Policy Brief

Central Inspections for Low-Carbon Chinese Cities: Policy Intervention and Mechanism Analysis

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Background

The onset of industrialization has led to a concerning and significant increase in global emissions and climate change. This alarming trend has raised ecological concerns and triggered a chain reaction of adverse effects on the global climate. Therefore, climate governance is an imperative agenda for all to minimize ecological consequences. At COP26[1], 153 nations committed to combating global warming by setting national autonomous contribution objectives and striving for quasi-net-zero emissions worldwide. China's role in fighting climate change and engaging in global environmental governance is important due to its major share in global industrial output, energy consumption and associated emissions.

The Chinese central government has enacted several laws and regulations aimed at decreasing carbon emission intensity. Despite these efforts, challenges arise from the weak implementation of environmental policies by local governments, including incomplete execution and free-riding tendencies. Moreover, there is a concern about "emphasizing legislation but neglecting enforcement and supervision." Consequently, effective supervision of environmental policies and their local implementation becomes crucial to foster robust environmental governance.

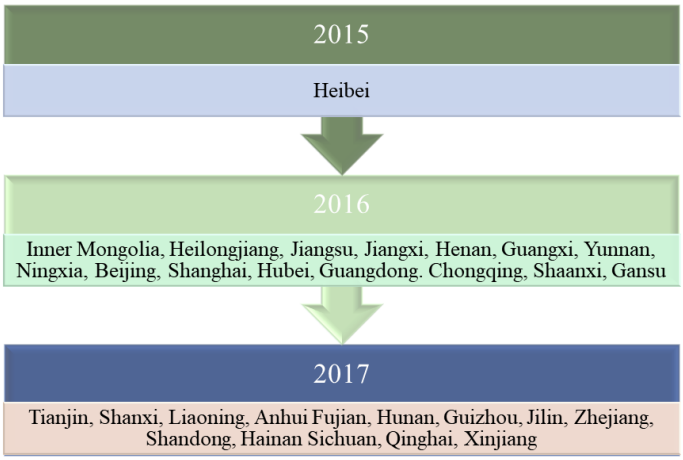
Central inspections for low-carbon Chinese cities drive sustainable development and environmental protection. These inspections involve rigorous assessments and evaluations conducted by the central government to ensure that cities effectively implement low-carbon policies and meet emission reduction targets. These comprehensive inspections identify potential gaps and challenges in low-carbon initiatives, allowing for targeted interventions and policy adjustments to enhance environmental performance. By engaging with local authorities and communities, central inspections foster a culture of accountability and encourage cities to adopt innovative measures and best practices for reducing carbon emissions. As a result, these inspections serve as a vital catalyst for fostering eco-friendly urban development and aligning cities with China's commitments to combat climate change and achieve a greener and more sustainable future.

Inspections constitute a distinctive administrative system within China, involving higher-level governments overseeing the actions of lower-level governments. In the context of environmental protection, inspections involve establishing environmental protection inspection groups by higher authorities, which are then deployed to local areas to supervise, inspect, control, and hold local governments and environmental protection departments accountable. Among these inspection mechanisms, Central Inspections of Environmental Protection (CIEP) is one of China's most stringent and obligatory environmental regulations.

In 2015, China’s government initiated the trial implementation of the inspection of the environmental protection program in Hebei. This group conducted the first pilot inspections in Hebei Province, and subsequently, multiple batches of CIEP were executed nationwide. For instance, pilot programs were introduced in eight provincial-level administrative regions (See Figure 1). Despite these efforts, local governments might exploit knowledge imbalances between national and local authorities to conceal high-emission firms for political gain, leading to lenient, ineffective, and selective enforcement. Consequently, the full realization of environmental policies becomes challenging.

[1] 26th Conference of the Parties (COP26) of the United Nations Framework Convention on Climate Change (UNFCCC).

