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UNVEILING LEADERSHIP DYNAMICS AND TOURNAMENT INCENTIVES: INSIGHTS FROM THE ENVIRONMENTAL MISCONDUCT OF CHINESE LISTED COMPANIES

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Abstract. This study investigates whether the tournament compensation motivate executives to adopt environmentally responsible practices and reduce environmental violations. Focusing on CEO characteristics, we also examine whether politically connected CEOs and CEO gender enhance the effectiveness of these incentives in mitigating corporate environmental violations. Using a fixed-effects model, two stage least square (2-SLS) and the Generalized Method of Moments (GMM) on data from Chinese companies, spanning from 2010 to 2023, this study finds that executive tournament incentives play a significant role in reducing environmental violations. Our results further reveal that political connections and female CEOs strengthen the negative relationship between tournament incentives and environmental violations, demonstrating the critical influence of leadership diversity and institutional ties in driving corporate sustainability. Additionally, our findings provide robust support for tournament theory, highlighting the pivotal role of CEOs in shaping corporate environmental behaviour. This study provides pertinent insights for regulators and policymakers, assisting them to develop tailored strategies, regulations and legislative frameworks to reduce environmental violations and improve sustainable development.

Keywords: corporate environmental violation, CEO tournament incentives, tournament theory, political connection, CEO gender, China.

JEL Classification: Q56, G34, Q01, M14.

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1. Introduction

Nowadays, environmental quality is greatly deteriorating in emerging economies, and efforts to reduce carbon emissions have garnered global attention (Kagzi et al., 2024; Lingaitienė et al., 2021). Despite a significant amount of effort put into the exploration of renewable energy development and green technology adoption (Wang & Jiang, 2021), widespread corporate environmental violations are still a major issue. Corporate environmental violations involve behaviors that occur during the production of a company that contravene existing environmental laws which result in governments' formal sanctioning (Gong & Yang, 2025). Pollution related to water, air, and improper solid waste management resulting from such violations poses serious threats to both human health and ecosystems (Chircop et al., 2025).

The harmful nature of environmental violations is attracting focus of policymakers, investors and scholars (Gong & Yang, 2025; Jin et al., 2024).

To address corporate environmental violations requires robust internal governance and leadership engagement (Khalid et al., 2025). Within the corporate governance structure, top management – particularly CEOs – play a pivotal role in setting environmental priorities and ensure compliance with environmental standards (Ali et al., 2020). Being strategic leaders, chief executives have an impact on operational decisions, and long-term sustainability orientation (Arena et al., 2018; Gu et al., 2021). Their leadership is key in ensuring corporate culture for ethical responsibility.

A number of studies have looked at a variety of aspects of CEO characteristics, such as styles of senior leadership, ethical decision-making, and strategic orientations and their relationship to environmental and sustainable behaviours (Arena et al., 2018; Javed et al., 2023; Tang & Li, 2024). One emerging but less explored area of interest is CEO tournament incentives – compensation mechanisms that reward the CEO when they outperform other executives (Ali et al., 2020; Cao et al., 2019). While these types of incentives can contribute to enhanced organizational performance by incentivizing executives (Kong et al., 2022; Ma et al., 2020), however, their role in shaping environmentally responsible behavior remains insufficiently examined. Thus it is important to understand the degree to which tournament-based incentives may encourage or discourage environmental violations that require our attention to address a critical and timely research question: how do tournament incentives influence the propensity of firms to commit environmental violations?

To investigate this contention, we focus on China, not only because it is the most rapidly growing emerging market but also because China is one of the largest emitters of climate-destroying emissions in the world. Previous studies suggest that China has been severely affected by environmental devastation as a consequence of rapid economic growth (F. U. Khan et al., 2024a). A 2016 air quality report by the Ministry of Environmental Protection revealed that only 25% of prefecture-level cities met the established air quality standards (Jiang & Akbar, 2018). Considering the poor environmental situation in China, this paper uses data on A-share listed companies between the years of 2010–2023, and demonstrates that executive tournament incentives can be an important determinant to reduce corporate environmental violations.

This study makes few contributions. For instance, this study extends the broader discourse on sustainable business practices by investigating how internal incentive mechanisms, particularly tournament-based executive compensation, influence corporate environmental violations (CEV). Specifically, this study suggests that when executives are motivated by the prospect of higher rewards relative to their peers, they may be more inclined to pursue strategies that decrease likelihood of environmental violations. Furthermore, the situation is particularly significant in the context of an emerging economy such as China, which aims to pool land, capital, and human resources. As governments control critical resources in emerging economies, executives need to develop political connections to receive government support. Consequently, politically connected companies are likely to comply with government requirements regarding their social and political liabilities. We thus contribute by investigating the moderating effect of CEOs' political connections on their tournament incentives and CEV. In addition, this study provides insights that female executives exhibit stronger accountability and responsiveness to pay incentives, leading to enhanced environmental outcomes. These insights underscore the unique interplay between leadership characteristics, incentive structures, and sustainability practices in the Chinese context, providing actionable implications for policy and corporate governance in addressing environmental challenges.

The rest of the paper is organized as follows. Section 2 presents the literature review and hypotheses development. Section 3 describes the methodology used in this study. Section 4 summarizes the research results. Section 5 reports the robustness checks. Section 6 presents the discussion and implications, followed by the research conclusions.

