Environment for Development

Discussion Paper Series March 2023 ■ EfD DP 23-05

Blow the Lid Off:

Public Complaints, Bargaining Power, and Government Responsiveness on Social Media

Qi Wang, Mengdi Liu, Jintao Xu and Bing Zhang

Central America
Research Program in Economics and Environment for Development in Central America Tropical Agricultural Research and Higher Education Center (CATIE)

Chile
Research Nucleus on Environmental and Natural Resource Economics (NENRE)
Universidad de Concepción

China
Environmental Economics Program in China (EEPC)
Peking University

Colombia
The Research Group on Environmental, Natural Resource and Applied Economics Studies (REES-CEDE), Universidad de los Andes, Colombia

Ethiopia
Environment and Climate Research Center (ECRC), Policy Studies Institute, Addis Ababa, Ethiopia

Ghana
The Environment and Natural Resource Research Unit, Institute of Statistical, Social and Economic Research, University of Ghana, Accra

India
Centre for Research on the Economics of Climate, Food, Energy, and Environment, (CECFEE), at Indian Statistical Institute, New Delhi, India

Kenya
School of Economics
University of Nairobi

Nigeria
Resource and Environmental Policy Research Centre, University of Nigeria, Nsukka

South Africa
Environmental Economics Policy Research Unit (EPRU)
University of Cape Town

Sweden
Environmental Economics Unit
University of Gothenburg

Tanzania
Environment for Development Tanzania
University of Dar es Salaam

Uganda
EfD-Mak, School of Economics and Department of Agribusiness and Natural Resource Economics, Makerere University, Kampala

USA (Washington, DC)
Resources for the Future (RFF)

Vietnam
University of Economics
Ho Chi Minh City, Vietnam

Blow the Lid Off: Public Complaints, Bargaining Power, and Government Responsiveness on Social Media

Qi Wang[1], Mengdi Liu[2], Jintao Xu[3] and Bing Zhang[1]*

Abstract

Scholars have demonstrated that governments allow citizens to express their opinions and selectively respond to them, yet little is known about how local governments interact with netizens via social media. In this paper, we measure government responsiveness based on whether the government verbally responds to public environmental complaints on social media. Using crawled real-world interactions between citizens and governments on Weibo (a Twitter-like platform), we find that higher bargaining power is associated with a lower likelihood that the government will respond to an environmental complaint against a firm. Local governments in China are more likely to respond to appeals that are likely to attract the attention of the upper-level government. Moreover, involving upper-level government through social media can weaken the bargaining power of industrial giants. Finally, public complaints have a significant short-term impact on corporate environmental performance but have a limited effect on firms with high bargaining power.

Keywords: government responsiveness; bargaining power; social media; environmental complaint

JEL Codes:

[1] State Key Laboratory of Pollution Control and Resource Reuse, School of Environment, Nanjing University, 163 Xianlin Avenue, Nanjing 210023, China

[2] School of International Trade and Economics, University of International Business and Economics, No. 10, Huixin Dongjie, Chaoyang District, Beijing 100029, China

[3] The National School of Development, Peking University, 5 Yiheyuan Rd, Haidian District, Beijing 100084, China

* This research is supported by the National Natural Science Foundation of China (Grant No. 72004024, 71825005 and 72161147002) and Environment for Development (EfD) Initiative project EfD MS-519.

Blow the Lid Off: Public Complaints, Bargaining Power, and Government Responsiveness on Social Media

Qi Wang
State Key Laboratory of Pollution Control & Resource Reuse,
School of Environment,
Nanjing University
163 Xianlin Avenue, Nanjing 210023, China
1016713876@qq.com

Mengdi Liu
School of International Trade and Economics,
University of International Business and Economics
No.10, Huixin Dongjie, Chaoyang District, Beijing, 100029, China
liumengdi@uibe.edu.cn

Jintao Xu
The National School of Development,
Peking University
5 Yiheyuan Rd, Haidian District, Beijing, 100084, China.
xujt@pku.edu.cn

Bing Zhang
State Key Laboratory of Pollution Control & Resource Reuse,
School of Environment,
Nanjing University
163 Xianlin Avenue, Nanjing 210023, China
zhangb@nju.edu.cn

Abstract

Scholars have demonstrated that governments allow citizens to express their opinions and selectively respond to them, yet little is known about how local governments interact with netizens via social media. In this paper, we measure government responsiveness based on whether the government verbally responds to public environmental complaints on social media. Using crawled real-world interactions between citizens and governments on Weibo (a Twitter-like platform), we find that higher bargaining power is associated with a lower likelihood that the government will respond to an environmental complaint against a firm. Local governments in China are more likely to respond to appeals that are likely to attract the attention of the upper-level government. Moreover, involving upper-level government through social media can weaken the bargaining power of industrial giants. Finally, public complaints have a significant short-term impact on corporate environmental performance but have a limited effect on firms with high bargaining power.

Keywords: government responsiveness; bargaining power; social media; environmental complaint

1 Introduction

A growing body of research shows that almost all governments allow citizens to express their opinions and respond to them selectively, depending on the number of voluntary associations (Bevan and Rasmussen, 2020), the level of public dissatisfaction (Chen and Xu, 2017), the public's social identity (Flavin and Franko, 2017; Kornreich, 2019), and the policy domains (Su and Meng, 2016). Considering that economic development is the most important criterion for evaluating local governments, the responsiveness of local governments may also be influenced by whether the object of the complaint has an important impact on the local economy, i.e., bargaining power.

Decentralization, in which regulations are formulated at the central level but implemented at the local level, allows local governments to implement regulations in ways that fulfill local preferences (Evans and Stafford, 2019), such as granting large factories bargaining power at the local level (Wang et al., 2003). The bargaining power of large enterprises results in an inadequate enforcement of pollution control regulations (Wang et al., 2003; Deng et al., 2020). Cities dominated by large polluting firms that have high bargaining power have also fallen behind in implementing environmental transparency (Lorentzen, Landry, and Yasuda, 2014).

In recent years, governments around the world have made significant progress in developing Government 2.0, specifically in promulgating new models for public

participation in governance (Bertot, Jaeger, and Hansen, 2012; Ma, 2013; Kim, Park, and Rho, 2015). Using Twitter messages sent by legislators and the public during the 113th U.S. Congress, Barberá et al. (2019) found that legislators are more likely to respond to their party supporters than to the general public. However, the question of how China's local governments implement these models through social networks remains unanswered. Using social media to participate in government programs is different from using traditional government portals. The most significant feature of social media is its low entry barriers, which makes it difficult for political actors to conceal information (Zhuravskaya, Petrova, and Enikolopov, 2020). Network supervision provides a new platform that offers a solution to break both the traditional administrative level of filtering and constraints for public participation and facilitates the maximum dissemination of public opinion. In addition, it can pass straight through traditional administrative departments or levels to reach different departments and higher levels. Local officials' promotions in many political systems are determined by superior leadership, so whether the superior leadership pays attention to posts on social media may affect local governments' responsiveness.

Although China's central government has implemented stricter environmental policies, local governments often fail to comply with regulations and requirements in an autocratic setting (the so-called implementation gap) because of the limited role of public oversight and participation (Beyer, 2006; Kostka and Mol, 2013; Zhang and Cao, 2015). In the context of realizing modern government management, the Chinese

national government is gradually implementing an environmental information disclosure system with a view to integrating the power of the public into the system of environmental governance and achieving an environmental governance system of pluralistic co-governance.[1] A significant change has been the establishment of official government microblogs by local environmental protection departments since 2011 with the goal of building public-government communication. Network supervision plays an increasingly important role in China's environmental governance.

