioritize reporting on corporate initiatives aimed at reducing emissions, while advocating for technological advancements, and simultaneously endeavor to establish a symbiotic context that enhances both environmental sustainability and financial performance.

(3) Government departments have a crucial role in ensuring the effectiveness of laws and regulations, as well as leveraging market-based mechanisms such as pricing to curb emissions. On the one hand, the government can establish sewage charges based on scientific grounds to encourage plants to bear greater environmental responsibility. Additionally, it is imperative to implement strengthened legal deterrent measures such as enhanced environmental monitoring and penalties for environmental pollution. On the other hand, government departments should actively disclose environmental information in annual financial reports and be subject to media scrutiny, which promote clean production, green operations, and waste reduction.

Deficiencies and prospects

It is important to acknowledge some limitations of this study. Firstly, there are certain constraints in measuring media attention. For instance, we solely focus on the quantity of media attention, without considering the impact of the tone of media coverage. Secondly, we have not investigated the economic ramifications of media attention in relation to environmental governance, such as corporate financial performance or innovation quality. Furthermore, an external viewpoint that examines the impact of media attention on environmental governance, considering factors like financial constraints and product competitiveness, could provide valuable insights Fig. 5.

Appendix

Fig. 5 Word cloud of corporate environmental awareness

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Data availability The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical approval The submitted manuscript is original and has not been published elsewhere in any form or language.

Consent to participate It is confirmed that this manuscript has been participated by all the co-authors.

Consent for publication It is confirmed that the publication of the manuscript has been participated by all the co-authors.

Competing interests The authors declare no competing interests.

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