



## RESEARCH BRIEF

# Crackdowns in Hierarchies: Evidence from China's Environmental Inspections

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*We investigate how firms respond to crackdowns on public policy enforcement by linking the timing of centralized dispatch of environmental inspectors to cities in China with high-frequency observations of air pollution at coal power plants. During inspections, concentrations of sulfur dioxide (SO<sub>2</sub>) at plants fall on average by 25-27%, but return to prior levels thereafter. A plant's accountability to central versus local regulators affects how long post-inspection reductions last. Allowing citizens to file complaints against polluting plants during crackdowns does not increase long-run effectiveness: high pollution at baseline does not predict complaints, nor do complaints prolong pollution reduction.*

A common byproduct of rapid industrial growth, severely polluted air damages human health and causes premature death. Researchers often attribute hazardous air quality to inadequate enforcement of environmental regulations, but the causes and extent of implementation failures are poorly understood. We study enforcement in China, an industrializing country that has experienced repeated episodes of severely degraded air. In late 2015 the central government announced rotating environmental inspections (*huanbao ducha* in Chinese) to strengthen enforcement by city-level environmental protection bureaus against polluting firms. Inspection teams from the Ministry of Environmental Protection are deployed to cities, where they conduct month-long reviews of

local governments' environmental protection efforts. The goal of the inspections is to ensure all provincial-level regions follow the central government's instruction when implementing pollution control measures. These inspections constitute an example of an informal institution that temporarily raises central scrutiny and regulatory enforcement at the periphery. We define such pre-announced increases in the stringency of regulatory scrutiny or enforcement as a "crackdown".

First, we study how a centrally-led crackdown, in the form of rotating environmental inspections, affected pollution over time at coal power plants. We use high-frequency, plant-level data to quantify effects on the concentrations of a major short-lived industrial

air pollutant, sulfur dioxide (SO<sub>2</sub>). We find that while crackdowns are in progress, pollution falls by 25-27%, a substantial decline. After inspectors leave, pollution reverts to prior levels within approximate two months. These findings suggest that crackdowns had no long-term effect on environmental performance as local agencies have weak incentives in environmental cleanup. By observing how power plants respond during crackdowns, we further investigate the origins of China's regulatory enforcement gap. During inspections, firms employ short-term measures that reduce both SO<sub>2</sub> emissions and electricity production. This finding confirms cost of reversal as a mediating factor in determining effects of crackdown. After inspections end, plant activity rises above baseline, while SO<sub>2</sub> emissions gradually increase to prior levels. How the cost and reversibility of firm responses interact with a crackdown's time horizon appear to be important determinants of whether the targeted behavior is deterred or simply displaced in time or space. Duration and expectations about the frequency of a crackdown's recurrence may interact with decisions about whether to implement a (less costly) short-term or (potentially more costly) long-term solution. In the case of China's environmental inspections, we find that firms employed short-term measures—turning scrubbers on, or temporarily restricting electricity output—that were relatively easy and rewarding to reverse. This corresponds to an expectation that crackdowns impose short-term pressure. Our findings suggest that an ongoing threat of scrutiny outside of inspection periods is needed to strengthen firms' incentives to fully comply with regulatory requirements such as installing scrubbers and operating them continuously.

Second, our findings shed light on the effect of agents' heterogeneous accountability structure on enforcing the principal's goal. Reversion occurs most rapidly among firms accountable to the central government, which originated the crackdowns, while cleanup persists longer among firms accountable to the local government. The differential rates of reversion may reflect an updating of expectations about the likelihood of punishment by the remaining (local) authority once the center has left. Managers of

state-owned enterprises (SOEs) that outrank the city government ("upper SOEs") may have been more confident that they could escape detection or punishment, and returned to polluting sooner, while those subordinate to the city government ("lower SOEs") may have had residual uncertainty about the extent of any increased stringency in local government oversight. Our results are consistent with this uncertainty resolving several months after inspections end, when all plants had returned to prior polluting levels. The short-lived nature of crackdowns and the more rapid reversion of centrally-connected state-owned enterprises suggests that the central authorities may be unable or unwilling to sustain cleanup pressure. To resolve such misalignment, the central government could continuously scrutinize the environmental performance of upper SOEs directly on an ongoing basis, rather than via regional campaigns.

We then consider the effectiveness of involving citizens in environmental oversight in the crackdown context. We study one component of the crackdowns: allowing citizens to complain about pollution via hotlines, mailboxes, and social media while an inspection is in progress. The local environmental protection bureau was required to investigate and formally respond to all complaints against plants located in a city. We find that citizens do not tend to complain about dirtier plants on average, and although plants receiving complaints reduce pollution more during crackdowns, they also return more rapidly to baseline levels of pollution after crackdowns end. However, inspections may also improve perceptions of state effectiveness among the broader populace. The media's likening of inspections to organizational approaches used in imperial China (Imperial Commissioner, *qinchai dachen* in Chinese) may only strengthen this perception. The inspections could thus shore up legitimacy in a time of (environmental) crisis—an important benefit for leaders in an authoritarian regime. These benefits could accrue to the crackdown's originators, even if there is no lasting effect on pollution. However, the durability of the inspection approach not yet known. Legitimacy benefits to the central leadership may erode if citizens discover that pollution reductions do not last.

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## References

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## About the Authors



Valerie J. Karplus is Assistant Professor of Global Economics and Management at the MIT Sloan School of Management. Karplus studies resource and environmental management in firms operating in diverse national and industry contexts, with a focus on the role of institutions and management practices in explaining performance. She is an expert on China's energy system, including technology and business model innovation, energy system governance, and the management of air pollution and climate change. She studies the determinants of clean energy transitions in emerging markets, with projects in China, India, and Sub-Saharan Africa. From 2011 to 2015, she directed the MIT-Tsinghua China Energy and Climate Project, a five-year research effort focused on analyzing the design of energy and climate change policy in China, and its domestic and global impacts. She holds a B.S. in biochemistry and political science from Yale University and a Ph.D. in engineering systems from MIT.



Mengying Wu is a Ph.D. student in the Institute for Data, Systems, and Society at MIT. Her research interest lies in environmental politics and governance, with a special focus on policy design and institution management of air pollution (esp., China). Her recent project investigates the role of citizen engagement in inducing environmental accountability at local bureaucracies.

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