In this paper, we examine the effects of real-world Weibo public appeals on government responses from 2014 to 2016. We find that the public appeals more likely to receive responses were those that received more public attention, informed higher levels of government, and were issued by organizations. The same factors led to responses that were more detailed and timely. In addition, lower-level governments responded more actively, which is in line with China's localized environmental management requirements.[2] Most importantly, when complaints were about firms with greater economic dominance in their localities, the possibility of local government response was lower, but only in underdeveloped areas or in areas with a high proportion of secondary industry (manufacturing and assembly). It is possible,

1 See http://www.gov.cn/xinwen/2014-04/25/content_2666328.htm for the new Environmental Protection Law of the People's Republic of China issued in 2014.

2 Localized management is one of the basic features of China's administrative management system, that is, county-level governments are required to take full responsibility for local environmental management.

however, to break the bargaining power of industrial giants by engaging upper-level government through social media. Finally, firms significantly improved their environmental performance after public complaints, especially when local governments responded to the complaints, which indicates that public participation helps close the implementation gap. However, large industrial firms, which account for more than 5% of the total value of output, have not improved their environmental performance after public complaints, possibly because of long-term relatively loose supervision that makes them expect that those complaints will not hinder them.

This study contributes to the literature in three ways. First, we add to the literature on government responsiveness. In contrast to the differences in government responsiveness found in countries that primarily seek support from voters, which are primarily affected by whether the requesters are their supporters or median voters (Barberá et al., 2019; Driscoll et al., 2018; Kastellec et al., 2015), their racial differences (Butler and Broockman, 2011; McClendon, 2016), their wealth differences (Gilens 2012), etc., we discovered that the differences in government responsiveness in China are primarily affected by whether the higher-level government paid attention to the request. This is primarily due to the fact that the evaluation of higher-level leaders determines the promotion of officials in China. Moreover, recent research on government responsiveness suggests that the use of new information technologies may alter government responsiveness and the interactions between politicians, bureaucrats, and citizens by lowering barriers to accessing information; however,

empirical evidence is lacking (Grossman and Slough 2022). We contribute to the literature by providing evidence on how new information and communication technologies affects the interaction between citizen, local governments, and central government in China.

Second, this study adds to the rapidly developing literature on the application of social media to governance (Omar, 2020). Due of the low cost of entry and the difficulties of concealing information, social media is believed to make the government more accountable (Zhuravskaya, Petrova, and Enikolopov, 2020), and we support this view with empirical evidence from China. Social media's many-to-many interaction enables geographically dispersed individuals to develop useful information resources and obtain varied views and opinions through debate (Bertot, Jaeger, and Hansen, 2012). Our findings provide evidence that the aforementioned characteristics of social media are the reason why social media improves government responsiveness, i.e., the government is more likely to respond to posts that generate a large amount of discussion and netizen attention.

Finally, we also contribute to the literature on nonstate actors' role in environmental performance. Although public participation has been gradually encouraged in China's environmental management (Zhong and Mol, 2008), few studies have estimated the impact of public participation on environmental performance in China. Dong et al. (2011) use provincial-level complaints and environmental performance from annual

statistics yearbooks to study this question. However, the use of annual aggregate information on all kinds of environmental complaints cannot reveal causal effects and mechanisms. Additionally, complaints submitted the traditional way, such as petitions to local government through e-mail, telephone, fax, letter or in-person visits where complaint information is not publicly available, create less public pressure on both firms and local governments compared to public appeals through social media (Buntaine et al., 2022) and leave room for local Environmental Protection Bureaus (EPBs) to misreport. Our study offers empirical evidence of the role of the public in China’s environmental governance using firm-level complaints and firm emissions from real-time online platforms.

2. Context

2.1 China’s environmental management

China's environmental management system consists of central and local governments. The central government is responsible for promulgating laws, regulations, standards, and plans, while local governments at all levels are responsible for policy implementation. Specifically, the Environmental Protection Law of the People's Republic of China (revised in 2014) stipulates that "environmental protection departments at or above the county level shall supervise and manage environmental protection-related issues in their administrative areas." Local governments at provincial, prefectural, and county levels can be regarded as the agents of the central government. From the perspective of assessment, the direct leader of each level of

government is the level of government above it. The prefecture-level government evaluates the county-level government, the provincial-level government evaluates the prefectural-level government, and the national-level government evaluates the provincial-level government. Among them, county-level environmental protection departments are the most direct and most important departments in contact with the public, and they are also the departments that directly regulate the pollutant discharge of enterprises.

One of the paradoxes of China's environmental politics is the large gap between central government policy and local implementation (Ran, 2013). On the one hand, China's central government shows a high level of awareness of environmental problems and has established a highly developed and comprehensive set of environmental laws that provide the framework for pursuing sustainable development and environmental progress. On the other hand, because of conflicts of interest between national regulations and local stakeholders, local officials oppose or refuse to implement the central government's environmental policies (Van Rooij, 2006).

2.2 China’s environmental information disclosure and public participation

The public has long severely lacked a role in environmental enforcement due to the limited information available to the public in China (Zhang and Cao, 2015; Kostka and Mol, 2013). Over the past decade, however, an increasingly prominent bottom-up

movement for open government has emerged. In 2008, the US Embassy in Beijing installed a rooftop air-quality monitor to tweet out data; this was the first time the public had access to information on one of the most dangerous types of air pollutants, PM2.5. While this has put tremendous pressure on Chinese officials, public awareness of environmental pollution has also grown.

On May 1, 2008, the trial Regulations of the People's Republic of China on Open Government Information and the Ministry of Environmental Protection Measures on Open Environmental Information entered into effect. These regulations mark major developments in Chinese environmental governance. Although China's previous environmental laws and regulations also have requirements for "information disclosure," there has been a lack of operational regulations on how to disclose information and to whom. For the first time, the policy compelled environmental protection departments and polluting enterprises to disclose important environmental information to the whole society, providing a platform for the public to participate in pollution reduction work. The release of real-time online monitoring data of key polluting firms across the country since 2014 has enabled the public to obtain more timely information on firms' wastewater and waste gas emissions. The new Environmental Protection Law that was implemented in January 2015 added a chapter on "Information Disclosure and Public Participation," which requires environmental protection authorities at all levels to disclose environmental information. Additionally, it requires that local governments improve procedures to facilitate the participation

and supervision of individuals, legal entities, and other organizations in environmental protection.

The documentary “Under the Dome” released by the journalist Chai Jing in 2015 further set off a wave of public environmental demands. The documentary led the Chinese to realize that they are facing an impending environmental pollution crisis and that some firms are releasing pollutants into the environment illegally. This documentary caused an unprecedented sensation, and related topics dominated social media platforms for several days following its production. The willingness of people to pay for better environmental quality was found to increase after the documentary was released (Tu et al., 2020).

