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Regularized Campaigns as a New Institution for Effective Governance

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ABSTRACT

How can governments sustain compliance improvements when institutions falter and ad hoc enforcement fades? This study introduces "regularized campaigns" as an institutional innovation that combines the high-intensity enforcement of campaigns with the stability of institutions to mitigate principal-agent problems. Compliance gaps often emerge when local regulators (agents) prioritize local economic or political interests over the directives of central or federal authorities (principals), resulting in greater violations by economically influential targets. Regularized campaigns address this by institutionalizing periodic enforcement waves, signaling sustained central government priority, reshaping local incentives, and reducing enforcement gaps. We examine this concept in the context of China's central environmental inspections (CEIs), which depart from traditional one-off crackdowns by implementing structured, recurring enforcement waves. Leveraging a unique firm-level dataset that integrates multiple confidential government sources, we show that before CEIs, firms with greater economic influence violated more environmental standards while facing fewer penalties. After CEIs became institutionalized, these compliance gaps narrowed significantly. Our findings suggest that regularized campaigns can realign incentives and reduce compliance gaps not only during active enforcement but also in periods between enforcement actions. The insights extend beyond China to decentralized authoritarian and democratic systems where persistent compliance gaps challenge effective policy implementation.

摘要

在制度失败、临时性执法消退时，政府如何维持合规性的持续改善?本研究提出"常态化运动"这一制度创新概念，它将行动式执法的高强度特点与制度稳定性相结合，以缓解委托代理问题。当地方监管机构(代理人)将地方经济或政治利益置于中央或联邦权威(委托人)指令之上时，合规差距往往随之出现，经济影响力较大的监管对象更易违规，且受罚更少。常态化运动通过制度化的周期性执法行动，向地方传递中央政府持续关注的信号，重塑地方激励机制，从而缩小执法落差。本研究以中国的中央生态环境保护督察(CEIs)为案例，这一机制不同于传统的一次性严打行动，而是引入结构化、周期性的执法波次。通过整合多个政府机密信息而构建的独特企业层面数据集，我们发现，在CEIs实施之前，经济影响力较大的企业违反环境标准的情况更多，而受到的处罚更少。CEIs制度化后，这种合规差距显著缩小。研究结果表明，常态化运动不仅能在执法期间校准激励，缩小合规差距，也能在执法间歇期保持其效果。这些洞见不仅适用于中国，也对于分权型威权体制与民主体制在应对持续性合规差距方面，具有广泛的借鉴意义。

RESUMEN

¿Cómo pueden los gobiernos mantener las mejoras de cumplimiento cuando las instituciones flaquean y la aplicación ad hoc se desvanece? Este estudio presenta las "campañas regularizadas" como una innovación institucional que combina la aplicación intensiva de las campañas con la estabilidad de las instituciones para mitigar los problemas entre principal y agente. Las brechas de cumplimiento suelen surgir cuando los reguladores locales (agentes) priorizan los intereses económicos o políticos sobre los mandatos centrales (principales), lo que resulta en mayores infracciones por parte de objetivos económicamente influyentes. Las campañas regularizadas abordan este problema institucionalizando oleadas periódicas de aplicación, señalando una prioridad gubernamental sostenida, reestructurando los incentivos locales y reduciendo las brechas de aplicación. Examinamos este concepto en el contexto de las inspecciones ambientales centrales (IEC) de China, que se alejan de las medidas represivas puntuales tradicionales mediante la implementación de oleadas de aplicación estructuradas y recurrentes. Aprovechando un conjunto único de datos a nivel de empresa que integra múltiples fuentes gubernamentales confidenciales, demostramos que antes de las IEC, las empresas con mayor influencia económica infringían más normas ambientales y se enfrentaban a menos sanciones. Tras la institucionalización de las IEC, estas brechas de cumplimiento se redujeron significativamente. Nuestros hallazgos sugieren que las campañas regularizadas pueden realinear los incentivos y reducir las brechas de cumplimiento, no solo durante la aplicación activa, sino también en los períodos intermedios. Los hallazgos se extienden más allá de China, a sistemas autoritarios y democráticos descentralizados, donde las persistentes brechas de cumplimiento dificultan la implementación eficaz de las políticas.

1 | Introduction

Governance—the implementation of state policies—is a central theme in social science research and practice worldwide (Fukuyama 2016). Typically, a principal—often a legislator—delegates implementation tasks to agents, such as bureaucracies, who frequently possess superior information about execution processes and whose interests may diverge from those of the principal (Shepsle 2010). Addressing this agency dilemma is crucial for effective governance. Scholars widely regard institutions that establish durable constraints and oversight mechanisms as key solutions: by aligning agent behavior with principal goals and reducing information asymmetries, institutions help mitigate risks such as bureaucratic drift, non-compliance, and compliance gaps—defined as disparities in compliance outcomes among regulated entities (Acemoglu et al. 2002; Rodrik et al. 2004; McCubbins et al. 1987; Wood and Waterman 1991).

However, institutions alone often fall short, particularly in multi-tiered governance systems where local implementers must navigate tensions between national mandates and local priorities. In democratic federations, informational asymmetries and conflicting incentives persist despite the presence of formal channels for third-party monitoring by citizens and interest groups (McCubbins and Schwartz 1984; Banks and Weingast 1992). Subnational governments may prioritize local political or economic goals over national directives, resulting in uneven implementation and persistent compliance gaps (Rodden 2004; Bednar 2011; Konisky and Reenock 2013; Konisky and Teodoro 2016).

Authoritarian regimes face even steeper challenges: information asymmetries are often more severe, and institutions, whether by design or dysfunction, are more vulnerable to strategic manipulation (Shen 2024). Censorship often renders citizens, the media, and other interest groups ineffective as sources of corrective feedback for the principal (Stockmann 2012; Roberts 2018). Those attempting to raise concerns or sound "fire alarms" may face severe repercussions (King et al. 2013; Yang 2024). As a result, institutions in authoritarian systems tend to prioritize regime stability and elite cohesion over consistent enforcement, exacerbating compliance disparities (Gandhi and Przeworski 2007; Gandhi 2008; Svolik 2012; Geddes et al. 2018).

This paper focuses on one increasingly salient tool for addressing such governance failures: implementation campaigns. Often associated with authoritarian regimes but also present in democracies, these campaigns serve as temporary, high-intensity interventions to correct institutional deficiencies—akin to what McCubbins and Schwartz (1984) describe as "police patrols." Campaigns are defined here as organized, ad hoc series of actions characterized by high-intensity enforcement, rapid resource mobilization, and severe penalties for non-compliance. Unlike democratic election campaigns, which primarily inform and mobilize support, implementation campaigns improve information flows and increase deterrence through visible state action (e.g., Oi 1989; Perry 2011). In the criminal justice literature, such efforts are referred to as "high visibility enforcement (HVE) campaigns"—intensive, short-term crackdowns to compel compliance and deter violations through the credible threat of penalties (Sherman 1990).[1]

While such campaigns can yield immediate improvements, their effects are often ephemeral. Once the campaign ends, enforcement weakens, and regulated entities often revert to their previous patterns of behavior (van Rooij 2006, 2016). This inherent short-termism limits the ability of campaigns to sustain compliance improvements over time.

This paper introduces the concept of "regularized campaigns"—a novel governance tool that institutionalizes periodic enforcement waves, combining the high-intensity oversight of campaigns with the continuity of institutions.[2] Unlike traditional campaigns, regularized campaigns are structured to recur over time, thereby signaling the central or federal government's sustained prioritization of the policy

TABLE 1 | Comparison between (functional, governance-oriented) institutions, ad hoc campaigns, and regularized campaigns.

Governance tool	Continuity of enforcement	Intensity and visibility	Adaptability	Signaling function	Effect on the compliance gap
Institutions	Continuous, rule-based, bureaucratized	Typically, low to moderate	Low; often rigid	Weak or diffuse; absorbed into routine bureaucratic processes	Often persistent due to entrenched discretion
Ad hoc campaigns	Temporary, time-bounded	High during campaign periods	High, but reactive	Strong, but short-lived	Short-term narrowing, then reversion
Regularized campaigns	Periodic and structured, embedded in governance waves	High during waves; moderate residual impacts	Medium to high; can be targeted	Strong and recurring; maintains credible central prioritization	Sustained reduction

issue and its credible commitment to enforcement. By embedding campaign-style enforcement into a periodic and institutionalized format, they reshape the incentives of both regulators and regulated entities, not only during active waves but also in the intervals between them. Regularized campaigns thereby enhance overall compliance while reducing disparities across regulated entities.

Unlike traditional institutions, which rely on continuous, rule-bound procedures, regularized campaigns operate through structured, episodic enforcement waves. This hybrid form makes them more adaptable than institutions and more enduring than ad hoc campaigns. Through repetition and visibility, they reinforce political signaling, establish credible threats of enforcement, and reduce the influence of local discretion or capture. Understanding this hybrid logic is crucial for distinguishing the function of regularized campaigns from that of traditional institutions or ad hoc campaigns.