2. Literature review and hypotheses

The tournament incentive is the compensation gap between the CEO and other executives that may consequently encourage executive performance (Elsayed & Elbardan, 2018; Park & Kim, 2017). When rewards are derived from a tournament approach, all competitors utilize their entire potential (Lee et al., 2025). CEO tournament incentives align with tournament theory, which posits that a substantial compensation gap between the CEO and other executives fosters competitive pressure within the management hierarchy (Zhao et al., 2023). This theoretical framework views organizational hierarchies as competitive arenas where top executives engage in performance-based rivalry (Nalebuff & Stiglitz, 1983). Regarding environmental governance, this competition may extend into sustainability measures with CEOs endeavouring to reduce corporate environmental violations in order to improve company reputation. Recently, it was shown that firms with a (more) established system of executive incentives were more sensitive to environmental scrutiny because the reputational costs of the violation would hinder upward mobility, ultimately harming long-run value of the firm (Zhu et al., 2023). Tournament incentives can influence executive behaviour more broadly and also function as internal mechanisms to promote environmental sustainability. This research expands the tournament theory to show how tournament incentives can encourage executives to align their own self-interest with sustainability goals in order to create conditions for environmental actions to be brought into corporate governance.

2.1. CEOs' tournament incentive and corporate environmental violation

Drawing on tournament theory, firms should enlarge their tournament compensation structure to ensure executives continue exerting high levels of effort (Sun et al., 2024). Previous research suggests that top executives' incentives are an efficient incentive mechanism to elicit efforts to enhance organizational performance when managerial performance is difficult to observe (Ullah et al., 2022; Zhao et al., 2023). The compensation gap can be used as a powerful tool to support wage competition that drives executives to commit to long-term projects (Kong et al., 2022). The increasing incentives obtained by executives for the company's social and environmental efforts, have several important implications, including their own reputation, career advancement, customer satisfaction, and organizational legitimacy (Lee et al., 2025).

This study explores whether CEOs' incentives motivate them to mitigate environmental violations in countries like China, where the common society is increasingly aware of air quality degradation and pollution. Compared with other developed nations, China has lower environmental standards and weaker environmental regulations and enforcement (Liu et al., 2023). Considering this difference, we hypothesize that such tournament incentives can influence chief executives to adopt strategies that reduce environmental violations.

While explicit compensation plans tie incentives directly to established performance measures, tournament reward systems evaluate executives for their relative performance (Sun et al., 2024). Once someone is a CEO – at the peak position in the corporate hierarchy – there

is no further advancement. In this case, it is likely that CEOs in tournament-based reward systems may sensitize their competitive instinct toward improving the firm's reputation and long-term value (Ma et al., 2020). This may show up as proactive measures to address environmental responsibilities and bolster socially responsible practices (M. K. Khan et al., 2022; Lee et al., 2025), as these areas increasingly influence stakeholder perception, regulatory scrutiny, and market competitiveness. In particular, senior executives tend to concentrate on performance-based incentives that amplify their incentive to achieve improvements (including environmental compliance) (Wu et al., 2018). Notably, it has been demonstrated that rewarding employees based on their responsibilities represents a positive influence on corporate activities, including sustainable R&D (Zhao et al., 2023). Consequently, performance-based incentives may closely align the decision-making of CEOs with their corporate sustainability goals by creating a context in which the most pro-social adaptation initiatives will ultimately entail stability of organization that is sustainably competitive by mitigating socially undesirable practice(s) through the enhancement of environmental performance.

Based on this discussion, we formulate the following hypothesis:

Hypothesis 1 (H1): CEO tournament incentives have a negative relationship with corporate environmental violations.

2.2. The moderating role of CEO political connection

This study also investigates whether the relationship between CEO tournament incentives and CEV is influenced by CEOs' political connections. Political connections help executives build a good relationship with the government to receive support in important business transactions, especially in emerging economies, like China and Russia (Fuchs et al., 2024). Previous studies acknowledged that CEOs' political tie may be useful in their efforts to obtain preferential treatment from banks (Zou et al., 2023), lower taxation (Fan & Chen, 2022), preferential treatment when competing for government contracts (Preuss & Königsgruber, 2021), less regulatory monitoring and government support (Faccio, 2010). In return, politically connected executives align corporate actions with government priorities to meet social and political obligations.

Politically connected CEOs have the legitimacy and authority to influence the amount of their compensation given their link to the government, which is dominant and continues to play an important role in businesses (Wu, 2023). Specifically, Chinese companies are influenced by government perspectives when deciding on CEO compensation levels. Taken together, executives with political standing are strongly influenced by state policies (i.e., environmental protection) and tend to deviate from market-based recommendations. Moreover, political standing is considered when monitoring, hiring, and promoting CEOs of Chinese companies. Therefore, top executives are motivated to make decisions that are in the interest of the state by prioritizing social objectives over economic ones. Additionally, the Chinese government provides subsidies to executives with connections and expects company actions to be deemed legitimate in relation to compensation (Luo & Wang, 2021). Overall, this type of connection supports companies by reducing the financial burden on environmental stewardships, lowering the cost of capital associated with environmental protection, and sharing the risks of innovative environmental technology with the government. Consequently, it encourages companies to green their practices and potentially clarifies the assumed link between executive compensation gaps and environmental violations.

Based on the above discussion, we propose the following hypothesis:

Hypothesis 2 (H2): Politically connected CEOs strengthens the link between top executive compensation incentives and environmental violations.