2.3 Government affairs microblog

China had over 1 billion internet users at the end of June 2021 and an internet accessibility rate of 71.6%, making it the world's largest digital society (CNNIC, 2021). Sina Weibo, often described as a Chinese version of Twitter, is one of the leading social media platforms in China. By the fourth quarter of 2019, it had over 516 million monthly active users (compared to Twitter's 300 million), making it China's second most popular social media platform after WeChat. The widespread use of such platforms has led to the use of social media as an instrument of government reform by political parties, government agencies, and mass organizations at all levels in China. The Chinese government uses Weibo, WeChat, and other social media

platforms to provide information to citizens, respond to social concerns, promote collaborative governance, and continuously improve the online disclosure of government information.

In 2009, Taoyuan County, Hunan Province, established an official Weibo account, "Taoyuan Network," making it the first government department in China to open a Weibo account. On October 15, 2013, the central government issued "Opinions on Further Strengthening Government Information Disclosure to Address Social Concerns and Improve Government Credibility," which urged all departments and regions to actively explore the use of new media, such as government Weibo and WeChat, and to publish all government information in a timely manner. In addition, governments were further required to make full use of the interactive functions of new media, to interact with the public in a timely and convenient way and to standardize the procedures for information release and the procedures for handling and answering questions from the public.

According to the "Statistical Report on Internet Development in China," as of June 2019, there were 139,000 Weibo accounts registered by government agencies that were accredited by the Sina platform, and all 31 provinces (autonomous regions and municipalities) in China had created Weibo accounts for public sector organizations (CNNIC, 2019). As of 2017, all provincial and prefecture-level environmental protection departments in China had opened official Weibo accounts, providing a

convenient means for the public to interact with the government. As an example, in Jiangsu Province, there are 65 official Weibo accounts for environmental protection departments, including 1 at the provincial level, 13 at the prefecture-city level, and 51 at the county level.[3]

Online participation through social media is different from traditional government portals and is usually not as risky as protests, so it is regarded as "in between" those other forums (Qiaoan and Teets, 2020). Unlike petitions within official settings, appeals to governments on social media are less formal and easier for the public to see. In most cases, submitting an appeal through government online portals requires the provision of basic personal information, such as name, phone number, and home address. Additionally, the local government has the right to decide whether the request on the message board of the government's website is publicly viewable or kept private between the individual submitting the request and the government. Local officials may hide their wrongdoing from superiors who control their career prospects (Pan and Chen, 2018).

In contrast, the most important distinguishing feature of social media is low barriers to entry, which makes it more difficult for political actors to hide information (Zhuravskaya, Petrova, and Enikolopov, 2020). Social media postings, once seen by

[3] A prefecture-level city in China has an average of five counties.

higher-level governments, may also facilitate the oversight of local governments. Most descriptions of governments' use of social media focus on citizen engagement, openness, transparency, good governance, and trust as priorities of the implementation process (Charalabidis and Loukis, 2012; Meijer, Grimmelikhuijsen, and Brandsma, 2012). However, the goals of social media in government can be extensive, including cost savings, managerial efficiency, and public employee performance and satisfaction (Andersen et al., 2012).

We already know that if an incident dissatisfies a large number of netizens on social media, the government usually responds quickly (Hassid, 2015). For example, a video shared by the Chinese Ministry of Railways in 2011 of the hasty burial of wrecked train cars after a train collision in Wenzhou angered netizens and generated 26 million messages on Weibo within a few days. The Chinese government responded quickly and imposed penalties on the railway officials (Wines and LaFraniere, 2011). It has been claimed that one of the main reasons for the Chinese government's response to netizens is the fear of internet exposure and the prevention of collective action (Chen, Pan, and Xu, 2016; Hassid, 2015; King, Pan, and Roberts, 2013). However, we do not know whether the government responds to more common, relatively small-scale complaints via social media and what different strategies governments use. In particular, studies have not considered the role of large-firm dominance, which has been found to undermine the implementation of China's environmental transparency regulations at the local level (Lorentzen, Landry, and Yasuda, 2014), in government

responsiveness.

3. Conceptual Framework and Hypotheses

Here, we briefly outline a conceptual model to understand the central role and decision-making patterns of local governments in their environmental governance. Consider a local government authorized by the central government to comply with rules and provide services. Each local government chooses whether to respond or not respond to public complaints in a binary decision. The payoff of ignoring public complaints for the local government increases with the avoidance of implementation costs. We assume that in the absence of upper-level monitoring, local governments tend to ignore online complaints. A recent audit experiment in China suggests that local governments are more responsive to citizen concerns when those concerns might reach the central government (Chen, Pan, and Xu, 2016). Therefore, in our case, if the higher-level government discovers the public's online appeal, responding to public complaints will enable the local government to recover some of its losses from upper-level dissatisfaction. Given these considerations, we develop our first hypothesis:

Hypothesis 1: Local governments are more likely to respond to public online complaints if those complaints are more likely to be discovered by higher-level governments.

Existing evidence shows that bargaining power hinders policy implementation and that cities dominated by industrial giants lag behind in implementing environmental information disclosure; this effect seems to be stronger when a prefecture-level city's largest firm is a highly polluting firm (Lorentzen, Landry, and Yasuda, 2014). Local governments may be primarily concerned with establishing connections with powerful party elites (Shih, Adolph, and Liu, 2012) and extorting rent from local businesspeople through clientelist arrangements (Ong, 2012). Therefore, we are particularly interested in whether these industrial giants with large bargaining power receive special treatment in government online response. In the case of a complaint against a large industrial firm, the local government’s response and enforcement could lead to a breakdown in the relationship with the industrial giant, and the government could suffer losses. However, whether a local government protects an industrial giant is contingent on how dependent the government is on the relationship. Furthermore, we assume that the local bargaining power, the strategy of local governments to protect large polluting companies, may not work if higher-level governments are alerted on social media. In view of this possibility, we propose the following three hypotheses:

Hypothesis 2: If the target of the appeal is an industrial giant, the local government may respond perfunctorily or not respond to the public's online environmental complaints.

Hypothesis 3: In regions where economic development is highly dependent on industrial giants, governments are more likely to ignore online environmental complaints from the public toward industrial giants.

Hypothesis 4: Local governments will not protect industrial giants if the public's online environmental complaints can be discovered by higher-level governments.

Finally, we argue that public complaints can affect corporate environmental performance by influencing local governments' enforcement of environmental regulations. For the sake of economic development, local governments may protect industrial giants from environmental penalties, thereby loosening supervision of their polluting emissions. We propose the following hypothesis:

Hypothesis 5: Polluting firms subject to public complaints improve environmental performance, but public complaints have little effect on industrial giants.

4. Data and Method

4.1 Research sample

The object of this study is the public's complaints about environmental pollution. Specifically, we focus on the public's online complaints against heavily polluting enterprises. The central government launched the National Specially Monitored Firms (NSMF) pilot program, which placed key industrial polluters under special

monitoring at the national level by installing a Continuous Emission Monitoring System (CEMS) to upload their pollution emission data in real time directly to the central environmental protection department and make it public. The top-ranked firms for water or air pollution annual total emissions were selected as the high polluting firms, which accounted for at least 65% of the total emissions. The list is updated annually.

4.2 Measures of government responsiveness

In this study, our measurement of government responsiveness is restricted to words or expressions, as opposed to actions or substance. Specifically, we measure government responsiveness using a variety of measures, including whether the government responds to public environmental complaints on Weibo, the length of the response, and its timeliness.