Figure 1: CIEP enforcement across Chinese regions

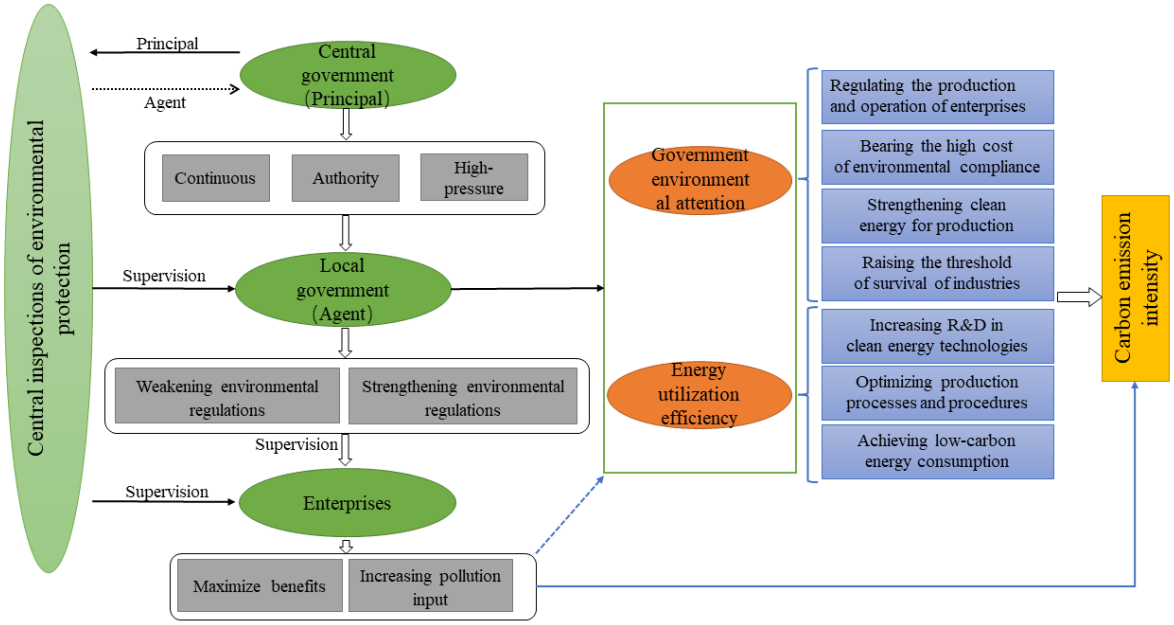


Theoretical framework

Due to central government support, CIEP has officially adopted a campaign-style governance approach. This involves direct interventions in local environmental protection efforts through various measures, including investigating reports of environmental issues, conducting thorough investigations into environmental cases, holding officials accountable through interviews and public notifications, and utilizing its authority to allocate incentives. CIEPs operate independently and are obligatory, leading to stringent enforcement and supervision of local governments' environmental governance and protection efforts. This approach effectively addresses the challenges often faced with local environmental regulations, ensuring more effective implementation. Certain high-emission enterprises receive increased attention from the CIEP and local authorities within this framework. Consequently, local governments are compelled to take robust measures, such as the closure and rectification of high-emitting enterprises.

The attention given by local governments to environmental issues reinforces environmental regulations. It enables better management of production activities of local manufacturers through various measures, such as pollution taxes, penalties, and emission permits. This heightened focus has several significant implications. Firstly, tightening rules lead to increased expenses for businesses regarding environmental management, which drives them to reduce their reliance on high-carbon energy sources, adopt cleaner energy options for production, and achieve a low-carbon regional energy consumption structure. Secondly, as environmental concerns become more pronounced, pollution-intensive industries face higher "environmental compliance costs," leading to a higher survival threshold for energy-intensive industries. This shift promotes the development of advanced and environmentally friendly local industrial structures, thus facilitating a reduction in carbon emission intensity. Figure 2 presents a mechanism analysis, clearly understanding how CIEP influences carbon emission intensity.