2.3. The moderating role of CEO gender

CEOs' traits and personal values significantly determine organizational priorities and strategies (Paul, 2024). Among these characteristics, gender has become a prominent focus in the literature. Studies have shown that female CEOs place more emphasis on ethical issues, sustainable growth, and stakeholder benefits as compared to male CEOs (Larrieta-Rubín de Celis et al., 2015; Lim & Chung, 2021). The difference in strategic orientation can more easily be interpreted in light of social role theory, which indicates that gender roles are a powerful predictor of behavior by emphasizing communal traits of women like empathy, responsibility, and ethical sensitivity (Diekman & Schneider, 2010). Literature indicates that female executives take on leadership philosophies that utilize long-term sustainability, which reflects societal norms, ethical compliance and sustainability (Huang et al., 2025).

The impact of tournament incentives on environmental violations can be amplified with female CEOs, as they usually value sustainability in their decision-making (Javed et al., 2023). When CEOs are incentivized to outperform peers, female-led firms are more likely to activate this competitive channel in ways that are socially responsible (Maoret et al., 2024). With an emphasis on organizational entrepreneurship, the tournament incentives can be a very powerful mechanism to leverage on sustainable outcomes.

Furthermore, women CEO take a more comprehensive approach that promotes competition and collaboration to develop a climate where employees and executives can perform. By using tournament incentives to incentivize both financial success and environmental care, female CEOs transform these incentives into a tool for positive change (Vieito, 2012). It shows that tournament incentives can reduce environmental violations paired with values-based leadership, leading to corporate and societal benefits. By doing so, the moderating effect of CEO gender further adds a significant dimension to the understanding of the relationship between tournament incentives and corporate environmental violations that lead us to make the following hypothesis:

Hypothesis 3 (H3): Female CEO moderates the relationship between CEOs' tournament incentives and environmental violations, such that the negative impact of tournament incentives on environmental violations is stronger under female leadership.

The conceptual framework of the current study is presented in Figure 1.

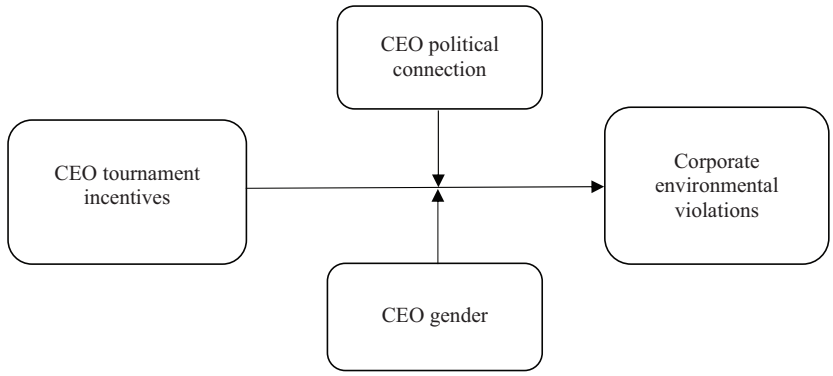

Figure 1. Conceptual framework

3. Research methodology

3.1. Data sources and sample

This study used a sample of A-share Chinese listed companies on the Shanghai and Shenzhen Stock Exchanges for the period of 2010–2023. We selected the sample period from 2010 to 2023 because this timeframe captures the most comprehensive and consistent disclosure of environmental violation data by publicly traded firms. Data related to the dependent, independent and control variables were collected from the Wind and the China Stock Market and Accounting Research Database, which is a reliable financial and accounting database (F. U. Khan et al., 2024a; Usman et al., 2024). The initial dataset included 56,965 firm–year observations. However, we excluded firm–year observations for companies with H-shares and B-shares because these companies are subject to foreign regulations, making their characteristics and nature not directly comparable to those of Chinese A-share listed companies. Additionally, we removed companies in the financial sector because the accounting standards, regulations, and ownership structures are different for this sector compared to other sectors. After an extensive data cleaning process in which we removed missing or irrelevant observations, we ultimately had 38,681 firms' year observations.

3.2. Variables

Corporate environmental violations (CEV) measured a continuous variable is the dependant variable, considered as the number of environmental violations. In specifically CEV indicates if the company violate the environmental regulations set by the Chinese government (Shahab et al., 2023).

In regard to the independent variable, we used tournament incentive as a representative proxy in the present study. Following previous studies (Ali et al., 2020; He & Fang, 2016; M. K. Khan et al., 2022), this study measured CEO tournament incentive as the difference between CEO pay and the pay of other executives. We employed two distinct methods to estimate tournament incentive: incentive gap (I_Gap), determined as the logarithm of CEO compensation minus the average executive compensation. This study additionally looked at the incentive gap ratio (I_Gap-R) to confirm the results of the original proxy, which is the ratio of CEO compensation to executives' compensation. The formulas mentioned below were employed:

$$\text{I\_Gap} = \text{Log (CEO Compensation} - \text{Average Executives Compensation);}$$

$$\text{I\_Gap-R} = \text{CEO Compensation / Executive Compensation.}$$

Political connections generally offer businesses many benefits including access to preferred resources, lower levels of regulation, and support for policy implementation. Political connections can create incentives to businesses for aligning with government strategic goals for the sake of society at large and this can assist businesses in meeting their social responsibility expectations. For this reason we used CEO political connections (CEO_PC) as a moderating variable, and set the value of 1, when a company's CEO is currently serving or has served as a deputy or member of the National People's Congress or the Chinese People's Political Consultative Conference and 0 otherwise (Cao et al., 2019). Secondly, this study utilized CEO gender (CEO_G) as a moderating variable that coded 1 if there is a female CEO of a firm and 0 otherwise.