Despite their increasing relevance and significance, the concept of regularized campaigns remains undertheorized and underexplored empirically (see Table 1 for a comparison across three governance tools).[3] Existing research has primarily focused on ad hoc campaigns and their short-term impact on absolute compliance levels. However, campaigns target not only absolute non-compliance but also systematic disparities in compliance across regulated entities, particularly those stemming from local discretion or regulatory capture. When embedded into recurring, institutionalized waves, regularized campaigns maintain both deterrence and signaling effects, allowing them to reduce compliance disparities in a more sustained fashion. This paper fills both theoretical and empirical gaps by examining how regularized campaigns affect compliance disparities over time.

We empirically examine the effectiveness of regularized campaigns in the context of environmental regulation in China, leveraging an original firm-level dataset that includes several comprehensive and confidential government statistics. Specifically, we analyze the impact of central environmental inspection (CEI) campaigns on firms' compliance with air and water pollution standards. The findings demonstrate a significant narrowing of the compliance gap between economically influential firms and others following the introduction of CEI campaigns. This suggests that regularized campaigns can disrupt entrenched patterns of information withholding and non-compliance during and beyond active periods.[4]

The remainder of the paper is organized as follows: Section 2 develops the theory of regularized campaigns. Section 3 describes the empirical setting of environmental regulation in China. Section 4 details the research design. Empirical findings are presented in Section 5. Finally, Section 6 concludes by highlighting the theoretical and empirical contributions of regularized campaigns, discussing their broader applicability to governance challenges beyond environmental regulation, and outlining key directions for future research, including their relevance in both authoritarian and democratic contexts.

2 | Theory of Regularized Campaigns

2.1 | Institutions as the Foundational Governance Tool

Institutions are fundamental to governance, providing rules and constraints that align agents' behaviors with the objectives of principals. Douglass North defines institutions as "humanly devised constraints that structure political, economic, and social interactions," emphasizing their role in reducing uncertainty and promoting cooperation over time (North 1991). They are designed to address core principal-agent challenges—particularly information asymmetries and incentive misalignments—by establishing oversight mechanisms, sanctions, and incentives that constrain non-compliance (North and Weingast 1989; North 1981).

Yet even well-designed institutions often fail to prevent compliance gaps, especially in decentralized systems. In democratic systems, third-party oversight monitors—such as citizens, interest groups, and the media—can help expose and deter non-compliance (Przeworski et al. 1999; Hollyer et al. 2018; Schedler et al. 1999; Bovens et al. 2014; McCubbins and Schwartz 1984). Still, these "fire alarms" are not always sufficient. When subnational governments prioritize local interests over national mandates, particularly in

federalist systems, they may unevenly apply regulations, resulting in persistent disparities in compliance (Konisky and Reenock 2013; Konisky and Teodoro 2016).

These challenges are magnified in authoritarian regimes, where information asymmetries are more sever, and institutions often lack independence or capacity (e.g., Wang 2014; Yang 2024). Mechanisms for public accountability are weaker or repressed, rendering alternative information channels, such as investigative journalism or civic reporting, ineffective or risky to use (King et al. 2013; Roberts 2018). Moreover, more influential entities are able to violate standards and evade penalties while less powerful ones face comparably stricter enforcement and heavier compliance burdens (Yang 2017a). Under such conditions, institutions alone struggle to ensure consistent rule enforcement or close compliance gaps.

2.2 | Campaigns as Ad Hoc Governance Tools

To address institutional deficiencies, states often deploy campaigns—episodic, high-intensity enforcement initiatives intended to restore compliance and realign local actors with central mandates (e.g., Oi 1989; Perry 2011). At their core, campaigns temporarily resolve the agency dilemma by increasing state presence, addressing information asymmetries between the principal and agents, and signaling the urgency of policy.

Campaigns influence compliance through three primary mechanisms. First, they signal governmental priority and commitment by making the issue salient to both implementers and regulated entities and demonstrating its urgency (Naoi et al. 2022; Liu et al. 2015; Sherman 1990). Second, they increase the perceived risks of non-compliance, often through highly visible enforcement actions and penalties (Sherman 1990). Third, they introduce a direct influx of centrally directed oversight, disrupting local collusion and capture. Together, these mechanisms temporarily realign the interests and behaviors of agents and regulated entities with the objectives of the principal, but only while the campaign lasts.

Historically, campaigns have been used across regime types. In authoritarian contexts, they have been deployed to promote rural development (Taiwan and South Korea during their authoritarian periods), combat corruption and waste (North Korea), and facilitate rural population settlement (Tanzania) (Hong et al. 2023; Carothers 2022; Scott 1998). In post-Mao China, campaigns have transitioned from ideological mobilization to more pragmatic enforcement, targeting issues such as public security, environmental protection, and rural development (Tanner 2000; Noakes and Ford 2015; Perry 2011; van Rooij 2016).

Although often associated with authoritarian regimes, campaigns share functional similarities with HVE campaigns in democratic systems, such as seatbelt or anti-speeding crackdowns (Sherman 1990). Both approaches emphasize visible deterrence and concentrated enforcement, though HVE campaigns—typically initiated by law enforcement agencies or regulatory bodies—operate under greater institutional constraints and public scrutiny.

Despite their utility, campaigns face a core limitation: their effects are fleeting. Once the enforcement surge recedes, regulated entities may revert to earlier behaviors. The deterrent and signaling effects fade, and compliance gaps may re-emerge (van Rooij 2006, 2016).

2.3 | Toward Regularized Campaigns: Theoretical Contributions

This paper conceptualizes "regularized campaigns" as a hybrid governance tool that combines the intensity of ad hoc campaigns with institutional continuity. Unlike one-off campaigns, regularized campaigns are structured to recur—they are not merely a series of crackdowns, but an institutionalized enforcement rhythm that reshapes the expectations of both regulators and targets over time.

During enforcement waves, regularized campaigns function similarly to traditional campaigns: central authorities apply rigorous scrutiny, mobilize resources intensively, and impose penalties for violations, thereby creating strong short-term compliance incentives. Yet they go beyond one-off enforcement by serving as recurring, public declarations of the government's policy direction and priorities. This signaling function is particularly critical in governance contexts characterized by competing priorities, where local bureaucracies struggle to allocate enforcement capacity across multiple directives (Sabatier and Mazmanian 1979; Matland 1995). By reaffirming specific central policy priorities through repeated, institutionalized oversight, regularized campaigns reshape expectations, not only during enforcement waves but also in the intervals between them. They discourage regulated entities and local agents from exploiting periods of reduced scrutiny, reinforce a "new normal" in regulatory vigilance, and align compliance behavior more consistently with national mandates. In doing so, they overcome the primary limitation of ad hoc campaigns by ensuring more sustained reductions in compliance disparities over time.

Within the principal-agent framework, regularized campaigns reinforce central oversight by embedding incentives for sustained compliance. They mitigate information asymmetries, discipline agents over time, and weaken the bargaining advantages of influential entities. This makes enforcement more uniform and less susceptible to local discretion or capture.

Two theoretical implications follow. First, under traditional institutions, entities with greater economic or political leverage are more likely to exhibit higher levels of non-compliance, *ceteris paribus*. Second, by establishing credible political signaling and recurring scrutiny, regularized campaigns curb these disparities and level enforcement across entities even beyond periods of active enforcement, *ceteris paribus*.

In summary, regularized campaigns offer a governance solution tailored for contexts where institutions alone are weak and where ad hoc campaigns tend to be ephemeral. By leveraging periodic enforcement as both a deterrent and a signal, they address entrenched compliance inequalities while reinforcing institutional goals.

Although the general theory does not require capture to be present, it is particularly relevant in cases where powerful actors distort local enforcement. As shown in the empirical case of China, regularized campaigns can disrupt such patterns, making enforcement less contingent on political or economic clout.

3 | Empirical Setting: Regulating Industrial Pollution in China

To evaluate the theoretical implications of regularized campaigns, it is essential to examine them within an empirical context that exhibits two key characteristics. First, the setting must involve significant information asymmetries between the central legislator and local bureaucracies responsible for implementation, creating enforcement challenges that cannot be fully resolved through institutions alone. Second, the governance system must incorporate both formal institutions and periodic campaigns. China's system of industrial pollution regulation provides a strong empirical case that meets these conditions, offering insight into the challenges of regulatory enforcement under institutional constraints and the role of regularized campaigns in mitigating compliance disparities.

3.1 | Structure of Environmental Governance

Environmental policy in China is formulated by the Ministry of Environmental Protection (MEP) and implemented by local environmental protection bureaus (EPBs).[5] Historically, EPBs have operated under a dual leadership system, being accountable to both the next higher level in the vertical environmental management hierarchy and to the local government at their administrative level (Jahiel 1997; Sinkule and Ortolano 1995; van Rooij 2003).[6] Figure 1 illustrates this dynamic, with "Local" encompassing administrative levels below the central government, including provinces, prefectures, and counties in hierarchical order. While the relationship among the government, EPB, and firms is structurally consistent across these levels, the actual distribution of responsibilities and enforcement authority varies, as further discussed in Section 3.2.