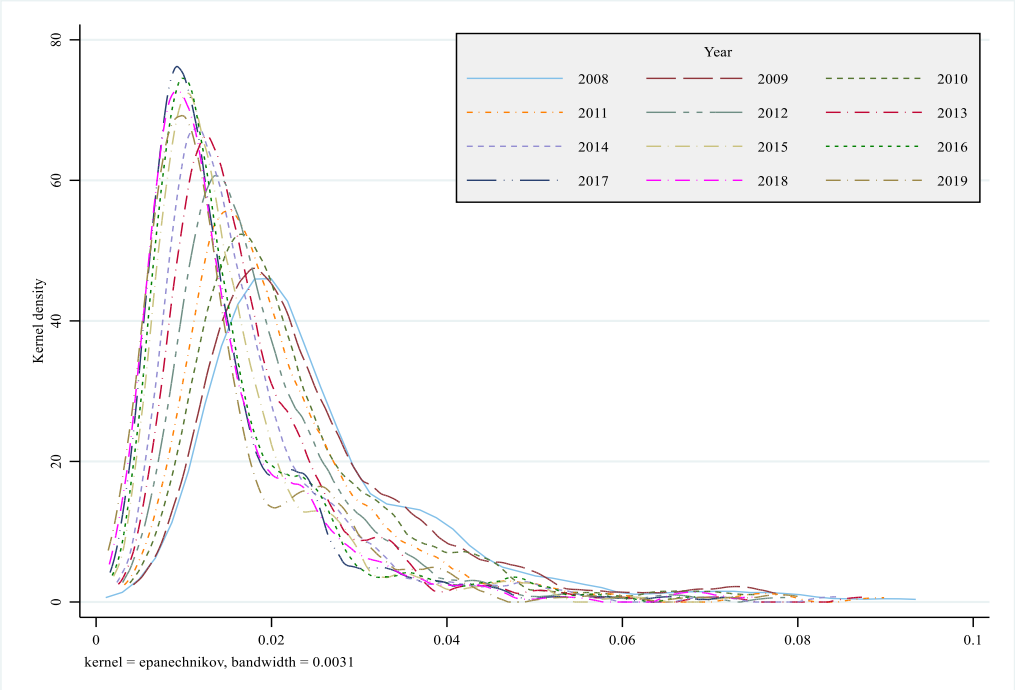
Figure 2: Mechanism analysis



Materials and methods

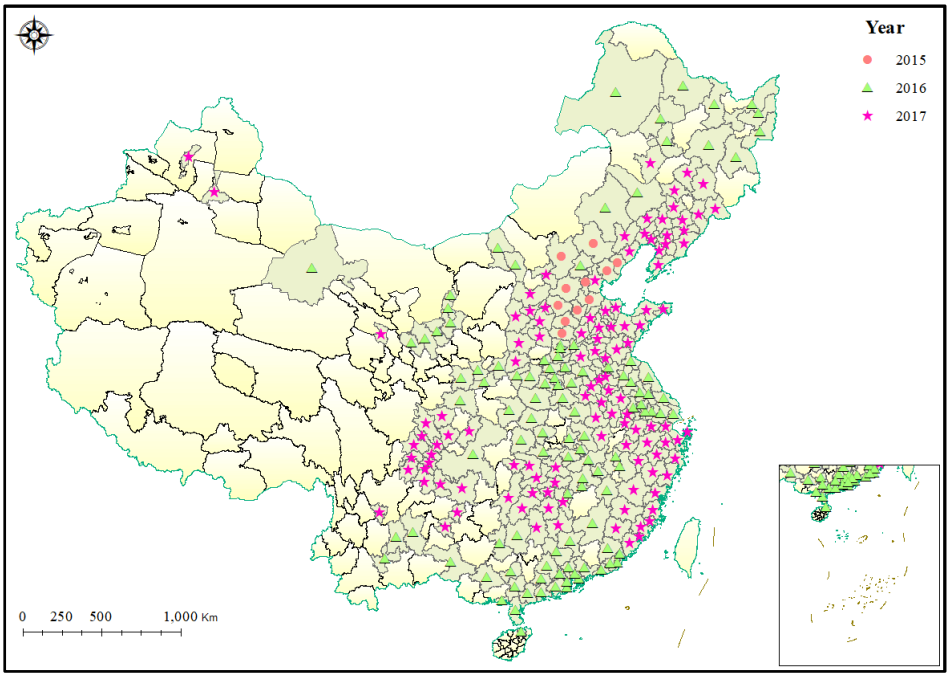
The dependent variable for this study is the carbon emission intensity (CEI) of each city derived from the "China Carbon Emissions Database". Satellite lighting data is utilized to calculate carbon emissions accurately, which proves more precise than using economic indicators of cities. The kernel density graph (Figure 3) depicts CEI distribution, shows a noticeable trend over time. The "peak" of the wave gradually shifts leftward, indicating a clustering tendency. Over time, the waveform shifts leftward, the height of the peaks rises, the width reduces, and the number of peaks decreases, signifying a decreasing movement in the kernel density.

Figure 3: Carbon emission kernel density graph



Policy Intervention Variable: This study employs dummy variables to assess the impact of the CIEP. The CIEP was implemented in three batches in 2015, 2016, and 2017. It analyzes the policy effect of CIEP, utilizing a treatment variable that varies over time and individuals. Specifically, the treatment variable is set to 1 for the region where it is implemented, and 0 otherwise. Figure 4 visually represents the implementation schedule for the three batches of CIEP initiatives.

Figure 4: Spatial map of CIEP Implementation



Mechanism and Control Variables: This study utilizes Python's Jieba library for accurate word segmentation and keyword analysis on the text from each city government's annual "Government Work Report" to gauge government attention to the environment (Gea). It records the collective frequency of all environmental-related keywords in these reports. It employs the super efficiency slack-based model to estimate energy utilization efficiency. This model also controls several factors, including industrial structure, residential consumption expenditure, population, energy consumption, and fixed asset investment.