Based on previous literature (Arena et al., 2018; Ouyang et al., 2023; Shahab et al., 2023), the following CEO attributes were employed in this study as control variables: CEO age (CEO_A), which is measured in years; CEO tenure (CEO_T), which indicates the duration of the CEO's leadership role; and CEO duality (CEO_D), a dummy variable that yields 1 if a company's CEO also serves as the board chairman and 0 otherwise. Regarding the board characteristics, we added board size (B_S), calculated as the number of board directors who play a vital role in strategic decision making; and board independence (B_I), calculated as the number of independent directors on the company's board. Given that a company's social investments may be impacted by its financial attributes, we employed the following variables: company size (C_S), calculated as the logarithm of total assets; company growth (C_G), which reflects the change in total company assets; financial leverage (FL), calculated as the total debt-to-total assets ratio; and company performance (ROA), determined by dividing net profit by total assets, represents accounting-based performance. Finally, taking into consideration the possible impact of time and industry on the link between CEO tournament incentive and environmental violation, we included year and industry dummies.

3.3. Statistical model

Given our panel data, we determined the optimal model by following the methodology of previous studies and conducting three key tests: the F-test, Lagrange multiplier (LM) test, and Hausman test. The F-test result (4.88, $p < 0.01$) suggests that the fixed effects regression model is more appropriate than the ordinary least squares (OLS) regression model. The LM test result (201.18, $p < 0.01$) indicates that the random effects model is preferable to the OLS model. Finally, the Hausman test result (260.66, $p < 0.01$) supports the fixed effects model as the optimal choice over the random effects model. Thus, in line with previous studies (Ali et al., 2020), we used a fixed effects model as the baseline method. To check our research hypotheses, we used the following equations: Equation (1) was used to test Hypothesis 1 (H_1), which states that tournament incentives are negatively associated with CEV. Equation (2) and (3) was used to k our second and third hypotheses, which state that politically connected CEOs and female CEOs strengthen the link between top executive pay incentives and CEV. These equations are as follows:

$$CEV_{it} = \beta_0 + \beta_1 I\_Gap_{it} + \sum_{i=1}^{n} \beta_n Controls_{it} + \varepsilon_{it}; \quad (1)$$

$$CEV_{it} = \beta_0 + \beta_1 T\_I_{it} + \beta_2 CEO\_PC_{it} + \beta_3 I\_Gap_{it} \times CEO\_PC_{it} + \sum_{i=1}^{n} \beta_n Controls_{it} + \varepsilon_{it}; \quad (2)$$

$$CEV_{it} = \beta_0 + \beta_1 I\_Gap_{it} + \beta_2 CEO\_G_{it} + \beta_3 I\_Gap_{it} \times CEO\_G_{it} + \sum_{i=1}^{n} \beta_n Controls_{it} + \varepsilon_{it}. \quad (3)$$

We used number of corporate environmental violations (CEV) as the dependent variable and tournament incentive gap (I_Gap) as the independent variable. For the moderating variable, we used CEO political connection (CEO_PC) and CEO gender (CEO_G). Controls represent all control variables in our study.

3.4. Descriptive statistics and correlations

Table 1 provides the descriptive statistical analysis results for the research variables. The mean value of corporate environmental violations is 0.268, indicating that on average, companies commit relatively few violations. However, the standard deviation of 0.892 suggests significant variability in the CEV of Chinese companies, with some companies having no violations and others reporting with the maximum of 6 violations. Regarding tournament incentives (I_Gap), the mean value is 627358.69 RMB, which means that on average, top executives receive 627358.69 RMB more than other executives annually. Similarly, the mean value of the CEO pay gap ratio (I_Gap_R) is 2.52, indicating that on average, CEOs earn more than twice the compensation of other executives in their organizations. The mean value of the variable CEO_PC (political connection) is 0.313, indicating that approximately 31.3% of the CEOs in the sample have political connections. Similarly, the mean value of CEO_G (CEO gender) is 0.071, suggesting that only about 7.1% of the CEOs in the sample are female.

Table 1. Descriptive statistics

Variables	Mean	Std. Dev.	Min	Max
CEV	.268	.892	0	6
I_Gap	627358.69	1080854.3	–4331313	49239944
I_Gap_R	2.52	1.156	0	19
CEO_PC	.313	.464	0	1
CEO_G	.071	.257	0	1
CEO_A	49.699	3.002	24	78
CEO_T	.336	.472	0	1
CEO_D	.321	.467	0	1
B_S	8.46	1.781	0	21
B_I	3.143	.604	0	9
C_S	22.118	1.479	11.348	31.431
C_G	.348	5.806	–.972	1100.448
FL	.435	1.085	–.195	178.345
ROA	.041	.339	–64.819	29.662

Note: CEV – Corporate environmental violation; I_Gap – Incentive Gap; I_Gap-R – Incentive Gap Ratio; CEO_PC – CEO political connection; CEO_G – CEO gender; CEO_A – CEO age; CEO_T – CEO tenure; CEO_D – CEO duality; B_I – board independence; B_S – board size; C_S – company size; C_G – company growth; FL – financial leverage; ROA – company performance.

The correlations between the research variables are reported in Table 2. Our findings reveal a negative and statistically significant association between CEV and tournament incentive (T_I). We also find that political connection (CEO_PC) and CEO gender (CEO_G) are negatively related to corporate environmental violations. These findings provide preliminary support for our hypotheses.