This dual accountability structure created conflicting incentives for local EPBs (Lieberthal and Lampton 1992; Mertha 2005; van Rooij 2006). While the MEP prioritized environmental protection, local governments often prioritized social stability and economic growth, particularly when faced with competing demands (Wang and Minzner 2015; Yang 2017b). These competing objectives frequently prompted local governments to pressure the EPBs to relax enforcement for economically significant firms, enabling them to evade compliance with environmental standards (Yang 2017a; Zhang et al. 2018). This behavior reflects broader principal-agent challenges in governance but can also extend to outright regulatory forbearance—or even capture—when influential firms leverage local discretion to influence enforcement outcomes in their favor (Dal Bó 2006; Shen 2022).

The misalignment between central and local priorities was further exacerbated by the financing structure of local EPBs. Revenue from pollution levies and fines—paid directly by firms or transferred through local EPBs—was nominally intended to enhance firms' pollution-treatment capabilities. However, chronic budget constraints created perverse incentives for EPBs to tolerate pollution, as continued violations generated additional revenue that could be used to offset fiscal shortfalls. This dynamic shifted EPBs' interests away from alignment with the MEP and toward alignment with influential firms, further widening compliance gaps (Sinkule and Ortolano 1995; Jahiel 1997; Ma and Ortolano 2000; van Rooij 2003; Shen 2022).

While local officials may strategically manipulate enforcement to prioritize economic development and personal career advancement, bureaucratic capture remains a particularly concerning issue in this context (Zhao and Qi 2020). Following Ernesto Dal Bó's broad definition, capture can be understood as "the process through which special interests affect state intervention in any of its forms" (Dal Bó 2006, 203). This contrasts with the narrower interpretation of regulatory capture associated with utility regulation, in which regulated entities, such as monopolistic utility companies, influence regulatory agencies tasked with overseeing them to secure favorable outcomes (Stigler 1971). In China's environmental governance, capture can manifest when economically influential firms leverage their contributions to local economies to secure lenient enforcement (Wang et al. 2003). This entrenched pattern of preferential treatment underscores the structural challenges of aligning local enforcement with national environmental goals.

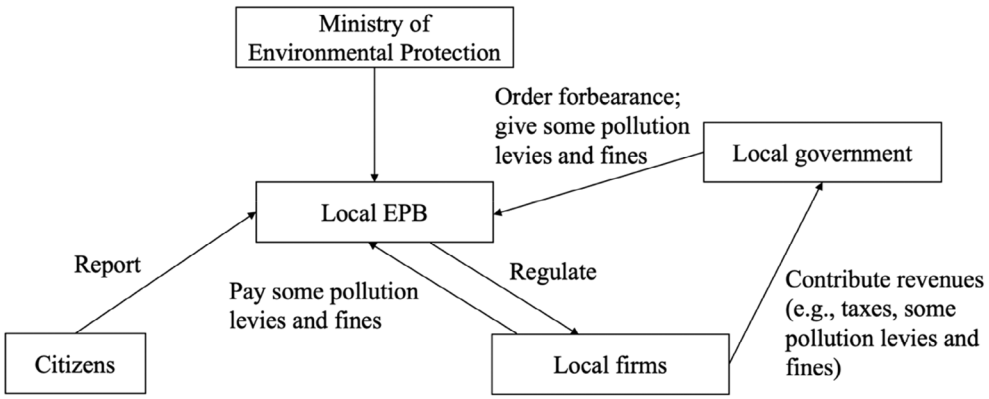

FIGURE 1 | Structure of local environmental governance in China (before verticalization reform under the 13th FYP).

3.2 | The Principal, the Supervisor, and the Agent

Our empirical analysis on environmental management at the prefectural level, which plays a crucial role in local environmental governance (Shen 2022, 35–36; 2025a, 2025b). First, prefectural leaders wield significant authority over the local economy, shaping critical aspects such as subsidies, labor policies, and industrial priorities, which collectively influence the economic landscape. Second, they hold substantial de facto authority over local pollution control measures, determining how environmental regulations are enforced and interpreted at the local level. This dual role makes prefectural leaders key actors in the environmental regulatory process, balancing economic and environmental priorities.

In the context of our study, the environmental management system aligns with a principal-supervisor-agent framework (see Figure 2). The MEP acts as the principal, responsible for establishing fundamental environmental institutions, including enacting environmental laws, policies, and regulations, and organizing their implementation (Ministry of Ecology and Environment, n.d.). The MEP's primary incentives are to ensure that local EPBs faithfully execute their duties, report accurate information upward, and enforce environmental standards evenly across all regulated entities. At the prefectural level, the EPB serves as the agent tasked with regulating polluting firms, while the provincial EPB, positioned between the MEP and the prefectural EPB, functions as the supervisor, overseeing and evaluating the enforcement actions of the prefectural EPB.

Collusion among various local levels of government and bureaus (e.g., between provincial EPBs and prefectural EPBs) has been well-documented and poses a major challenge to effective governance (Pan and Chen 2018; Yang 2024). In many cases, provincial authorities prioritize local economic interests over national environmental goals, enabling firms to evade compliance with environmental standards. Many provincial authorities prioritize local economic growth over national environmental objectives, creating opportunities for firms to evade compliance with environmental standards. For instance, following the 2015 decentralization of authority to approve environmental impact assessments for new coal projects, provincial governments rapidly approved projects to stimulate local economic growth and secure inexpensive energy production despite China's national commitments under the Paris Agreement (Hao 2016). This surge in approvals exacerbated power overcapacity and worsened environmental quality, ultimately prompting the central government to implement stringent coal policies to curb new and ongoing projects.

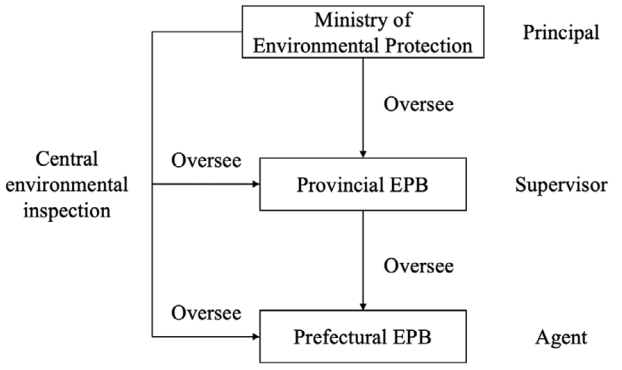

FIGURE 2 | Principal-supervisor-agent relationship in environmental management.

Within this principal-supervisor-agent framework, what may appear as regulatory failure due to inefficiency often involves the discretion exercised by supervisors (provincial EPBs) in interpreting and acting on information from agents (prefectural EPBs). Economically influential firms often exploit this discretion, leveraging their contributions to local economies to secure lenient enforcement. Whether this behavior is framed as a capture or simply as a natural consequence of competing priorities, the result is the same: the perpetuation of compliance gaps (Wang et al. 2003; Zhao and Qi 2020).

The introduction of campaign-style inspections by the MEP fundamentally disrupted this entrenched pattern of collusion, signaling the central government's determination to address these systematic governance failures. By intensifying scrutiny and centralizing oversight through periodic inspections, the MEP reduced the discretion of local supervisors and agents, effectively curtailing collusive practices. These inspections, which targeted supervisors, agents, and regulated entities, undermined the ability of economically influential firms to leverage their economic contributions for preferential enforcement. As a result, the bargaining power of these firms was diminished, causing their compliance behaviors to align more closely with those of less influential entities. This shift not only narrowed compliance gaps but also demonstrated the potential of regularized campaigns to reinforce central priorities and address long-standing structural challenges in environmental governance.

3.3 | Means of Governance in Regulating Industrial Pollutant Emissions

The MEP has established various institutions to regulate industrial pollution, including pollutant emissions standards, firm-level monitoring systems, and procedures for local EPBs to address violations. However, significant information asymmetries persist between the enforcement activities reported by EPBs and their actual practices, creating opportunities for local discretion and manipulation. To address these asymmetries and strengthen central oversight, the MEP initiated centrally sponsored inspection campaigns in 2016. This subsection outlines the key governance tools, including institutions and inspection campaigns.

3.3.1 | Institutional Monitoring: Continuous Emissions Monitoring System

In 2007, the MEP launched the CEMS, mandating the installation of automatic monitors at major state-controlled polluting firms. At the time, these firms accounted for over 65% of China's industrial pollution. The CEMS monitors

hourly concentrations of key pollutants, including air pollutants—total suspended particles (TSP), sulfur dioxide (SO_2), and nitrogen oxides (NO_x)—and water pollutants—ammonia nitrogen (NH_3-N) and chemical oxygen demand (COD). The roster of monitored polluting sources is updated annually. By 2016, the program covered 14,312 firms, with emissions data made publicly available (General Office of the Ministry of Environmental Protection 2016).