First, we directly measure whether the government provides a response by identifying whether each public complaint has a follow-up response by the local government who received @, with a value of 1 if there is a response and a value of 0 if there is not. A response is at least one of the following by the local government environmental protection department account: replying to the poster with @, commenting in the comment area of the complaint post, posting a response notice, or directly forwarding the complaint post on Weibo.

Second, considering that the quality of local governments' responses to public online complaints may also differ, for example, ranging from a perfunctory description of a few words to a detailed investigation record, we use the length of the government's response to measure the quality of the response. For cases in which the government does not respond, we define the length of the reply content as 0.

Third, the timeliness of the government's online response to public complaints is also an important dimension of responsiveness. We use the time gap between the public complaint and the government response as a measure of response time. When the government did not respond, we could not obtain a response time. For this part of the sample, we use the longest response time in the sample to define the case of no response in the benchmark regression, and we use other definitions as a robustness test. Our research involves environmental protection departments at the provincial, prefectural, and county levels. Our observations are each Weibo post involving @ local governments.

4.3 Measures of corporate environmental performance

To measure corporate environmental performance, we use the daily average SO2 concentration from CEMS. We focus on the pollutant SO2 for air pollution because it has the most comprehensive coverage for CEMS firms and is the most high-stakes[4]

[4] Since 1992, China has successively introduced a number of air pollution prevention and control policies, the

367 "criterion pollutant" initially assigned by the central government to evaluate the
368 environmental performance of local government officials (He et al., 2020).
369
370 ## 4.4 Explanatory variables
371 Based on the hypotheses outlined in Section 3, the explanatory variables we focus on
372 include whether the complaint is more likely to be exposed to the higher-level
373 government, whether the subject of the complaint is an industrial giant, and the city's
374 dependence on industrial giants.
375
376 ***Exposure to higher-level government.*** We use multiple indicators across multiple
377 dimensions to measure whether a complaint is more likely to be exposed to higher
378 levels of government. First, if the public dissemination of a complaint post is
379 widespread, then given the need for public opinion monitoring, the complaint is more
380 likely to be a concern for higher-level governments. On Weibo, people may follow
381 and spread posts through functions such as likes, comments, or reposts. Therefore, we
382 constructed a public promotion indicator by adding the number of likes, retweets and
383 comments. Second, by using the authentication function of Weibo, we could identify
384 whether the poster was the general public or a certified organization. Posts published
385 by an organization are seen by more people, so they are more likely to be noticed by
386 the higher-level government. Furthermore, posters may use the @ function for direct

main object of which is SO2.

communication with higher levels of government when posting, and we can use this to determine whether the message is delivered directly to the higher levels of government.

Industrial giant. We measure large-firm dominance in two ways. In the benchmark regression model, we use the proportion of the output value of polluting enterprises to the industrial output value of the prefecture-level city to measure the degree of dominance. A larger percentage indicates that the city is more dependent on the enterprise, and local governments may be inclined to protect the enterprise to promote the economic development of the region. In addition, as an alternative measure, we employ the output value of polluting firms while controlling for city fixed effects. In the heterogeneity analysis, we group cities according to their characteristics and examine whether regions with different reliance on large polluting firms exhibit different effects. The economic development structure of underdeveloped areas may be relatively simple; they may still be undergoing rapid economic development and their dependence on large polluting industries may be more pronounced, so we group cities according to the prefecture-level city's per capita GDP. In addition, compared with cities that rely more on the service industry, cities that rely on manufacturing for economic development may be more dependent on large polluting firms, so we also use the proportion of secondary industries to group cities.

4.5 Control variables and fixed effects

In the baseline model, we control for the government level the public mentions in Weibo posts, year fixed effects, and month fixed effects. As a robustness check, we control for additional fixed effects (province fixed effects, province by time fixed effects, and city fixed effects) and firm characteristics (whether state-owned enterprises (SOEs), whether listed companies in the stock market, and firm age).

4.6 Data sources

Our study uses real online public environmental complaints against polluting firms and government response information to analyze government response strategies. We use data crawling, data mining, and content analysis techniques to collect Weibo online data on environmental complaints and government responses from 2014 to 2016 and clean the raw data for analysis. Specifically, we first crawled the list of high-polluting enterprises in 2014, 2015, and 2016 through the data center of the Ministry of Environmental Protection of China. Then, we used polluting firms' names and pollution-related descriptions as keywords to collect public environmental complaints. Next, we collected all official government environmental Weibo accounts based on the list of provinces, prefectures, and counties in China. We then determined whether the Weibo post crawled in the previous step was an appeal to an environmental protection department based on the official account information retrieved. For each identified Weibo post, we extracted the following information: the poster, the government Weibo account mentioned, the name of the polluting firm, the time of the complaint, the number of forwards, the number of comments, and the

number of likes (see Figure A1). For government responses, we identified the following information: government name, response time, polluting firm name, and response content (see Figure A2). Upon the collection of complaint and response information, we could determine which complaints received follow-up responses and which did not.

We used two firm-level datasets. We used pollution concentration information from the CEMS. As described in Section 4.1, the CEMS monitors and uploads pollutant concentrations at the outlets of heavily polluting enterprises. The CEMS consists of automatic monitoring equipment and a monitoring center. The automatic monitoring equipment refers to the apparatuses and flow (current) meters installed on the site of air and water pollution sources, which are used for monitoring and supervising pollutant discharge, operational recorders for the pollution prevention and control facilities, data collection and transmission apparatuses, and other instrument and apparatuses, which are a component part of the facilities for the prevention and control of pollution. The monitoring center refers to the computer software and equipment that are used by the national environmental protection department to link communications transmission circuits and the automatic monitoring equipment to achieve the automatic monitoring of key pollution sources. To ensure the quality and authenticity of the CEMS data, the central government makes significant efforts. The CEMS monitoring equipment installation must be performed by a third-party team designated by the central government, and 24-hour CCTV cameras are installed near

the monitoring equipment to ensure that the plant cannot interfere with the equipment. Furthermore, the central government uses various algorithms and technologies to detect anomalies and inconsistencies in the CEMS data and hosts monthly meetings with the local governments to discuss any data anomalies that have been identified.

Basic information about polluting enterprises, including output value, date of establishment, and ownership, comes from the Chinese Environmental Statistics Dataset (CESD). The CESD is the most comprehensive environmental microdata set in China, covering approximately 85% of the annual emissions of major pollutants in each county and in every year. The data are self-reported by each firm seasonally and are compiled by the Ministry of Ecology and Environment (MEE).

We also use information on whether a company is listed in the stock market, which is obtained by comparing the list of high-polluting firms with the set of listed companies. The set of listed companies comes from Wind, China's financial database. The Wind database is a large-scale financial database that aggregates and processes domestic financial securities data.

Finally, the prefectural-level cities' data come from the China City Statistical Yearbook, which is an annual publication of the National Bureau of Statistics of China. It presents significant socioeconomic statistics for 658 cities (including 289 at the prefecture level and above and 369 at the county level).