4. Research results

Table 3 presents the results of the OLS regression analyses for our hypotheses. Hypothesis 1 (H_1) predicts that tournament incentives are negatively related to corporate environmental

Table 2. Correlation values for research variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CEV	1.000													
I_Gap	–0.006*	1.000												
	(0.037)													
I_Gap-R	–0.030*	0.527*	1.000											
	(0.032)	(0.000)												
CEO_PC	–0.044*	0.006	–0.003	1.000										
	(0.027)	(0.550)	(0.773)											
CEO_G	–0.049*	0.094*	0.087*	0.102*	1.000									
	(0.014)	(0.000)	(0.000)	(0.000)										
CEO_A	–0.022	–0.066*	–0.062*	0.120*	–0.004	1.000								
	(0.276)	(0.000)	(0.000)	(0.000)	(0.711)									
CEO_T	–0.001	0.119*	0.071*	0.084*	0.200*	0.104*	1.000							
	(0.950)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)								
CEO_D	–0.034	0.007	0.025*	0.236*	0.129*	0.475*	0.092*	1.000						
	(0.084)	(0.466)	(0.010)	(0.000)	(0.000)	(0.000)	(0.000)							
B_S	–0.031	–0.078*	–0.111*	0.084*	–0.118*	0.698*	0.055*	0.257*	1.000					
	(0.116)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)						
1B_I	0.039	0.065*	0.144*	–0.041*	0.043*	–0.133*	–0.033*	–0.104*	–0.168*	1.000				
	(0.050)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)					
1_S	0.163*	0.240*	–0.026*	–0.012	0.129*	–0.207*	0.041*	–0.171*	–0.284*	0.240*	1.000			
	(0.000)	(0.000)	(0.009)	(0.231)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)				
C_G	–0.023	0.014	0.031*	0.007	–0.028*	0.050*	–0.067*	0.048*	0.064*	0.049*	0.054*	1.000		
	(0.255)	(0.138)	(0.002)	(0.488)	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
1FL	0.035	0.015	0.017	–0.035*	–0.012	–0.102*	–0.040*	–0.042*	–0.150*	0.066*	0.091*	–0.031*	1.000	
	(0.077)	(0.132)	(0.083)	(0.000)	(0.238)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)		
ROA	–0.008	0.020*	0.001	0.007	0.017	0.013	0.007	–0.004	0.018	–0.020*	0.029*	0.063*	–0.738*	1.000
	(0.680)	(0.041)	(0.912)	(0.448)	(0.076)	(0.210)	(0.475)	(0.678)	(0.056)	(0.040)	(0.003)	(0.000)	(0.000)	

Note: *p < 0.05.

violation. The fixed effect regression results for Models 1 and 2 support Hypothesis 1, indicating that the coefficients of CEOs' tournament incentives in Models 1 (I_Gap) and Model 2 (I_Gap_R) are significantly negative in both models ($\beta = -0.037$, $p < 0.05$; $\beta = -0.032$, $p < 0.01$, respectively). Our findings are in line with the expectation that tournament incentives encourage CEOs to prioritize environmentally oriented practices and adopt an environmentally sustainable attitude by reducing environmental violations.

Table 3. CEO tournament incentives and corporate environmental violation

Variables	(1)	(2)
	CEV	CEV
I_Gap	–0.037**	–
	[–2.12]	
I_Gap_R	–	–0.032***
		[–3.42]
CEO_A	0.000	0.000
	[0.70]	[0.73]
CEO_T	–0.027	–0.018
	[–0.88]	[–0.62]
CEO_D	0.063	0.063
	[0.73]	[0.82]
B_S	–0.099*	–0.107*
	[–1.87]	[–1.81]
B_I	0.163	0.189
	[1.38]	[1.43]
C_S	–0.314***	–0.320***
	[–5.41]	[–5.52]
C_G	–0.097***	–0.102***
	[–2.80]	[–2.86]
FL	0.014*	0.059***
	[1.67]	[3.51]
ROA	–0.008*	–0.033*
	[–1.70]	[–1.73]
	[0.54]	[0.70]
Constant	–6.199***	–6.730***
	[–6.12]	[–5.86]
Observations	38,681	38,681
R-squared	0.13	0.14
Adj.R-sequered	0.13	0.13

Note: CEV – Corporate environmental violation; I_Gap – Incentive Gap; I_Gap-R – Incentive Gap Ratio. *,**,*** show 10%, 5% and 1% significance levels respectively.

Table 4 reports findings for the moderating effects which are proposed in Hypothesis 2 and 3. H2 predicts that CEO political connections can significantly moderate the link between top executive compensation incentives and environmental violation. In line with this

prediction, the regression results for the interaction term in Models 1 in Table 4 (I_Gap × CEO_PC) indicates a significant and negative relationship with CEV (β = –0.021, p < 0.05) at the 5% significance level. Therefore, Hypothesis 2 is accepted and strongly supported. Our findings show that when executives with political connections receive tournament incentives, they become more deeply engaged in environmental initiatives and gain legitimacy. They can be explained by the fact that the state provides subsidies to politically connected executives (Cao et al., 2019) and expects that company actions will be deemed legitimate by addressing environmental issues.

Along this, Model 2 of Table 4 presents the findings related to Hypothesis 3 (H3), which posits that CEO gender strengthens the relationship between CEO tournament incentives and environmental violations. The results support this hypothesis, as evidenced by a significant and negative coefficient (β= –0.068, p < 0.05) for the interaction term (I_Gap × CEO_G). This indicates that when a female CEO is in place, the influence of tournament incentives is more effective in reducing environmental violations.