To ensure data integrity, the MEP implemented several safeguards. Firms were required to have third-party installation of CEMS equipment and operate CCTV cameras near monitoring devices around the clock. The system also incorporated algorithmic detection of data anomalies, with local EPBs conducting monthly supervisory sessions to review irregularities. Additionally, firms were subject to mandatory on-site inspections at least once a month to verify the functionality of their monitoring equipment. To enhance transparency, the central government required the publication of each plant's hourly emissions data in real time on provincial government websites.[7]

Despite these precautionary measures, the enforcement of regulatory standards based on CEMS data often fell short due to local EPB discretion and capacity (Shen 2022; Yang 2017a; Zhao and Qi 2020). As a result, while CEMS, as a form of institutional monitoring, provides a critical foundation for environmental governance, additional oversight measures are necessary to ensure compliance and mitigate enforcement gaps.

3.3.2 | Campaign-Style Inspections: Central Environmental Inspections

Following severe air pollution events in Beijing in January 2013 and subsequent "red alert" days in 2015, the central government announced plans to deploy CEI teams for surprise, campaign-style inspections. On July 1, 2015, the Central Commission on Comprehensively Deepening Reforms officially established these inspection teams, which were directly supervised by the MEP and included members from the Central Commission for Discipline Inspection, the Central Organization Department, and the MEP itself. Notably, the CEIs were endowed with unprecedented power. Unlike past ad hoc campaigns, which primarily targeted firms, CEIs were authorized to scrutinize not only firms but also the main leaders of the Party and government at the local level. This broad scope enabled CEIs to overcome local collusion, a major factor contributing to poor compliance with environmental standards, particularly among more powerful firms (Wang et al. 2003; Yang 2017a; Zhang et al. 2018; Shen 2022). Local party committees and governments perceived the CEIs' focus as being directed more at their actions and failures than at those of the firms (Xiang and van Gevelt 2020, 434). These teams conducted unannounced inspections across all 31 provincial-level regions, including autonomous regions and prefectures of equivalent administrative rank, with each inspection lasting approximately 1 month.

This paper focuses on the first wave of CEIs (2016–2017), which began with a pilot in Hebei Province early in 2016, followed by four additional batches later that year and in 2017. Prompted by mounting concerns about persistent pollution and weak enforcement of environmental regulations at the subnational level, the CEIs were initially conceived as a high-profile corrective measure but quickly evolved into a recurring policy instrument within China's environmental governance system. Coordinated by the MEP and the Central Leading Group for Inspection Work, each CEI followed a structured three-phase process: (1) forming the inspection team with experts and officials under MEP supervision; (2) conducting unannounced on-site inspections, targeting local governments, EPBs, and firms; and (3) completing post-inspection evaluations, with results publicly reported to ensure transparency and accountability (see Section S1 in the Supplemental Information for detailed processes).

The impact of the CEI campaigns has been profound. The first wave (2016–2017) alone resulted in approximately 135,000 citizen complaints, fines totaling RMB 1.43 billion (USD 224 million), and punitive measures against 29,000 enterprises (China News 2018). These inspections also held 18,448 government and party leaders accountable, significantly altering the behavior of both firms and local government entities (China News 2018).

A notable example of CEIs' effectiveness in addressing compliance disparities and disrupting bureaucratic capture is the case of Laoganma, a major sauce producer and significant tax contributor in Guiyang Prefecture. Historically, Laoganma benefited from preferential treatment due to its economic importance, with local authorities shielding the firm from strict enforcement of environmental regulations (The Paper 2017a; China Youth On Line 2017). This dynamic aligns with the bureaucratic capture effect theorized earlier, where economically influential firms leverage their contributions to evade compliance obligations.

During the first wave of CEI inspections in 2017, numerous complaints about pollution from Laoganma's operations reached the central inspection team (The Paper 2017b). Unlike prior instances where local officials downplayed or ignored these complaints, the CEI team directly engaged with local government officials through interviews and meetings, holding them accountable for their inaction. As part of the CEI's enforcement process, the team issued a mandatory rectification plan with a firm deadline, threatening severe penalties for non-compliance.

Under this heightened scrutiny and direct oversight, Laoganma was compelled to comply (People's Daily 2018; Chongqing Daily 2018). The firm made significant investments in technological upgrades, including the installation of a near-zero emissions terminal combustion system, to meet environmental standards. Ultimately, it relocated its factory to address persistent air quality complaints.

This outcome not only demonstrates the deterrence effect of CEI campaigns but also illustrates their ability to undermine entrenched patterns of local collusion and align the compliance behavior of influential firms with national environmental

standards. By disrupting the firm's reliance on its economic leverage to evade regulations, the CEI effectively neutralized the compliance gap between Laoganma and less influential firms, reinforcing the governance implications of regularized campaigns.

3.3.3 | Regularizing Campaigns as a New Governance Tool

Following the success of the first wave, the central government institutionalized CEIs as a regular governance tool to ensure sustained oversight and enforcement. The second wave (2019–2022) consisted of six inspection batches that covered all 31 provincial-level regions, while the third wave, which began in November 2023, has completed three inspection batches as of December 2024. The continuation and intensity of the CEIs are likely adaptive to changing compliance conditions, with the MEP potentially scaling back inspections in regions demonstrating high compliance and intensifying them where compliance declines. Although this responsiveness introduces the possibility of an endogenous relationship between the frequency and intensity of CEIs and compliance levels, this dynamic reflects a deliberate strategy rather than a limitation of the approach.

What is evident is that CEIs serve not only as enforcement mechanisms but also as clear and strong signals of the central government's policy priorities. These campaigns compel local officials to align their actions accordingly, reshaping local decision-making to prioritize pollution reduction. Based on field interviews with local officials, Xiang and van Gevelt (2020, 436) highlight that CEIs alter the incentive structures of local officials by making environmental performance a visible and significant metric in career advancement and promotion. This dual function—elevating the salience of environmental governance while deterring non-compliance—ensures that improvements in compliance and narrowing of compliance gaps persist between inspection waves.

The institutionalization of CEIs demonstrates their value as a dynamic and adaptive governance tool that complements traditional regulatory institutions. By fostering behavioral changes among local officials and regulated entities, CEIs address implementation gaps that previously limited the effectiveness of existing environmental governance tools. The shift in incentive structures not only reinforces compliance during active inspection waves but also ensures a more consistent alignment with national environmental priorities over time.

Building on the theory outlined in Section 2, we assess the impact of CEIs on compliance behavior, specifically their capacity to address entrenched disparities in enforcement and compliance gaps. Our analysis focuses on two key hypotheses:

H1. *Before the implementation of CEIs (i.e., before 2016), firms with greater economic influence exhibited higher levels of environmental violations, ceteris paribus.*

H2. *After CEIs were institutionalized (i.e., from 2016 onward, including 2018, when no active campaigning was ongoing), the relative economic influence of firms no longer significantly affected compliance behavior, ceteris paribus.*

4 | Research Design

4.1 | Variable and Data Description

4.1.1 | Dependent Variables

The key dependent variable is environmental compliance, following Gray and Deily (1996).[8] It is measured by the total annual number of violations of daily average concentrations of TSP, SO_2, NO_x, NH_3-N, and COD. In one robustness check, we analyze the types and severity of punishments imposed by the prefectural EPB for environmental standards violations in relation to firms' bargaining power. In another robustness check, we examine changes in firms' production stoppages in the weeks leading up to, during, and after the CEI to assess how patterns differ among high-polluting, medium-polluting, and low-polluting firms.

4.1.2 | Independent Variables

To measure a firm's relative importance and bargaining power within a prefecture's economy, we use the percentage of output as our primary proxy for environmental bargaining power, a widely adopted metric in existing literature (e.g., Stenbacka and Tombak 2012; Wang, Liu, Xu, et al. 2023). This is calculated as the output of an industrial firm as a percentage of the total output of all industrial firms in the prefecture. This measure is appropriate because local economic development is critically influenced by such contributions.

For robustness checks, we also use the percentage of tax and the percentage of employees as alternative measures of bargaining power. The percentage of tax reflects the percentage of total industrial taxes contributed by a firm within a prefecture, given the importance of tax contributions in prefecture leader promotion decisions (Guo 2009). Similarly, the percentage of employees measures a firm's workforce as a percentage of the prefecture's population, capturing its socioeconomic significance (Lorentzen et al. 2014).