4.7 Model specification

To estimate the influencing factors of local governments' responses to public online environmental complaints, we construct the following econometric models:

$$Y_{it} = \beta_1 Promotion_{it} + \beta_2 Organization_{it} + \beta_3 Upper_{it} + \beta_4 LFD_i + \beta_5 Level_{it} + \beta_6 X_i + \gamma_t + \varepsilon_{it} \quad (1)$$

where Y_{it} equals 1 if there is a government response to public complaint i and 0 otherwise. Alternatively, Y_{it} measures the length of the response or the response time. To test Hypothesis 1, we focus on the number of likes, retweets and comments ($Promotion_{it}$), whether the poster is a certified organization ($Organization_{it}$), and whether the message is delivered directly to the higher levels of government ($Upper_{it}$). To test Hypotheses 2-4, we use the ratio of the firm's output to the prefecture-level city's industrial output as a measure of large-firm dominance (LFD_i). We control for the level of the government ($Level_{it}$) and a series of firm-level characteristics (X_i). We also include a set of fixed effects. In the baseline specification, we control for time fixed effects (γ_t), and we control for province fixed effects, province by time fixed effects, or city fixed effects as robustness checks. ε_{it} is the error term.

We further estimate whether public complaints affect corporate environmental performance (Hypothesis 5). In our sample, we focus on firms that are the subject of public complaints on Weibo. We collect their pollution concentration before and after

the complaints from CEMS. To analyze the impact of online environmental complaints on firms' pollution concentration at exhaust vents, we construct the following model:

$$Y_{it} = \beta_1 Complaint_{it} + f(Day_t) + Complaint_{it} f(Day_t) + \gamma_t + \alpha_i + \varepsilon_{it} \quad (2)$$

where Y_{it} represents the pollution concentration. $Complaint_{it}$ is a dummy variable indicating after the complaint or not. $Complaint_{it}$ equals 0 before the complaint and 1 after the complaint. $f(Day_t)$ denotes a polynomial in the day difference between the monitoring and the complaint. The interaction of $Complaint_{it}$ and $f(Day_t)$ allows a flexible functional form before and after the complaint. γ_t and α_i refer to time fixed effects and firm fixed effects, respectively. ε_{it} is the error term. We further test for heterogeneity based on whether it is a dominant firm, defined by whether the output ratio of the firm is larger than 5%.

5. Results

5.1 Descriptive statistics

After matching and cleaning the Weibo data, we obtained 4304 public complaints regarding polluting firms from 2014 to 2016, of which 11% received a response from the government. More than half of the public complaints were against the thermal power industry. The cement manufacturing and glass manufacturing industries also received more than 200 public complaints. With regard to the time trend, the response

rate of the Chinese local governments to public online complaints increased year by year, from 8% in 2014 to 16% in 2016 (see Figure 1). It is worth noting that 2015 had a very high number of public complaints, which may be because 2015 was the first year of the implementation of China's new environmental protection law. This may be related to the release of Chai Jing's investigative documentary, "Under the Dome," on February 28, 2015, which raised public awareness about environmental issues (Tu et al., 2020). In terms of monthly distribution, as shown in Figure 1, the number of public complaints was highest during March, accounting for 17% of all complaints. This may be because the documentary increased the number of public environmental complaints in March 2015, resulting in a high average for March 2014, March 2015 and March 2016. The large number of public complaints may also be caused by the Chinese New Year in February and the return to work after the holiday, which caused an outbreak of pollution. The response rate varies between approximately 7% and 13%.

Most interestingly, among the 4304 public complaints, 26 had an @ at upper-level governments, and all of them received a response by local-level governments. This suggests that the local government perceives pressure from the higher-level government to pay attention to environmental pollution, and local government officials hope to be viewed favorably by the higher-level government, which is consistent with our framework in which upper-level attention increases the probability of response.

Further categorizing the types of Weibo users, we find that the government's response rate to reports initiated by organizations is higher than the response rate to complaints initiated by individuals (see Figure 1). This is consistent with our hypothesis that complaints initiated by organizations receive more attention, and government responses to these complaints may compensate more for public and higher-level government dissatisfaction.

Moreover, we divided the local governments into different levels as mentioned (provincial, prefectural, and county levels), and we found that most people reported to the environmental protection department of the prefecture-level city. However, the county-level environmental protection department has the highest response rate (see Figure 1). This is in line with China's localized environmental management model; that is, managing specific environmental issues is the responsibility of the county-level government.

To measure public promotion, we used the number of forwards, comments, and likes to represent the public exposure of the complaint. Based on Figure A3, the response rate increased as public promotion increased. Posts with fewer than 5 forwards, comments, and likes had only a 4.9% probability of receiving a response, while complaints with more than 30 forwards, comments, and likes were six times more likely to receive responses. This is consistent with our hypothesis that more public

promotion leads to more responses. Additionally, a high level of public promotion suggests the potential for collective action, which has been demonstrated to influence government responsiveness (King, Pan, and Roberts, 2013; Li, 2014).

Another key factor that influences the government's response is whether the firm receiving complaints is an industrial giant. In quantifying the degree of firm dominance, we use the ratio of a firm's output to the prefecture-level city's industrial output. According to Figure A4, as the output ratio of a firm increases, the likelihood of government response decreases. A complaint against a firm that contributes more than 5% of the city's industrial output has a probability of receiving a response of less than 5% compared to the overall average of 11%.

The summary statistics of the main variables are presented in Table A1. Although descriptive statistics provide some possible influencing factors, to test the hypotheses, we provide statistical analysis of the results in Section 5.2.

5.2 Main results

According to our theoretical framework, whether governments respond to public complaints depends on the probability that the post is discovered by the higher-level government, the contribution rate of the complained-about enterprise to the local economy, and the characteristics of the regions.

585 Table 1 shows the main results of the influencing factors of governments' responses.
586 In column 1, we present our baseline OLS specification, which controls for year fixed
587 effects and month fixed effects to rule out the effect of time trends. In column 2, we
588 further control for province fixed effects because each province has its own
589 management and requirements for government microblogs. Additionally, local
590 governments may be influenced by their neighbors (Huang, Chen, and Yi, 2021),
591 especially by those in the same province. In column 3, we use city fixed effects and
592 enterprise output value to identify large-firm dominance instead of observing the
593 proportion of enterprise output value in the benchmark regression. In the fourth and
594 fifth columns, using the original measure of large-firm dominance, we further add the
595 province-time fixed effect and a series of firm-level control variables, including
596 whether it is a state-owned enterprise, whether it is a listed company, and the age of
597 the firm.
598
599 ***Hypothesis 1: Pressure from higher-level government***. To test Hypothesis 1, we
600 focus on three main indicators: public promotion, organization, and whether there is
601 an @ targeting upper-level government. According to Table 1, whether the
602 government responds to the public's pollution complaints on social media is
603 significantly positively correlated with public promotion, whether the poster is a
604 certified organization, and whether the higher-level government is informed, which
605 verifies Hypothesis 1 (posts that draw the attention of upper governments are more
606 likely to receive responses from local governments). Each additional like, retweet or

comment by a netizen increases the government's response probability by 0.26-0.34%, representing a 22-29% increase compared to the baseline response rate (that is, without any likes, retweets or comments). Complaints posted by organizations increase the likelihood of receiving a government response by 3.5-4.9%, representing a 38-53% increase compared to the case of individual postings. Complaints with a @ to the superior government increase the likelihood of receiving a government response by 78-89%, which is 8-9 times as much as posts that do not alert the higher-level government. The results of two other indicators of government responsiveness show similar trends; namely, public outreach, posting by organizations, and alerting higher-level governments significantly increase the length and quality of government responses (see Table A2) and lead to more timely responses from the government (see Table A3).[5]

Hypothesis 2: Large-firm dominance. To test Hypothesis 2, we use the proportion of the output value of the enterprise that received complaints to the industrial output value of the prefecture-level city where it is located as a measure of large-firm dominance. As shown in Table 1, as the proportion of the output value of the enterprises increases, the government response rate drops significantly. For every 1%

[5] We use an alternative measure for nonresponses as a robustness check (see Table A6 in the appendix). We also conduct a robustness check by dropping nonresponses (see Tables A7 and A8 in the appendix). Due to the limited number of observations leading to low power, some of the variables are no longer statistically significant, but the signs of the coefficients remain the same as our previous model.

increase in the proportion, the response probability decreases by 0.22-0.44%, representing a 2-4% decrease compared to the average government response rate. Tables A2 and A3 show consistent results; that is, as the proportion increases, the response length decreases and the response time increases. By substituting core variables with firm output and city fixed effects, robust results are obtained (see column 3 of Tables 1, A2 and A3). These results support Hypothesis 2; that is, as the proportion of the output value of the enterprises receiving complaints increases, the local government's response rate and response quality both decrease.