Our study also controls for the company-level control variables. The results show that all the variables have a significant impact on CEV, except CEO age (CEO_A), CEO tenure (CEO_T), CEO duality (CEO_D), and board independence (B_I). Our findings show that board size (B_S) has a negative association with CEV because a broader board maintains more diverse experiences and knowledge that tend to reduce environmental violations. Company size (C_S), growth (C_G) and company performance (ROA) are also negatively associated with CEV as broader and more profitable companies gain more interest from stakeholders in environmental issues. Additionally, these companies should be able to make their investments more environmentally friendly. Regarding the financial leverage (FL) variable, our findings indicate that companies with a greater level of leverage are less likely to address environmental issues.

Table 4. The moderating role of CEO political connection and CEO gender

Variables	(1)	(2)
	CEV	CEV
I_Gap	–0.033*	–0.042***
	[–1.89]	[–2.78]
CEO_PC	–0.227*	–
	[–1.68]	
I_Gap × CEO_PC	–0.021**	–
	[–2.14]	
CEO_G	–	–0.809**
		[–2.22]
I_Gap × CEO_G	–	–0.068**
		[–2.30]
CEO_A	0.000	0.000
	[0.67]	[0.58]
CEO_T	–0.027	–0.028
	[–0.85]	[–0.90]
CEO_D	0.062	0.051
	[0.72]	[0.59]

End of Table 4

Variables	(1)	(2)
	CEV	CEV
B_S	–0.100*	–0.100*
	[–1.88]	[–1.88]
B_I	0.164	0.162
	[1.38]	[1.37]
C_S	–0.314***	–0.313***
	[–5.42]	[–5.39]
C_G	0.097***	0.097***
	[2.80]	[2.80]
FL	0.014*	0.014
	[1.72]	[1.61]
ROA	0.005	0.005
	[1.47]	[1.37]
Constant	–6.242***	–6.101***
	[–6.14]	[–5.73]
Observations	38,681	38,681
R-squared	0.13	0.13
Adj.R-sequered	0.13	0.13

Note: This table report findings about the moderating effect of CEO's political connection and CEO gender. T-values are highlighted in parentheses.

4.1. Robustness checks

The results of the OLS regression analyses regarding the relationship between CEO tournament incentives and environmental may be biased because of possible endogeneity problems. To solve this issue, we used several statistical approaches in accordance with prior research (F. U. Khan et al., 2024a).

Two stage least sqaure (2-SLS) approach

First, to solve endogeneity issues, we used a two-stage least squares regression analysis. The instrumental variable method requires that the instrumental variable be correlated with the independent variable but not with the dependent variable. Following this approach, we used the industry average of tournament incentives (Ind_Av) as the instrumental variable, as it is strongly correlated with the independent variable (tournament incentive, I_Gap) but has no association with the dependent variable (environmental violations). In the first stage of the regression, we regressed I_Gap on Ind_Av along with all control variables. The results, summarized in Table 5, show that Ind_Av is positively and significantly associated with I_Gap, confirming it as a strong predictor. In the second stage of the 2-SLS estimations (Models 2, 3, and 4), the fitted values of I_Gap from the first stage were utilized. The results consistently show that I_Gap is negatively linked with CEV, while CEO_PC and CEO_G further reinforce this negative relationship. The interaction term between the proxy of CEO incentives and political connection and CEO gender exert a significant and negative impact on companies'

environmental violation. These findings are consistent with our preliminary results and support our hypotheses.

Table 5. Endogeneity test using Two-Stage Least Squares (2-SLS)

	I_Gap	CEV	CEV	CEV
Ind_Av	0.791***	–	–	–
	[25.22]			
I_Gap	–	–0.249***	–0.312***	–0.255***
		[–3.29]	[–3.24]	[–3.22]
CEO_PC	–	–	–3.242***	–
			[–2.95]	
I_Gap × CEO_PC	–	–	–0.255***	–
			[–2.99]	
CEO_G	–	–	–	–1.498*
				[–1.69]
I_Gap × CEO_G	–	–	–	–0.112*
				[–1.83]
CEO_A	–0.118	–0.217	–0.104	–0.188
	(–0.424)	(–0.745)	(–0.267)	(–0.663)
CEO_O	–24.026	–25.236	–53.350*	–33.819
	(–0.905)	(–0.960)	(–1.727)	(–1.282)
CEO_T	0.080	0.244	–0.265	0.087
	(0.149)	(0.463)	(–0.344)	(0.166)
CEO_D	–3.450	–5.354	–5.346	–5.939
	(–0.749)	(–1.114)	(–0.888)	(–1.234)
B_O	22.654*	23.586*	32.036**	25.817**
	(1.762)	(1.836)	(2.088)	(2.003)
B_S	0.880	0.448	1.072	0.925
	(1.161)	(0.545)	(1.119)	(1.177)
C_S	–0.808	–1.077	–1.235	–1.487
	(–0.347)	(–0.466)	(–0.384)	(–0.638)
C_G	3.197	3.223	1.629	4.259
	(0.494)	(0.508)	(0.201)	(0.674)
FL	18.627	22.930**	39.341**	20.482*
	(1.597)	(1.992)	(2.437)	(1.790)
ROA	–29.710	–14.597	–32.343	–14.793
	(–0.811)	(–0.424)	(–0.664)	(–0.433)
Constant	–70.220**	–18.435	–140.864***	–27.556
	(–2.222)	(–0.961)	(–2.967)	(–1.427)
R-squared	0.19	0.12	0.11	0.12
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes

Note: This table report findings of 2-SLS. T-values are highlighted in parentheses.