4.1.3 | Control Variables

We control for a battery of variables that are plausibly correlated with a firm's output percentage and affect its environmental compliance. At the firm level, we control for the firm output value. Generally, the higher a firm's output value, the greater its pollutant emissions and, consequently, the more likely it is to violate environmental standards. Since prefectures are at different levels of economic development and have varying levels of dependency on industries for economic growth, which could affect how much bargaining power a particular firm wields, we also control for relevant prefecture characteristics. These include GDP per capita, population density, the proportion of prefecture GDP that comes from the industrial sector, the proportion of employees in the industrial

sector, and the number of unemployed. In robustness checks, we will also control for poor air days, city industrial output, and decarbonization pilot city status.

4.1.4 | Data Sources

- *China Environmental Statistics Database (CESD)*: The CESD is regarded as one of the most comprehensive databases for environmental statistics, tracking firms that account for approximately 85% of China's total industrial emissions. It contains annual environmental data dating back to 1985 and spans 31 provinces, 113 prefectures, and 42 industrial sectors. The database is compiled and verified by the MEP and remains confidential. For our study, we accessed statistics from six key industries—paper, chemicals, nonmetallic minerals, ferrous metals, non-ferrous metals, and heating and electricity—which are major contributors to air and water pollution under regulatory scrutiny.
- *Chinese Industrial Enterprise Database*: We sourced firm-level tax and employment data from the Chinese Industrial Enterprise Database, which encompasses more than 300,000 firms across over 60 major industries. Together, these firms represent about 90% of China's total industrial output. Due to limited data availability, we accessed tax and employment statistics for the year 2014 only.
- *CEMS Database*: We utilized the CEMS Database for hourly pollutant concentration data. A study comparing CEMS data with onsite supervisory monitoring indicated insignificant manipulation of data by firms (Wang et al. 2022). Nonetheless, it cannot be entirely ruled out that some firms may turn off monitors during high-emission periods. To ensure the integrity of our analysis, we used the official CEMS data supplied by the MEP, which is more comprehensive and corrects basic errors sometimes found in real-time data from provincial government websites. To account for potential anomalies caused by mechanical errors or production suspensions, we excluded observations above the 99th percentile and below the 1st percentile for each pollutant. Negative values and zeros were also omitted. Finally, we aggregated the hourly data to provide annual pollutant levels for our analysis.

  The CEMS database also includes information on firm production stoppages, which firms are required to report to the government, as these stoppages can impact the monitoring readings.
- *Administrative Penalty Dataset (APD)*: We acquired the APD dataset from the MEP for the years 2015–2018. This dataset is part of a mandated statistical system established by the 2010 *Measures for Environmental Administrative Penalties*, which requires local EPBs to record and report administrative punishment cases to the MEP. The APD includes detailed records of environmental violations, specifying the time, type, reason, and monetary amount of each punishment. Although some of this data has been publicized by environmental NGOs, our dataset from the MEP is more comprehensive.
- *City Statistical Yearbooks (CSY)*: We drew statistics on prefecture characteristics from Prefectural Statistical Yearbooks, published by the National Bureau of Statistics. These yearbooks cover 656 prefectures nationwide and provide data on various metrics, including prefecture industrial output value, GDP per capita, population density, the percentage of GDP from the industrial sector, the employment percentage in the industrial sector, and the number of unemployed residents.
- *China National Environmental Monitoring Centre (CNEMC)*: We sourced prefecture-level AQI data from the CNEMC.
- *12,369 Platforms Complaints Dataset*: We accessed confidential statistics on citizen complaints from the 12,369 platforms for the years 2016 and 2017, obtained directly from the MEP. This comprehensive dataset includes the dates and details of the complaints.

4.1.5 | Descriptive Statistics

After integrating the CESD and the CEMS datasets, our sample comprises 21,754 firm-year observations. The key variables used in the analyses are summarized in Table 2, highlighting substantial variations in both the absolute output values of firms and their percentages relative to total industrial output in their respective cities. The "Percentage of firm output" variable is calculated as a firm's output divided by the city's total industrial output, expressed as a percentage, with firm-level data sourced from CESD and city-level data from CSY. This variable demonstrates a wide range of values, reflecting differences in firm size and economic significance across prefectures.

4.2 | Identification Strategy

Our study diverges from the existing literature, which predominantly focuses on the *short-term* effects of CEIs on various *air quality indicators* such as AQI, PM_{10}, $PM_{2.5}$, CO, NO_2, O_3, and SO_2 during or immediately surrounding active campaign periods.[9] Leveraging access to several comprehensive and confidential government datasets, we construct a unique firm-level dataset to examine how firm bargaining power influences environmental compliance levels before, during, and after the first wave of CEIs. Our dataset spans all 31 provincial-level regions and covers a longer time horizon than most existing studies. Additionally, while prior research has primarily centered on air pollution, we extend the analysis to include water pollution, reflecting the CEI's significant emphasis on both air and water quality enforcement.

Our analysis specifically compares firms with identical levels of industrial output but varying degrees of bargaining power within the same province. For our identification strategy, we capitalize on the plausibly exogenous timing of the announcement of prefecture inspections.[10] This enables us to examine how compliance behaviors differ across firms with varying bargaining positions, regardless of their absolute output size. We decided against using a difference-in-differences (DiD) approach for this analysis.[11]

TABLE 2 | Summary statistics of key variables.

Variable	Data sources	Data years	Min	Max	Mean	Std. dev.	Num. obs.
Violations							
Overall	CEMS	2014–2018	0	7507	86.43	296.01	21,754
TSP			0	2608	39.36	125.70	16,179
SO_2			0	2450	31.54	118.18	16,517
NO_x			0	3604	42.07	168.26	16,143
NH_3-N			0	597	4.30	24.92	6895
COD			0	360	2.60	21.16	5353
Penalties							
Whether punished	APD	2015–2018	0	1	0.28	0.45	17,488
Number of penalties			1	53	1.88	2.20	4854
Amount of penalties (10,000 yuan)			1	2810	32.06	118.08	4699
Percentage of firm output	CESD and CSY	2014–2018	0.000016	86.62	0.56	2.12	21,754
Firm output value (10,000 yuan)	CESD	2013–2018	14	23,069,764.40	145,538.50	496,688.90	21,754
GDP per capita (yuan)	CSY	2014–2018	10,171	215,488	64,693.84	35,445.61	21,730
Population density (people/km^2)			4.08	2648.11	508.39	351.76	21,730
% GDP from industrial sector			12.19	75.53	46.36	8.63	21,730
% employed in the industrial sector			7.53	83.43	47.05	13.76	21,726
Unemployed (people)			775	403,054	37,073.46	41,309.82	21,470
Number of heavily polluted days	CNEMC	2014–2018	0	76	11.84	14.26	20,368

Our analysis is conducted on an annual basis to capture broader trends and minimize the influence of short-term fluctuations. This approach is also consistent with the temporal granularity of the data used to calculate metrics of firm bargaining power. The OLS model for firm i in industry *ind*, with ownership type *own*, in prefecture *pref* within province *prov* for year t is structured as follows:

$$Compliance_{i,t} = \alpha + \beta_1 \frac{FirmOutput_{i,t}}{PrefectureOutput_{pref,t}} \times 100\% + \beta_2 FirmOutput_{i,t} + \beta_3 Prefecture_{pref,t} + \theta_{ind,t} + \zeta_{own,t} + \eta_{prov,t} + \varepsilon_{i,t}$$

where $Compliance_{i,t}$ denotes the inverse hyperbolic sine (IHS) transformation of firm i's number of violations of daily average concentration standards in year t.[12] $FirmOutput_{i,t}$ refers to firm i's industrial output value in year t. $PrefectureOutput_{pref,t}$ represents prefecture *pref*'s total industrial output value in year t. $Prefecture_{pref,t}$ denotes a vector of characteristics for prefecture *pref* in year t.

In addition, to account for variations across different dimensions, our model incorporates three sets of fixed effects (Pearson 2005). Firstly, environmental compliance can vary significantly across industries and over time due to differences in regulatory requirements, industry-specific technologies, and external economic factors. By including industry-year fixed effects, denoted by $\theta_{ind,t}$, we control for these variations, ensuring that our estimates reflect within-industry changes over time rather than being confounded by industry-specific trends. Secondly, firms with different ownership structures (e.g., state-owned, private, and foreign-invested) may have varying levels of compliance due to differences in management practices, regulatory oversight, and incentives. Ownership-year fixed effects, denoted by $\zeta_{own,t}$, control for these systematic differences across ownership types, allowing us to isolate the impact of firm-specific factors on compliance. Finally, environmental policies and enforcement practices often vary across provinces due to differences in provincial environmental policies and varying levels of state capacity. By including province-year fixed effects, denoted by $\eta_{prov,t}$, we account for these regional differences, ensuring that our analysis focuses on variations within provinces over time rather than being influenced by cross-provincial disparities. The error term in our model is represented by $\epsilon_{i,t}$.