We further group and regress by the level of government that was targeted in the complaint. As shown in Table A4, for the provincial, prefectural and county governments, the results are generally consistent with the benchmark regression; that is, prefectural- and county-level local governments' response rate depends on the possibility of being noticed by superiors and the degree of dominance of large enterprises. This suggests that our findings are robust and general across different levels of government.

5.3 Heterogeneous industrial giant effects

Hypothesis 3: Dependence on polluting firms. According to our conceptual model, whether the government responds is also affected by whether local economic development depends on large polluting enterprises. We divide cities according to their per capita GDP and the proportion of secondary production. According to Table

2, for large enterprises, only the regions with a low level of economic development and a high proportion of the secondary industry see an impact, while the response rate of governments in regions with a high level of economic development and a low proportion of secondary industry is not affected by the proportion of the output value of polluting enterprises, which is consistent with Hypothesis 3 (also see Table A5 for the effects on response length and response time).

5.4 Can social media disrupt bargaining power?

Hypothesis 4: Large-firm dominance and pressure from higher-level government. The reason why large polluting firms can collude with local governments is that the superior government cannot perfectly supervise the implementation of policies by local governments; that is, there is information asymmetry. We answer the question of whether social media can disrupt bargaining power by constructing the interaction between "whether there is an @ targeting upper-level government" and "large-firm dominance." As shown in Table 3, even for firms with strong bargaining power, when faced with pressure from higher-level governments, local governments do not show preferential treatment. This confirms Hypothesis 4, which states that bargaining power can be broken by introducing superior supervision in social media.

5.5 Do public complaints improve environmental performance?

Hypothesis 5: Impact on corporate environmental performance. In this section, we directly use the environmental performance of firms that receive complaints to

measure whether public online complaints contribute to environmental improvements. The results are presented using daily averages, and the time frame is 45 days before and after the complaints filed. As shown in Column (1) of Table 3, for all samples, after the public issued the appeal, the sulfur dioxide emission concentration of the reported enterprise dropped significantly by 4.6%. From Column (2) of Table 4, we find that if the local government responds, pollution drops by 9.5%. This is larger than the benchmark results, indicating that the government's response further improves corporate environmental performance.

We also focus on the impact of industrial giants. As shown in Columns (3) and (4) of Table 4, the industrial giants, which account for more than 5% of the total output value, did not improve their environmental performance after public reports. The nonindustrial giants reduced their SO2 concentration by 5.1%. The long-term relatively loose supervision may make them unconcerned about complaints from the public because they expect that these complaints will not lead to supervision and punishment.

6. Conclusion and Policy Implications

In the new media era, the public expression of opinions or complaints through Weibo has become a common form of public participation in social management in China. Through the use of microblogging in politics, network monitoring may be an effective complement to local government environmental governance and thus may mitigate

691 the implementation gap.

692

693 Our study found that the government's response rate on social media increased
694 between 2014 and 2016, suggesting that the Chinese government may be becoming
695 more responsive, but there is still significant room for improvement. We hypothesize
696 that the local government's response to public demands on social media depends on
697 the probability of being noticed by a higher-level government, whether the reported
698 polluting enterprise is a large enterprise, and the local dependence on the polluting
699 enterprise. The empirical research finds that local governments have a higher response
700 rate and higher response quality if they are more likely to be viewed by higher-level
701 governments, measured by public promotion, posts from organizations, and posts that
702 call for the attention of higher levels of government. This is consistent with the
703 demand-driven theory that China provides constituency service because it sustains the
704 informational advantages of citizen participation (Distelhorst and Hou, 2017). When a
705 polluting firm has a greater share of output value in a community, the local
706 government is less likely to respond, which is consistent with Lorentzen, Landry, and
707 Yasuda (2014). However, the industrial giant effect does not appear to occur in
708 developed areas or in areas with low secondary industry production. Additionally, the
709 industrial giant effect can be eliminated by introducing higher-level government
710 scrutiny on social media. Finally, polluting firms that receive public complaints
711 improve their environmental performance.

712

This study provides evidence that the public can use social media for environmental monitoring and public participation. The implementation of public policies by local governments may depend heavily on the oversight of higher authorities; the public can utilize social media channels to seek higher-level government supervision. According to our research, using the @ function of Weibo to directly remind higher-level governments to pay attention to posts greatly improves the response rate and quality of local governments, especially when the public makes appeals about pollution by industrial giants. Posting by environmental NGOs and public figures may also help to address environmental issues.

This study has several limitations as well. First, our measure of government responsiveness is inadequate, in that it counts only whether the government has responded in words and not its real responsive actions (e.g., onsite investigation and environmental penalty). To maintain public satisfaction, governments may simply respond to public complaints through performative governance (Ding, 2020, 2022). Second, even though our examination of corporate emissions revealed some indications of improved corporate performance, we were unable to determine whether the response was purely a tactical adjustment for the short term. There is evidence that local governments respond to upper inspections by strategically pressuring firms to lower emissions in the short term, but then revert to their previous levels (Tian and Tsai, 2022). Another concern is the possibility that firms may manipulate emissions statistics in response to increased regulatory or public pressure (Karplus, Zhang, and

735 Almond, 2018), particularly when regulatory capacity is still lacking
736 (Francesch-Huidobro, Lo, and Tang 2012; Lo et al., 2016). Thus, future research is
737 needed to analyze more dimensions of government responsiveness, especially at the
738 substantive level, as well as the long-term impact on corporate response.
739
740 Finally, as information technology and other means of interaction continue to develop,
741 understanding the motivation of the public to participate in social media government
742 interaction is also an important consideration (Lee and Kim, 2018) that has not been
743 addressed in this paper. The following questions should be addressed in future
744 research to better understand how social media affects co-governance: What factors
745 lead the public to use social media to make complaints? What are barriers to public
746 participation?
747
748
749 **Acknowledgments**

750 This research is supported by the National Natural Science Foundation of China
751 (Grant No. 72004024, 71825005 and 72161147002) and Environment for
752 Development (EfD) Initiative project EfD MS-519.

References

Andersen, K. N., Medaglia, R., & Henriksen, H. Z. (2012). Social media in public health care: Impact domain propositions. *Government Information Quarterly*, *29*(4), 462-469.

