

THE POLITICAL REGULATION WAVE

Why has there been uneven success in reducing air pollution even in the same locality over time? This book offers an innovative theorization of how local political incentives can affect bureaucratic regulation. Using empirical evidence, it examines and compares the control of different air pollutants in China – an autocracy – and, to a lesser extent, Mexico – a democracy. Making use of new data, approaches, and techniques across political science, environmental sciences, and engineering, Shen reveals that local leaders and politicians are incentivized to cater to the policy preferences of their superiors or constituents, respectively, giving rise to varying levels of regulatory stringency during the leaders' tenures. Shen demonstrates that when ambiguity dilutes regulatory effectiveness, having the right incentives and enhanced monitoring is insufficient for successful policy implementation. Vividly explaining key phenomena through anecdotes and personal interviews, this book identifies new causes of air pollution and proposes timely solutions. This title is also available as Open Access on Cambridge Core.

Shiran Victoria Shen is a Stanford-trained political scientist and environmental engineer currently based at the Hoover Institution. Her research explores the intersections of political science, public policy, environmental sciences, and engineering, with a particular interest in how local politics influence environmental governance. This is her first book.

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Montage of pollution during five consecutive days in Beijing when the city government tested pollution control in preparation for the Olympics, August 3–7, 2007. Reprinted by permission from Jacobson (2012, 199).

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The general editor of the series is Professor Jorge E. Viñuales, the Harold Samuel Chair of Law and Environmental Policy at the University of Cambridge and the Founder and First Director of the Cambridge Centre for Environment, Energy and Natural Resource Governance (C-EENRG).

The Political Regulation Wave

A CASE OF HOW LOCAL INCENTIVES SYSTEMATICALLY
SHAPE AIR QUALITY IN CHINA

SHIRAN VICTORIA SHEN

Stanford University



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To my parents

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Preface and Acknowledgments

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My earlier experience and preparation were integral to the birth of this book. My last full summer spent in Beijing was very memorable, witnessing firsthand how political power changed the color of the sky in a matter of days leading up to the 2008 Olympics. That experience inspired me to study the environment during my undergraduate years at Swarthmore College. I am eternally indebted to my alma mater for offering me a four-year full scholarship – a considerable rarity for international applicants – so that I was able to move to the United States to continue my intellectual pursuits in the liberal arts tradition. My life changed forever. I am grateful to have had an enabling and nourishing environment to be self-directed from the start and have had inspiring and dedicated teachers who convinced this natural-science-oriented student that the social sciences could be equally fascinating. I am also forever grateful to Stanford Political Science for taking a chance on me and to Stanford Civil & Environmental Engineering for eventually admitting me after I had completed all required coursework for the degree and showed that a social scientist can also become an environmental engineer.

Finally, my parents deserve my most tremendous gratitude. They always encouraged me to strive for the educational opportunities they never had. They endured many years living apart from their only child while I was chasing and living my dreams. They supported me no matter what. I thank them for their relentless love and encouragement, especially at critical junctures and tough moments, and for constantly reminding me that it is not because I see hope that I persist, but I persist in order to see hope (不是因为看到了希望才去坚持, 而是坚持了才能看到希望). When I asked them whom they thought I had dedicated this book to, they provided a long list of guesses, but never themselves. They are the most selfless humans and my favorite people. They have shared the pain and the sacrifice, and they shall share any positive outcomes that this book will bring about.

Abbreviations and Units

Abbreviation	Full Name
AOD	aerosol optical depth
API	air pollution index
AQI	air quality index
CEMS	continuous emissions monitoring system
CO	carbon monoxide
COD	chemical oxygen demand
DMSP-OLS	Global Defense Meteorological Satellite Program's Operational Linescan System
EIA	environmental impact assessment
EPA	Environmental Protection Agency (USA)
EPB	Environmental Protection Bureau
EV	electric vehicle
FGD	flue gas desulfurization
FYP	five-year plan <ul style="list-style-type: none"> • 1996–2000: 9th FYP • 2001–2005: 10th FYP • 2006–2010: 11th FYP • 2011–2015: 12th FYP • 2016–2020: 13th FYP
GEOS	Goddard Earth Observing System
HEV	hybrid electric vehicle
HNO ₃	nitric acid
H ₂ O	water
H ₂ SO ₄	sulfuric acid
INEGI	Instituto Nacional de Estadística y Geografía (Mexico's National Institute of Statistics and Geography)

List of Abbreviations and Units

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(continued)

Abbreviation	Full Name
Jing-Jin-Ji	Beijing-Tianjin-Hebei
MEE	<i>see</i> NEPA
MEP	<i>see</i> NEPA
MISR	multi-angle imaging spectroradiometer
MODIS	moderate resolution imaging spectroradiometer
NAAQS	National Ambient Air Quality Standards
NDRC	National Development and Reform Commission
NEPA, SEPA, MEP, MEE	<ul style="list-style-type: none"> • between 1988 and 1998: National Environmental Protection Agency (NEPA) • between 1998 and 2008: State Environmental Protection Administration (SEPA) • between 2008 and 2017: Ministry of Environmental Protection (MEP) • since 2018: Ministry of Ecology and Environment (MEE)
NOAA	National Oceanic and Atmospheric Administration
NO	nitrogen monoxide
NO ₂	nitrogen dioxide
NO _x	nitrogen oxides (combination of nitrogen monoxide, NO, and nitrogen dioxide, NO ₂)
NPC	National People's Congress
O ₃	ozone
OLS	ordinary least squares
OMI	ozone monitoring instrument
PBL	planetary boundary layer
Pearl River delta	a region encompassing nine prefectures in Guangdong Province, including Guangzhou, Shenzhen, Zhuhai, Foshan, Jiangmen, Zhaoqing, Huizhou, Dongguan, and Zhongshan
PM	particulate matter
PM _{2.5}	fine particulate matter; particular matter whose aerodynamic diameter is smaller than 2.5 μm
PM ₁₀	coarse particulate matter; particulate matter whose aerodynamic diameter is smaller than 10 μm
SASAC	State-Owned Assets Supervision and Administration Commission
SeaWiFS	sea-viewing wide field-of-view sensor
SEPA	<i>see</i> NEPA
SO ₂	sulfur dioxide
SOE	state-owned enterprise
TCZ	Two Control Zones
TEC	total emission control
TEPJF	<i>Tribunal Electoral del Poder Judicial de la Federación</i> (Mexico's Electoral Tribunal of the Federal Judiciary)
TSP	total suspended particle
ULE	ultralow emission
VOC	volatile organic compound

(continued)

Abbreviation	Full Name
WHO	World Health Organization
Yangtze River delta	Shanghai, southern Jiangsu, and northern Zhejiang

Unit	Description
Micrometer (μm)	$1 \mu\text{m} = 1 \times 10^{-6} \text{ m}$