Some may be concerned about the comparability of coefficients across samples from periods before and after the launch of the CEIs and the potential for measurement errors in violation counts or industrial output. We note the following: First, the identification of violations is based on concentration measurements recorded automatically by the CEMS. The CEMS data are collected under strict calibration protocols to ensure accuracy. While firms could theoretically tamper with CEMS equipment to lower emissions readings, such behavior is more likely among those with greater bargaining power and would have been more prevalent before the launch of the CEIs when enforcement was weaker. In this scenario, any tampering would bias our estimates downward, meaning that

TABLE 3 | Relationships between the percentage of output and the total number of violations (five pollutants).

	Pre-CEI period (2014–2016)				Post-CEI period (2017–2018)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Perc. of output	0.09***	0.08***	0.09***	0.07**	0.00	0.01	0.01	−0.02*
	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.01)	(0.02)	(0.01)
Firm output	0.17**	0.19***	0.16**	−0.17	0.22***	0.19**	0.18**	0.07
	(0.08)	(0.07)	(0.06)	(0.20)	(0.08)	(0.08)	(0.08)	(0.06)
Unemployed			−0.06	−0.17			−0.28***	−0.56
			(0.07)	(0.17)			(0.09)	(0.53)
Employees prop. from ind.			0.01	0.00			0.01	0.01
			(0.01)	(0.02)			(0.00)	(0.02)
GDP per capita			0.07	0.75			0.07	−2.11
			(0.14)	(1.10)			(0.14)	(2.28)
GDP prop. from ind.			0.01*	−0.02			0.00	0.03
			(0.01)	(0.04)			(0.01)	(0.05)
Population density			−0.06	−0.65			0.07	0.82
			(0.08)	(1.24)			(0.09)	(2.08)
Constant	2.64***	2.64***	1.77	0.98	1.20***	1.20***	2.47**	23.86
	(0.05)	(0.04)	(1.21)	(14.98)	(0.05)	(0.04)	(1.16)	(26.09)
Province-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FE	No	Yes	Yes	No	No	Yes	Yes	No
Ownership-year FE	No	Yes	Yes	No	No	Yes	Yes	No
Firm FE	No	No	No	Yes	No	No	No	Yes
Observations	12,967	12,962	12,723	11,712	8787	8784	8735	6205
Adj. R^2	0.19	0.28	0.29	0.60	0.12	0.14	0.14	0.49

Note: Standard errors are clustered at the province-month level and given in parentheses. The reduction in the number of observations in the post-CEI period, from 12,967 to 8787, is due to the shorter duration of 2 years (2017–2018), as opposed to the pre-CEI period of 3 years (2014–2016).
*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

the observed effect of CEIs on compliance disparities is likely a conservative estimate of their true impact.

Second, while firms may misreport their output values, the reported figures serve as the primary basis for government assessments of firms' production scale and bargaining power. As such, these figures likely offer a more reliable measure of firms' relative economic importance within local economies than actual output values. Furthermore, as output data were not a direct focus of CEI inspections, their quality is unlikely to have been systematically influenced by the campaigns. Therefore, any potential measurement errors in output are unlikely to significantly bias our results, and the comparability of coefficients across periods remains robust.

5 | Empirical Results

To examine the relationship between a firm's bargaining power and its environmental compliance, we analyze the total number of violations of environmental standards as the dependent variable. The results are presented in Table 3, where columns (1) to (4) correspond to the pre-CEI period, and columns (5) to (8) cover the post-CEI period. The results indicate that before the implementation of CEIs, firms with greater contributions to the prefecture's industrial outputs—and consequently more bargaining power with the prefectural EPB—were more likely to violate environmental standards. Specifically, a one standard deviation increase in a firm's output share was associated with a 19.08% increase in the total number of violations, *ceteris paribus*, prior to the CEIs. Given that each recorded violation reflects a legally defined exceedance of environmental discharge standards, this compliance gap had non-trivial consequences for public health and environmental quality. Although it is difficult to quantify precisely the public health or environmental damage caused by any single violation—given the complex causal pathways linking emissions, ambient pollutant levels, human exposure, and health outcomes—the broader evidence indicates that regulatory lapses of this nature have historically contributed to significant increases in morbidity, mortality, and environmental degradation (Shen 2022, chap. 6). Thus, even if the marginal effects of individual violations cannot be precisely estimated, the gap in compliance prior to CEIs is normatively and substantively important.

Consistent with our theoretical predictions, this relationship between firm influence and violations disappeared in the post-CEI period, suggesting that CEIs effectively curtailed the compliance advantage previously enjoyed by economically influential firms. As we further demonstrate in the robustness checks, overall violations declined significantly after CEI implementation, providing no evidence that smaller firms became less compliant. Rather, the narrowing of the compliance gap appears to have been driven by improvements among larger firms, rather than deterioration among smaller ones. Additional results using alternative measures of firm bargaining power are presented in Table S1.

We further examine the relationship between a firm's bargaining power and its compliance with standards for individual pollutant concentration. We visualize this relationship by plotting the coefficients and their 95% confidence intervals for the *percentage of output* variable on a graph. If the estimate and its 95% confidence intervals intersect the horizontal zero line, it indicates that a firm's percentage contribution to the prefecture's total industrial output does not significantly impact the number of violations it commits. Coefficients above zero suggest that firms contributing more significantly to the prefecture's industrial output commit more violations.

Figure 3 shows that the patterns across the five pollutants—TSP, SO_2, NO_x, COD, and NH_3-N—are consistent. Specifically, before

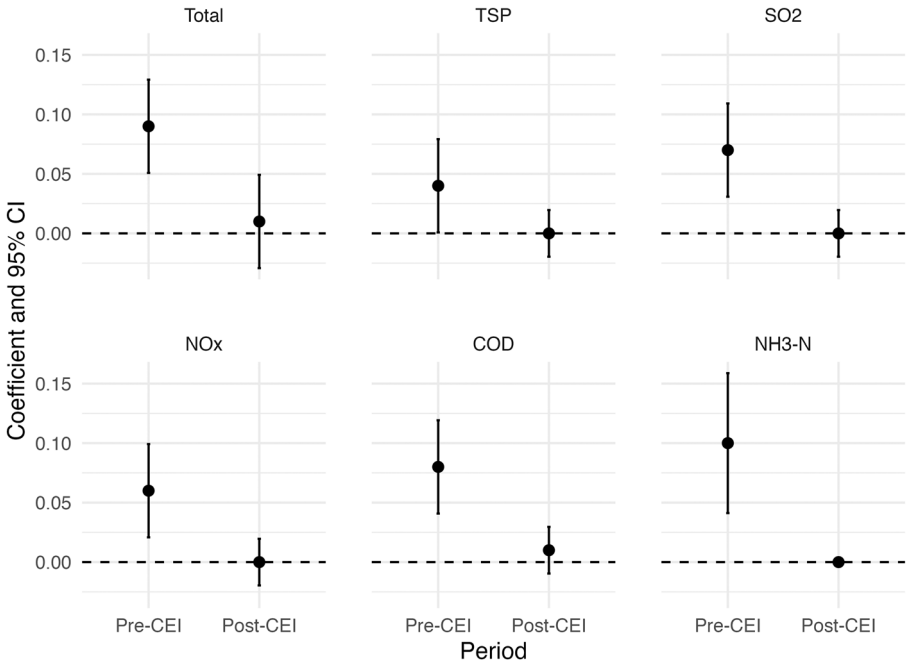

FIGURE 3 | Relationships between the percentage of output and the number of total violations and violations for TSP, SO_2, NO_x, COD, and NH_3-N concentrations.

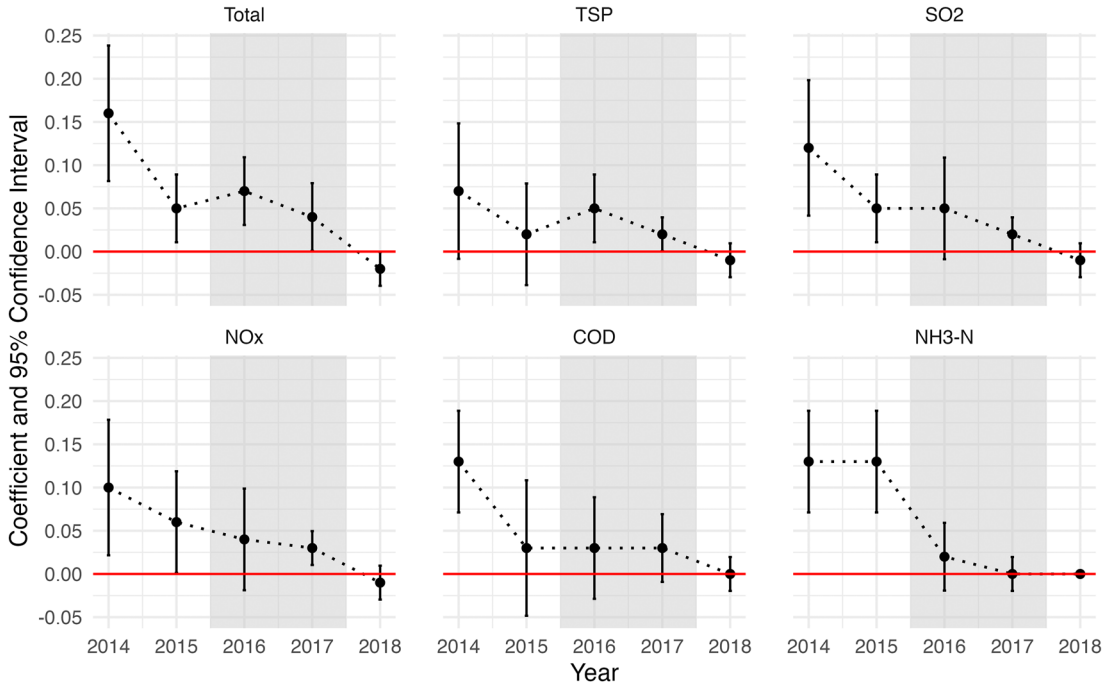

FIGURE 4 | The relationship between the percentage of firm output and the number of environmental violations, 2014–2018. The shaded area represents the period of the first wave of CEIs, 2016–2017.