Generalized method of moments (GMM) approach

The study uses dynamic panel data analysis with the Generalized Method of Moments (GMM) to address several types of endogeneity (for example, reverse causality). The GMM framework was chosen to try to mitigate the limitations associated with the strict exogeneity assumptions for the ordinary least squares (OLS) and fixed-effects regression models. Furthermore, contemporary research has advanced knowledge on endogeneity and emphasized the role of dynamic endogeneity in analytical frameworks (F. U. Khan et al., 2024b). The dynamic endogeneity perspective implies that past trends of independent variables could influence their current values. Such actions suggest it is conceivable that the firm, when making decisions about CEO's incentives, will reference its performance over the prior tenure. Wintoki et al. (2012) have emphasized the GMM technique is valid for the concerns raised by dynamic endogeneity. The GMM technique considers the possibility that governance structures may change or adjust based on prior performance and therefore is a robust solution to this challenge. A key advantage of GMM is that it can use internal instruments from a panel data or panel dataset, such as lagged values of the variables.

Hence, Table 6 presents the results of the dynamic Generalized Method of Moments (GMM) model, which explores the link between CEO tournament incentives and environmental violation (CEV). In Model 1, the coefficient of I_Gap is negative and statistically significant ($\beta = -0.031$, $p < 0.01$), consistent with our initial findings. Furthermore, Model 2 reveals significant and negative findings regarding the moderating impact of CEO political connection (I_Gap × CEO_PC) ($\beta = -0.188$, $p < 0.01$). Similarly, Model 3 reinforces our primary findings concerning the moderating role of CEO gender (I_Gap × CEO_G), yielding statistically significant and negative results ($\beta = -0.461$, $p < 0.01$).

Furthermore, the AR(1) statistic is significant across all three models, demonstrating the absence of autocorrelation in the first-differenced errors. Meanwhile, the AR(2) statistic is insignificant in all cases, confirming that there is no correlation in the error terms of the level equations. Additionally, the Sargan test yields statistically significant results, whereas the Hansen test produces insignificant p-values for all models. These outcomes collectively suggest that the results are consistent and robust, indicating a low likelihood of endogeneity issues.

Table 6. The generalized method of moments (GMM) approach

Variables	(1)	(2)	(3)
	CEV	CEV	CEV
I_Gap	–0.031***	–0.004*	–0.082***
	[–4.51]	[–1.73]	[–4.38]
CEO_PC	–	–2.465***	–
		[–4.55]	
I_Gap × CEO_PC	–	–0.188***	–
		[–4.39]	
CEO_G	–	–	–5.342***
			[–3.95]
I_Gap × CEO_G	–	–	–0.461***
			[–4.19]

End of Table 6

Variables	(1)	(2)	(3)
	CEV	CEV	CEV
CEO_A	–0.007***	–0.007***	–0.007***
	[–6.25]	[–4.95]	[–5.16]
CEO_T	0.020*	0.018	0.015
	[1.74]	[1.18]	[1.15]
CEO_D	0.055***	0.053**	0.040*
	[3.33]	[2.45]	[1.95]
B_S	0.042***	0.048***	0.039***
	[6.93]	[7.09]	[5.85]
B_I	0.004***	0.005***	0.005***
	[4.48]	[4.23]	[4.74]
C_S	0.024***	0.019***	0.024***
	[3.65]	[2.69]	[3.29]
C_G	0.012***	0.018***	0.012***
	[4.14]	[5.24]	[4.00]
FL	–0.021***	–0.015***	–0.018***
	[–5.92]	[–4.05]	[–6.06]
ROA	0.046***	0.040***	0.043***
	[6.56]	[5.42]	[6.34]
L_CEV	0.309***	0.306***	0.306***
	[93.44]	[87.73]	[85.88]
Constant	–5.452	–5.004*	–2.646**
	(–0.118)	(–1.887)	(–2.0511)
Observations	35,110	35,110	35,110
AR(1) p-value	0.000	0.000	0.000
AR(2) p-value	0.614	0.607	0.601
Sargen Test p- value	0.000	0.000	0.000
Hansen Test p-value	0.322	0.419	0.203

Note: This table presents findings of proposed hypotheses using dynamic GMM model. *,**,*** show 10%, 5% and 1% significance levels respectively.

5. Discussion

The findings of this research show important social and political implications for CEO incentives in context of improving a firm's environmental performance. This research has shown CEO incentives to be useful mechanisms for the promotion of sustainable development, and a component of the firm's environmental strategy (Lee et al., 2025), which may facilitate reductions in environmental violations. As sustainability develops into a valuable source of competitive advantage in the sustainable development realm, this study is an indication that firms can utilize CEO incentives not only for improved firm performance (Ma et al., 2020) but also for environmental performance. From a socio-political standpoint, this study

demonstrates that in a developing country market like China, where corporate governance is emerging (Javed et al., 2023) it is important to connect business leadership with future environmental objectives. Companies can use a competitive incentive system to motivate their CEOs to ensure that environmental sustainability remains a focal point of strategic decisions, aligned with sustainable development for the benefit of society (Wu & Tham, 2023). Previous research indicates executive remuneration affects corporate performance but the explicit relationship between CEO tournament incentives and social and environmental responsibilities and duties has been underrepresented in the academic literature (Ali et al., 2020; M. K. Khan et al., 2022; Lee et al., 2025). This study contributes to closing this gap by providing empirical evidence supporting the theoretical underpinnings of tournament theory relating to corporate environmental misconduct.