Barberá, P., Casas, A., Nagler, J., Egan, P. J., Bonneau, R., Jost, J. T., & Tucker, J. A. (2019). Who leads? Who follows? Measuring issue attention and agenda setting by legislators and the mass public using social media data. *American Political Science Review*, *113*(4), 883-901.

Bertot, J. C., Jaeger, P. T., & Hansen, D. (2012). The impact of polices on government social media usage: Issues, challenges, and recommendations. *Government Information Quarterly, 29*(1), 30-40.

Bevan, S., & Rasmussen, A. (2020). When does government listen to the public? Voluntary associations and dynamic agenda representation in the United States. *Policy Studies Journal*, *48*(1), 111-132.

Beyer, S. (2006). Environmental law and policy in the People's Republic of China. *Chinese Journal of International Law, 5*(1), 185-211.

Buntaine, M., Greenstone, M., He, G., Liu, M., Wang, S., & Zhang, B. (2022). Does the Squeaky Wheel Get More Grease? The Direct and Indirect Effects of Citizen Participation on Environmental Governance in China (No. w30539). *National Bureau of Economic Research.*

Butler, D. M., & Broockman, D. E. (2011). Do politicians racially discriminate against constituents? A field experiment on state legislators. *American Journal of*

Political Science, 55(3), 463-477.

Charalabidis, Y., & Loukis, E. (2012). Participative public policy making through multiple social media platforms utilization. *International Journal of Electronic Government Research, 8*(3), 78-97.

Chen, J., Pan, J., & Xu, Y. (2016). Sources of authoritarian responsiveness: A field experiment in China. *American Journal of Political Science*, *60*(2), 383-400.

Chen, J., & Xu, Y. (2017). Why do authoritarian regimes allow citizens to voice opinions publicly?. *The Journal of Politics, 79*(3), 792-803.

China Internet Network Information Center (CNNIC). (2019). The 44th statistical report on the development of China's Internet.

China Internet Network Information Center (CNNIC). (2021). The 46th statistical report on the development of China's Internet.

Deng, Y., Wu, Y., & Xu, H. (2020). Political connections and firm pollution behaviour: an empirical study. *Environmental and Resource Economics, 75*(4), 867-898.

Ding, I. (2020). Performative governance. *World Politics, 72*(4), 525-556.

Ding, I. (2022). The Performative State: Public Scrutiny and Environmental Governance in China. Cornell University Press.

Distelhorst, G., & Hou, Y. (2017). Constituency service under nondemocratic rule: Evidence from China. *The Journal of Politics*, *79*(3), 1024-1040.

Dong, Y., Ishikawa, M., Liu, X., & Hamori, S. (2011). The determinants of citizen complaints on environmental pollution: An empirical study from China. *Journal of Cleaner Production, 19*(12), 1306-1314.

797 Driscoll, A., Cepaluni, G., Guimarães, F. D. S., & Spada, P. (2018). Prejudice,
798 strategic discrimination, and the electoral connection: evidence from a pair of field
799 experiments in Brazil. *American Journal of Political Science*, *62*(4), 781-795.
800 Evans, M. F., & Stafford, S. L. (2019). The Clean Air Act Watch List and federal
801 oversight of state enforcement efforts. *Journal of Environmental Economics and*
802 *Management*, *93*, 170-184.
803 Flavin, P., & Franko, W. W. (2017). Government's Unequal Attentiveness to Citizens'
804 Political Priorities. *Policy Studies Journal*, *45*(4), 659-687.
805 Francesch-Huidobro, M., Lo, C. W. H., & Tang, S. Y. (2012). The local environmental
806 regulatory regime in China: Changes in pro-environment orientation, institutional
807 capacity, and external political support in Guangzhou. *Environment and Planning*
808 *A*, *44*(10), 2493-2511.
809 Gilens, M. (2012). Affluence and Influence: Economic Inequality and Political Power
810 in America. Princeton, New Jersey: Princeton University Press.
811 Grossman, G., & Slough, T. (2022). Government Responsiveness in Developing
812 Countries. *Annual Review of Political Science*, 25.
813 Hassid, J. (2015). Chinese government responsiveness to internet opinion: Promising
814 but dangerous. *Journal of Current Chinese Affairs*, *44*(2), 39-68.
815 Huang, C., Chen, W., & Yi, H. (2021). Collaborative networks and environmental
816 governance performance: a social influence model. *Public Management*
817 *Review*, *23*(12), 1878-1899.
818 Karplus, V. J., Zhang, S., & Almond, D. (2018). Quantifying coal power plant

responses to tighter SO2 emissions standards in China. *Proceedings of the National Academy of Sciences, 115*(27), 7004-7009.

Kastellec, J. P., Lax, J. R., Malecki, M., & Phillips, J. H. (2015). Polarizing the electoral connection: partisan representation in Supreme Court confirmation politics. *The Journal of Politics, 77*(3), 787-804.

Kim, S. K., Park, M. J., & Rho, J. J. (2015). Effect of the Government's Use of Social Media on the Reliability of the Government: Focus on Twitter. *Public Management Review, 17*(3), 328-355.

King, G., Pan, J., & Roberts, M. E. (2013). How censorship in China allows government criticism but silences collective expression. *American Political Science Review*, *107*(2), 326-343.

Kornreich, Y. (2019). Authoritarian responsiveness: Online consultation with "issue publics" in China. *Governance*, *32*(3), 547-564.

Kostka, G., & Mol, A. P. (2013). Implementation and participation in China's local environmental politics: challenges and innovations. *Journal of Environmental Policy & Planning*, *15*(1), 3-16.

Lee, J., & Kim, S. (2018). Citizens' e-participation on agenda setting in local governance: Do individual social capital and e-participation management matter? *Public Management Review*, *20*(6), 873-895.

Li, Y. (2014). Downward accountability in response to collective actions: the political economy of public goods provision in China. *Economics of Transition*, *22*(1), 69-103.

Lo, C. W. H., Liu, N., Li, P. H. Y., & Wang, W. (2016). Controlling industrial

841 pollution in urban China: Towards a more effective institutional milieu in the
842 Guangzhou Environmental Protection Bureau? *China Information, 30*(2), 232-258.
843 Lorentzen, P., Landry, P., & Yasuda, J. (2014). Undermining authoritarian innovation:
844 the power of China's industrial giants. *The Journal of Politics*, *76*(1), 182-194.
845 Ma, L. (2013). The diffusion of government microblogging: Evidence from Chinese
846 municipal police bureaus. *Public Management Review, 15*(2), 288-309.
847 McClendon, G. H. (2016). Race and responsiveness: An experiment with South
848 African politicians. *Journal of Experimental Political Science, 3*(1), 60-74.
849 Meijer, A., Grimmelikhuijsen, S., & Brandsma, G. J. (2012). Communities of Public
850 Service Support: Citizens engage in social learning in peer-to-peer
851 networks. *Government Information Quarterly*, *29*(1), 21-29.
852 Omar, A. M. (2020). Digital Era Governance and Social Media: The Case of
853 Information Department Brunei. In *Employing recent technologies for improved*
854 *digital governance* (pp. 19-35). IGI Global.
855 Ong, L. H. (2012). Between developmental and clientelist states: Local state-business
856 relationships in China. *Comparative Politics*, *44*(2), 191-209.
857 Pan, J., & Chen, K. (2018). Concealing corruption: How Chinese officials distort
858 upward reporting of online grievances. *American Political Science Review*, *112*(3),
859 602-620.
860 Qiaoan, R., & Teets, J. C. (2020). Responsive Authoritarianism in China--a Review of
861 Responsiveness in Xi and Hu Administrations. *Journal of Chinese Political*
862 *Science*, *25*(1), 139-153.