the implementation of CEI, with only institutions in place, a one standard deviation increase in the percentage of firm output was associated with increases in violations of 8.48% for TSP, 14.84% for SO_2, 12.72% for NO_x, 16.96% for COD, and 21.20% for NH_3-N, *ceteris paribus*. However, after the CEI was launched, a firm's relative contribution to industrial outputs did not significantly influence the number of violations committed. The corresponding regression results are presented in Table S2 in the Supporting Information.

Some may argue that parts of 2016 and 2017 fell within the CEI, so we excluded observations from these years and reanalyzed them. The results are presented in Table S3 in the Supporting Information and show very similar trends.

Our analysis of the effect of the percentage of output across individual years reveals that the compliance gap between firms with varying levels of relative contribution generally narrowed following the initiation of the CEI in 2016, as illustrated in Figure 4. The corresponding regression results are presented in Table S4 in the Supporting Information. By 2018, the year between the first and second CEI waves, this gap had closed to the point of statistical insignificance.

Furthermore, Poisson regression models are also estimated given the count nature of the dependent variable. These alternative specifications yield substantively similar results, confirming that the compliance gap between economically influential and less influential firms narrowed significantly after the implementation of CEIs. Full results are presented in Tables S5–S7 in the Supporting Information.

6 | Robustness Checks

We conduct a series of robustness checks to evaluate and rule out alternative explanations for our findings, which collectively reinforce the argument that CEIs effectively reduced the compliance gap among firms.

First, we address the possibility of reverse causality, wherein less compliant firms may contribute more to the prefecture's industrial output. A concern is that firms violating environmental standards may invest less in pollution abatement, reducing production costs and potentially increasing output. To mitigate this concern, we lag the independent variable by 1 year, using the percentage of firm output from the previous year, which is unlikely to be affected by the firm's compliance status in the current year. Our analysis confirms that the primary results remain robust despite this potential issue (Table S8).

Additionally, some may be concerned about endogeneity arising from a bidirectional relationship between a firm's industrial output and environmental compliance. However, we emphasize that firm output is explicitly controlled for in our model, ensuring that our estimates compare firms of the same industrial size but with varying degrees of bargaining power within the same province. By holding firm output constant, our analysis isolates the effect of relative bargaining power (measured as a firm's percentage contribution to prefecture-level industrial output) on compliance behavior independent of firm resources. Furthermore, our inclusion of province-year, industry-year, and ownership-year fixed effects accounts for time-varying factors that may simultaneously influence both firm size and compliance behavior. Given these model

specifications, we believe that potential endogeneity concerns are addressed within our identification strategy.

Second, we employ an alternative specification for the dependent variable, measuring non-compliance as the number of days with violations rather than the total number of violations. This accounts for the possibility that larger firms, due to scale (i.e., more plants and outlets), accumulate more total violations. The results remain consistent, reinforcing that the main findings are not artifacts of firm size (Table S9).

Third, we examine whether the observed compliance gap was driven by fine affordability rather than bargaining power. Before the CEIs, high-contributing firms not only committed more violations but also received disproportionately fewer penalties, suggesting regulatory forbearance rather than strategic fine-paying. After the CEIs, however, this compliance gap narrowed, and firms of all sizes faced more uniform enforcement, reducing the influence of bargaining power on compliance outcomes (Table S10).

Fourth, we rule out the possibility that CEIs simply relocated enforcement resources toward major polluters. One alternative explanation is that CEIs may have simply prompted local EPBs to focus on large polluters for efficiency reasons rather than actively disrupting capture. However, reports from state news agency Xinhua suggest otherwise: CEIs not only intensified enforcement against major polluters but also targeted small polluters who had previously escaped regulation due to logistical and bureaucratic constraints (Xinhua News Agency 2017). This evidence suggests that CEIs systematically addressed longstanding patterns of selective enforcement across firms of all sizes, rather than simply shifting enforcement toward larger targets.

Fifth, we investigate whether intensified citizen complaints could explain compliance improvements. Using the two-way fixed effects event study approach (Sun and Abraham 2021), we find that surges in citizen complaints were concentrated only during CEI inspection months and subsided quickly afterward, making it unlikely that citizen complaints drove the observed changes in compliance (Figure S2). This aligns with insights from qualitative interviews on citizens' perceptions of CEIs. For instance, prior research indicates that citizens place greater trust in the central government than in local officials, whom they perceive as more focused on career advancement and economic targets, often in collusion with businesses (Xiang and van Gevelt 2020, 435).

Sixth, we assess whether high-pollution days affected firm compliance. A concern is that local EPBs may enforce pollution regulations more rigorously on heavily polluted days to prevent social unrest, thereby diminishing the role of bargaining power. However, after controlling for the number of heavily polluted days, the core results persist, suggesting that perceived differential enforcement on bad air days is not driving the compliance gap (Table S11).

Seventh, we consider whether low industrial outputs (and associated lower state capacity) explain variations in enforcement. Including city-level industrial output as a control yields consistent results, suggesting that local regulatory capacity is not confounding our estimates (Table S12).

Eighth, we investigate whether the nationwide anti-corruption campaign launched in 2012 can account for the observed improvements in compliance. Since CEIs were launched 4 years later, and our analysis controls for province-year variation, our results reflect the impact of CEIs rather than broader anti-corruption efforts.

Ninth, we explore whether firms anticipated CEIs and preemptively altered their production behavior. Contrary to the "anticipatory compliance" hypothesis, event-study analysis shows that lower-polluting firms, not high-polluting firms that could plausibly anticipate greater scrutiny from the CEI team, reduced production more sharply, supporting our interpretation of CEIs disrupting local protection (Figure S3).

Tenth, we control for China's carbon emissions trading pilot and low-carbon city initiatives, which could confound firm-level compliance changes independently of the CEIs. Adding a "decarbonization pilot city" variable does not alter the key results (Table S13), indicating that these low-carbon policies do not bias our estimates.

Finally, we assess whether the narrowed compliance gap post-CEI was due to improved behavior among larger firms or deteriorating behavior among smaller firms. Regression results (Table S14) indicate overall improvements in compliance with no evidence of worsening compliance among smaller firms, suggesting that the gap narrowed due to better compliance among larger, previously protected firms.

7 | Conclusion and Implications

In implementing state policies, principals (i.e., legislators) rely on both institutions and campaigns to monitor enforcement by agents (i.e., the regulating bureaucracies) and ensure compliance by regulated entities (e.g., firms). Institutions establish long-term governance stability by creating rules and oversight mechanisms, while campaigns mobilize resources for high-intensity, short-term enforcement, often achieving rapid but temporary shifts in policy outcomes. However, existing scholarship highlights that institutions alone may falter in promoting compliance and that the effects of campaigns are inherently episodic. This study addresses these limitations by introducing "regularized campaigns"—a novel governance tool that blends the continuity of institutions with the enforcement intensity of campaigns.

7.1 | Theoretical and Empirical Contributions

This study presents regularized campaigns as a novel institutional form that embeds recurring enforcement waves to enhance regulatory oversight and close compliance gaps. By examining the implementation of CEIs in China, this study provides empirical evidence that these campaigns not only curb preferential treatment of economically influential firms but also sustain improvements in compliance and reduce compliance

gaps through durable incentive realignments prompted by credible and recurring central political signaling. Before the CEIs, firms with greater economic importance to their localities exhibited higher levels of non-compliance, leveraging their bargaining power to evade environmental regulations. After CEIs were institutionalized, however, this advantage eroded, and compliance gaps narrowed significantly. These findings demonstrate that regularized campaigns can disrupt entrenched enforcement asymmetries, reinforce central priorities, and achieve sustained improvements in closing compliance gaps, both during and between campaign waves. This represents a durable shift in regulatory dynamics, positioning regularized campaigns as a pathway toward institutional transformation.