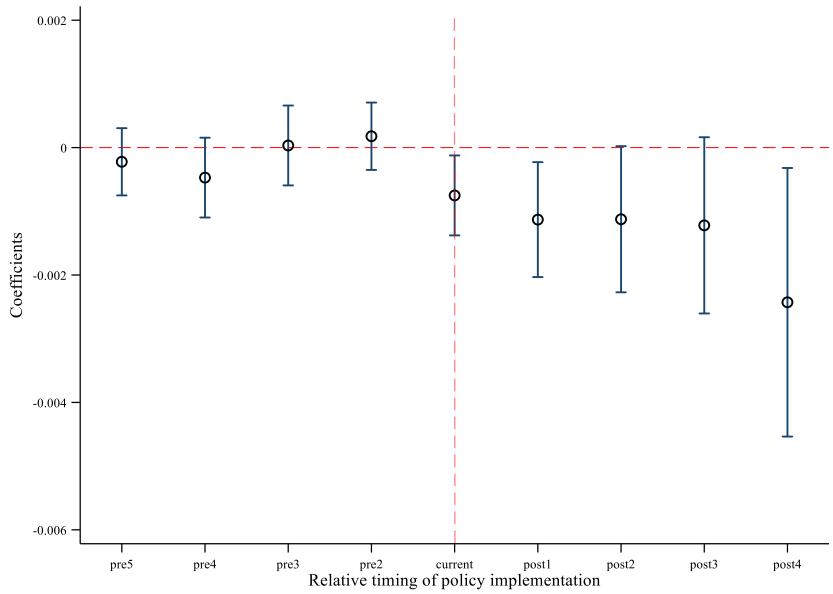
Empirical Model: This study applies the time-varying difference-in-differences (TV-DID) model to analyze data from multiple pilot areas in 233 Chinese cities from 2008 to 2019. It offers an efficient approach to address policy intervention effects that occur at different time points and vary among individuals, enhancing accuracy and generalizability in policy evaluation. Furthermore, it aids in countering potential confounding treatment effects caused by contemporary trends, effectively addressing endogeneity concerns, and providing a clear estimate of the net effect of the CIEP on carbon emission intensity.

Empirical results

Implementing CIEP leads to a substantial reduction in CEI, and these effects are consistent across various specifications. The plotted parallel trend test (refer to Figure 5) exhibits the marginal effect of CIEP implementation, with horizontal lines representing the 95% confidence interval. This test supports the parallel trend hypothesis, indicating that before the introduction of CIEP, there was no statistically significant difference between the treatment and control groups. Nevertheless, the coefficients of CIEP are significantly negative after the post-pilot phase, and their absolute values

tend to increase after the CIEP implementation. Over time, CIEP's influence on lowering CEI becomes increasingly pronounced. Mechanism analysis reveals that CIEP reduces CEI by strengthening local government's attention and attaining energy efficiency. Notably, the impact is insignificant in mid-western resource-based cities and significant in non-resource-based eastern cities. These findings support the implementation of CIEP as an effective strategy for achieving energy transition and carbon neutrality targets.

Figure 5: Parallel trend



Policy Implications

Tailor Strategies to Local Conditions: Officials would implement flexible strategies for each city, considering their economic conditions, industrial features, and resource endowment. The gravity of CIEP implementation can be moderated based on specific characteristics. Recognize that each city has its unique challenges and strengths in achieving low-carbon objectives. Governments would offer flexibility in implementation approaches, allowing cities to tailor low-carbon strategies to their specific contexts while adhering to overarching national goals.

Encourage Green Technology Adoption: Policymakers should encourage enterprises to improve energy utilization efficiency and invest in independent green technology. They can also facilitate the introduction of advanced production processes and equipment to accelerate the transition to low-carbon production methods. Legislation can reinforce the government's environmental focus and establish a standard operating mechanism for the CIEP to ensure continuous attention to environmental issues.

Emphasize Long-term Sustainability: Viewing environmental governance as a comprehensive and long-term endeavor is crucial. Avoiding undue emphasis on immediate success can foster a positive interplay between economic development and environmental protection. Stakeholders would build tolerance for mistakes and provide the environmental inspection departments with appropriate enforcement freedom. Implementing a dynamic adjustment mechanism for assessment targets will support the long-term effectiveness of environmental governance.