Additionally, this research contributes a new perspective by examining how CEO political ties and gender affect the relationship between executive incentives and corporate environmental wrongdoing behaviour, offering valuable contributions in the field corporate governance. The examination of political ties is an unexplored perspective and especially relevant to emerging economies, where political ties are often vital to business decisions and organizational priorities (Luo & Wang, 2021; Tang & Li, 2024). The study also illustrates the benefits that political ties may represent: a potential asset to leverage and work through regulatory environments while creating ethical dilemmas.

In a similar vein, the moderating effect of CEO gender, demonstrating the significant role of leadership diversity in shaping corporate behaviour. Our research found evidence that female CEOs are likely to strengthen the value of incentives as deterrents to environmental violations, indicating the promise of gender-inclusive leadership helping to institutionalize ethical and sustainable activities. By situating the findings in a larger debate, the study not only contributed to the literature with these moderators, but also extended its contributions by unveiling the interaction between corporate governance structures, executive characteristics and environmental performance across a distinct political and economic contexts.

6. Implications

6.1. Theoretical implication

Grounded in tournament theory, our results indicate that CEO incentive mechanisms are critical mechanisms for guiding corporate executives toward increased environmental performance. It appears that CEOs are motivated to adopt sustainable practices in response to the tournament incentives, which are characterised by a competitive framework where executives vie for higher rewards. Importantly, this finding demonstrates the effectiveness of performance-based incentives for aligning the interest of CEOs with the wider ethical goals of the firm (Zhao et al., 2023). These results affirm that tournament incentives can also be seen to increase the ethical responsibility, where sustainability practices become a part of the competitive landscape in executive leadership.

Our research also highlights the important moderating effects of CEO political connection and CEO gender on the relationship. Political connections by the CEO improve the effectiveness of tournament incentives in minimizing environmental violations by raising the executive's sensitivity to institutions' expectations and sustainability mandates. CEOs can access crucial resources and regulatory information through these networks (Preuss & Königsgruber, 2021), allowing them to align corporate activities with social and institutional requirements (F. U. Khan et al., 2022).

Moreover, CEO gender is the most significant ethical leadership that can exist for sustainable development at a strategic level in the long run (Javed et al., 2023). According to social role theory, gender roles impact business behaviours supporting communal roles and enhancing women's communal characteristics like empathy, responsibility, and ethical sensibility (Diekman & Schneider, 2010). Overall, organizations should integrate these recommendations in their approaches to sustainable development, and accountability practices for their ethical responsibilities.

6.2. Practical implication

The findings of this study are also relevant for policymakers, corporate strategists, and investors with an ESG focus. Particularly, this study highlights the importance of regulatory frameworks that encourage boardroom collaboration – linking executive remuneration to environmental goals, perhaps through incentive structures or mandates that incentivize sustainable business practices. These findings can also be used by corporate strategists to encourage CEOs to mitigate environmental misconduct problems, thereby improving their firms' long-run value and reputation in society.

Our findings highlight that the relation between corporate governance, CEO political connections, and gender diversity exemplifies significant opportunities for sustainable efforts; particularly evident in an emerging economy context. Emerging economies may utilize ties to politically connected CEOs to link corporate purpose with environmental performance, due to the likelihood of access to necessary information, knowledge and institutional resources they can support for firms to navigate compliance with environmental regulations. Furthermore, the contribution of gender diversity, along with women CEOs having more loyalty to ethical behaviour and adopting long-term sustainability focused targets (Tang & Li, 2024). This holistic approach may provide more tactful choices – to begin investing in places with emerging corporate governance frameworks where social infrastructure and environmental stewardship rank high with long-term financial sustainability (Mačiulytė-Šniukienė et al., 2022).

7. Conclusions

This study utilizes data from world's largest emerging market – China from 2010 to 2023, to study the extent to which CEO incentives drive corporate environmental standards to mitigate environmental violations. The results demonstrate that CEO tournament incentives significantly decrease the likelihood of environmental violations, highlighting the importance of executive compensation structures on corporate environmental actions. Furthermore, this study underscores the significance of political connections as a reinforcing factor, demonstrating that politically affiliated CEOs have a greater propensity to give environmental measures top priority. Collectively, these results show that a powerful mechanism is established when political ties and CEO incentives are strategically aligned for encouraging environmental initiatives in companies operating in emerging markets such as China.

Additionally, this study adds to the body of literature by emphasising how CEO gender influences the effectiveness of CEO incentives on environmental violations. The findings show that female CEOs significantly strengthen the negative relationship between tournament incentives and environmental violations, underscoring their ethical leadership and commitment to sustainability. This underlines how crucial gender diversity in leadership is to coordinating executive incentives with sustainability objectives.

This study has several limitations that provide potential for future research. First, this study focused on the context of the emerging economy of China, where corporate ownership structure, internal and external governance, and law enforcement are distinctly different from western counterparts, thus our findings may have limited generalizability to other institutional contexts. Future research should be conducted in other countries to provide additional insights into these arguments. Second, tournament incentives are not the only compensation mechanism. CEO pay gaps may also reflect market dynamics, firm-specific conditions, or industry benchmarks that should be focused in future studies. Moreover, this study operationalized corporate environmental violations as a count variable, which may oversimplify the multifaceted nature of environmental harm. Future research should consider incorporating measures of severity and duration of violations to more precisely capture the depth and impact of environmental misconduct.

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Author contributions

Authors contributed equally to this work.

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