Beyond environmental governance, these insights carry implications for political systems where local enforcement agencies face competing and conflicting political and economic incentives. Regularized campaigns could be applied to domains such as anti-corruption, financial regulation, tax compliance, public health, and workplace safety—areas where enforcement gaps persist due to local bureaucratic discretion, political interference, or limited capacity (Carpenter and Moss 2013).

While these issues span both decentralized authoritarian and democratic systems, the function of regularized campaigns may differ depending on the regime type. In authoritarian regimes, where governance-oriented institutions are weaker, bureaucratic discretion is higher, and independent oversight is limited, regularized campaigns can serve as a substitute for missing accountability mechanisms. By contrast, in democratic federations, where regulatory discretion also exists but is balanced by electoral and legal checks, regularized campaigns may complement institutional enforcement, much like HVE campaigns in areas such as traffic safety. This contrast highlights how regularized campaigns operate as substitutes or complements, depending on context.

Examples include anti-corruption drives in Russia and Vietnam, where recurring investigative waves have constrained entrenched bureaucratic behavior. In democratic contexts, HVE campaigns—such as those targeting seatbelt use and speeding in the United States—serve to amplify regulatory priorities through periodic, visible enforcement. These diverse applications suggest the versatility of regularized campaigns across regime types and policy areas.

Additionally, this study contributes to the literature on the politics of firm lobbying. While prior work has focused primarily on firm influence over legislators (e.g., Bertrand et al. 2014; Kim 2017; Richter et al. 2009), our findings highlight how firms exert influence over regulators, especially in contexts of weak institutional oversight.[13] This opens up new avenues for exploring how firms interact with regulatory agencies in various political and institutional settings, shedding light on how states balance the dual imperatives of economic growth and regulatory enforcement.

7.2 | Future Research Directions

Despite their promise, questions remain regarding the long-term viability and adaptability of regularized campaigns. While this study benefits from access to high-quality, confidential government data, future research should investigate their sustained impact on pollution control in China. In particular, future research should examine how regulated entities adapt their compliance strategies in response to repeated interventions and whether enforcement waves require periodic recalibration to maintain their effects over time.

Comparative research is also essential to evaluate how regularized campaigns function under different political regimes. In democratic contexts, where regulatory agencies face stronger political constraints and operate under judicial oversight and electoral accountability, do regularized campaigns yield similar compliance improvements? Can they complement market-based mechanisms such as emissions trading schemes, financial incentives, or voluntary compliance programs?

Yet, campaign-based enforcement carries inherent tradeoffs. The intensity and scope of the CEIs caused substantial economic disruption, forcing firms to scale back production, lay off workers, invest in costly compliance upgrades, or relocate. While arguably necessary to restore regulatory authority, these outcomes highlight the tension between economic stability and environmental protection. Future research should assess how regularized campaigns might be designed to minimize such disruptions without undermining enforcement effectiveness.

The cost-effectiveness and sustainability of regularized campaigns also merit further scrutiny. Policymakers must evaluate whether these campaigns can be scaled without exhausting administrative capacity, whether they risk weakening public trust in local institutions, and whether their benefits persist without continuing central intervention.

Additionally, future research could investigate how the sequencing of enforcement priorities within regularized campaigns affects their effectiveness. Governments must often balance limited resources across multiple policy goals. One strategy might involve rotating the focus of successive waves—for example, shifting from environmental regulation to labor protections, tax enforcement, or anti-corruption. This rotation could reduce enforcement fatigue, allow for a gradual adjustment to rising compliance standards, and prevent diminishing returns from repeatedly targeting a single issue. Maintaining uncertainty about which area will be prioritized next may also promote broader, cross-sector compliance by discouraging strategic non-compliance. Research into how such sequencing strategies influence regulatory outcomes would offer valuable insights into the flexibility, efficiency, and long-term impact of regularized campaigns, especially in settings marked by fragmented enforcement and high discretion.

In sum, this study identifies regularized campaigns as both a new governance tool and an institutional innovation that enhances regulatory enforcement, narrows compliance disparities, and sustains enforcement impacts over time. While further research is needed to refine their application across various policy domains and regime types, regularized campaigns hold significant promise for enhancing governance in both authoritarian and democratic systems.

Author Contributions

S.V.S. conceived the central idea of the study. S.V.S., Q.W., and B.Z. jointly designed the research. B.Z. provided access to the data sources. Q.W. conducted the data analysis. S.V.S. and Q.W. prepared the figures. The results were interpreted collaboratively by S.V.S., Q.W., and B.Z. S.V.S. wrote and revised the manuscript.

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Conflicts of Interest

The authors declare no conflicts of interest.

Endnotes

[1] We thank an anonymous reviewer for suggesting the inclusion of the HVE literature to ground our theory and expand the discussion on the applicable scope of regularized campaigns.

[2] The term "regularized campaign" may initially appear contradictory, as campaigns are typically associated with ad hoc, short-term enforcement efforts. However, we use "regularized" to emphasize the structured and recurring nature of these enforcement waves, distinguishing them from both fully institutionalized regulatory enforcement and sporadic crackdowns.

[3] Empirically, as discussed later in this paper, a few studies have examined the immediate effects of individual enforcement waves within regularized campaigns on absolute compliance. However, while informative, these studies have been limited to a narrow set of outcomes, provide little insight into compliance dynamics between enforcement periods, and do not address compliance disparities.

[4] We are grateful to Andy Walder for his suggestion to conceptualize our study through the lens of information flow across bureaucratic units operating under a principal-agent hierarchy.

[5] The MEP, responsible for environmental protection in China, was known as the State Environmental Protection Administration until 2008 and has been renamed the Ministry of Ecology and Environment since 2018. As the study period spans 2014–2018, we refer to the ministry as the MEP throughout this paper to maintain consistency.

[6] The dual leadership persisted through the 13th Five-Year Plan (FYP; 2016–2020), with reforms aimed at increasing the vertical accountability of prefectural EPBs to provincial EPBs unfolding gradually post-study period. In September 2016, the General Office of the Central Committee and the General Office of the State Council issued the *Guidelines on the Pilot Program for the Vertical Management Reform of Environmental Monitoring, Inspection, and Law Enforcement below the Provincial Level*. These guidelines shifted primary management responsibilities for the prefectural EPBs to the provincial EPBs, including budget allocation. However, the prefectural EPBs remained under the management of the prefectural government, albeit to a lesser extent than prior to the reform.

[7] Back in 2004, the MEP launched a nationwide automated monitoring system for key polluting enterprises, where a flow meter was installed on site to measure pollutant concentrations at discharge. That data would be transmitted to each local EPB's monitoring center in real time. However, those were only shared internally with the government and the monitored firms.

[8] We believe the number of standards violations is a more direct and accurate measure of environmental compliance than the amount of pollutant discharge fees collected. While the amount of pollution discharge fees has sometimes been used as a measure for firm environmental compliance, the enforcement of official policy is influenced by a firm's bargaining power and official relief policies in China (Wang et al. 2003).

[9] Prior studies typically assess the impact of CEIs on air quality metrics during active campaigning or immediately before and after, often without adequately accounting for jurisdictional spillover—a particularly critical issue for pollutants such as $PM_{2.5}$, which can travel very long distances (e.g., Zheng and Na 2020; Tan and Mao 2021).

[10] This likely reflects the MEP's strategy to implement CEIs across all provinces, which diminishes the importance of the specific order of provincial inspections. Another study by Wang, Liu, Xian, and Zhang (2023) notes that while some firms attempted to appear compliant in anticipation of the CEIs—evidenced by an increase in production stoppages starting in the first week of a CEI—this increase did not become statistically significant until the third week. This suggests that although firms had some capacity to anticipate inspections and adjust behavior, the CEIs generally caught them by surprise.

[11] We have determined that the DiD method is not suitable for our analysis for several reasons. First, our approach involves comparing firms within the same province that have the same output levels but differ in their contribution percentages to the prefecture's total outputs. This intra-provincial comparison is essential due to significant variations in policies and conditions across provinces, which could influence the outcomes. Implementing DiD at the provincial level would preclude such comparisons, as it requires differentiating between provinces. Second, there is considerable skepticism regarding the robustness of multi-period DiD analyses. While a single-period DiD might be preferable, it would limit our study to early batches of CEI (first and second as treatment and third and fourth as control), thus excluding discussions on trends beyond 2016. Additionally, since these early batches occurred in the latter half of 2016 and our analysis is conducted on an annual basis, detecting significant changes within this timeframe may be challenging. Third, employing DiD would necessitate the application of firm fixed effects, which would control for time-invariant factors at the firm level. This approach would absorb the effects of a firm's contribution to prefecture outputs, which does not change much over the years, obscuring the actual impact of this variable on compliance.

[12] We take the IHS because the number of violations can be 0. The transformation equation is $\sim x = arcsinh(x) = In\left(x + \sqrt{x^2 + 1}\right)$.

[13] We thank Bård Harstad for highlighting this aspect of our paper.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.