Ran, R. (2013). Perverse incentive structure and policy implementation gap in China's local environmental politics. *Journal of Environmental Policy & Planning*, *15*(1), 17-39.

Shih, V., Adolph, C., & Liu, M. (2012). Getting ahead in the communist party: explaining the advancement of central committee members in China. *American Political Science Review*, *106*(1), 166-187.

Su, Z., & Meng, T. (2016). Selective responsiveness: Online public demands and government responsiveness in authoritarian China. *Social Science Research*, *59*, 52-67.

Tian, G., & Tsai, W. H. (2022). The policy implementation strategies of county cadres: Political instrument and flexible local governance. *China Information*, *36*(1), 23-45.

Tu, M., Zhang, B., Xu, J., & Lu, F. (2020). Mass media, information and demand for environmental quality: Evidence from the "Under the Dome". *Journal of Development Economics*, *143*, 102402.

Van Rooij, B. (2006). Implementation of Chinese environmental law: regular enforcement and political campaigns. *Development and Change*, *37*(1), 57-74.

Wang, H., Mamingi, N., Laplante, B., & Dasgupta, S. (2003). Incomplete enforcement of pollution regulation: bargaining power of Chinese factories. *Environmental and Resource Economics*, *24*(3), 245-262.

Wines, M., & LaFraniere, S. (2011). In baring facts of train crash, blogs erode China censorship. The New York Times, *28.*

Wlezien, C. (1995). The public as thermostat: Dynamics of preferences for

spending. *American Journal of Political Science*, 981-1000.

Zhang, B., & Cao, C. (2015). Policy: Four gaps in China's new environmental law. *Nature News, 517*(7535), 433.

Zhong, L. J., & Mol, A. P. (2008). Participatory environmental governance in China: Public hearings on urban water tariff setting. *Journal of Environmental Management, 88*(4), 899-913.

Zhuravskaya, E., Petrova, M., & Enikolopov, R. (2020). Political effects of the internet and social media. *Annual Review of Economics, 12*, 415-438.

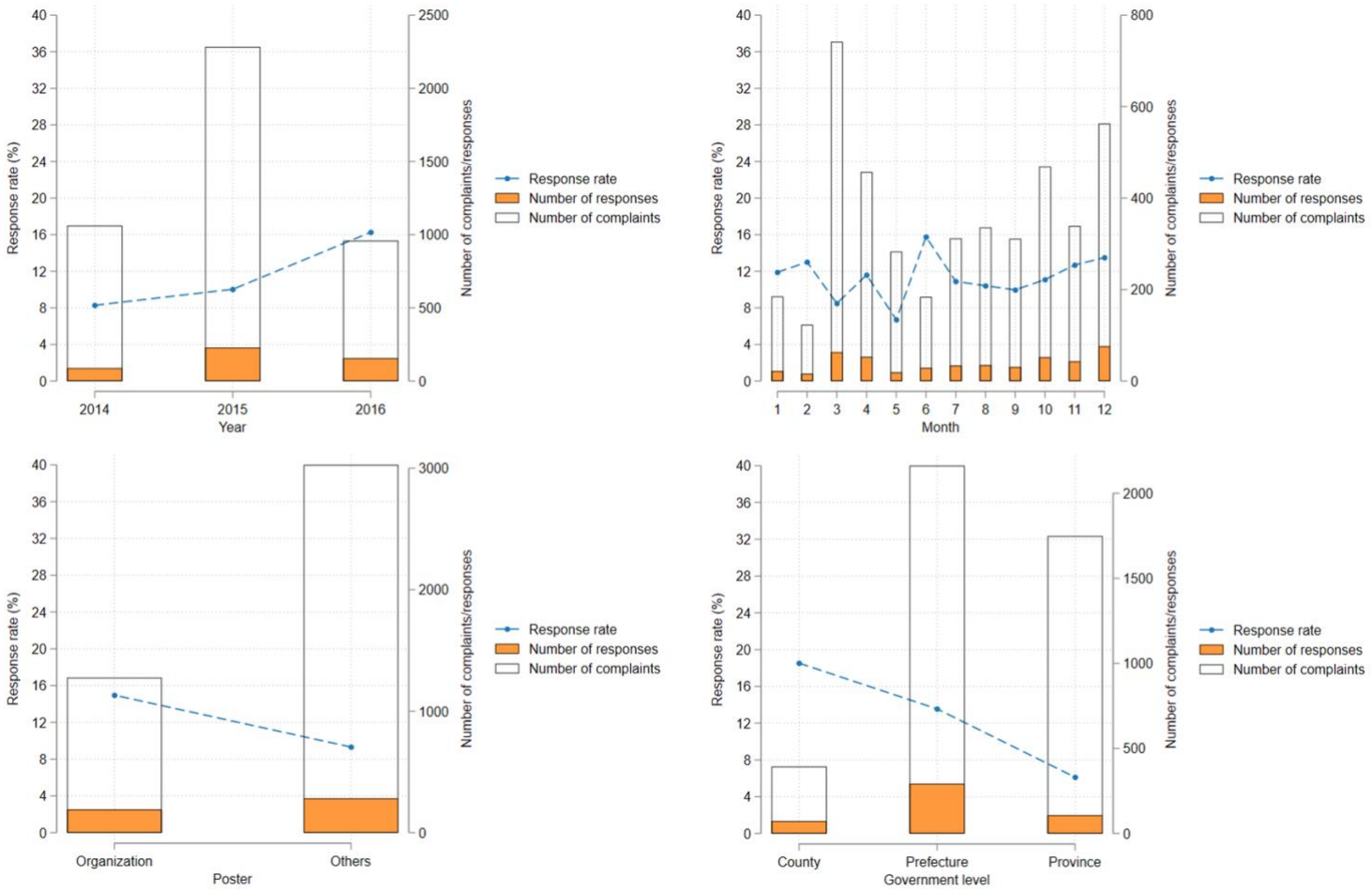

Figure 1. Summary of the number of complaints/responses and response rate

Table 1. Effects on whether the government responds

	(1) Whether Respond	(2) Whether Respond	(3) Whether Respond	(4) Whether Respond	(5) Whether Respond
Public Promotion	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Whether Organization	0.049***	0.040***	0.035***	0.047***	0.049***
	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)
Government Level	-0.067***	-0.057***	-0.047***	-0.058***	-0.058***
	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
Whether @ Upper	0.892***	0.813***	0.782***	0.790***	0.793***
	(0.059)	(0.057)	(0.057)	(0.058)	(0.058)
Large-Firm Dominance	-0.004***	-0.002**		-0.003**	-0.003***
	(0.001)	(0.001)		(0.001)	(0.001)
log(Output)			-0.007**		
			(0.003)		
Whether SOE					-0.002
					(0.012)
Whether Listed					0.007
					(0.025)
Firm Age					0.001***
					(0.000)
Year FE	Yes	Yes	Yes		
Month FE	Yes	Yes	Yes		
Province FE		Yes			
Province by Year FE				Yes	Yes
Province by Month FE				Yes	Yes
City FE			Yes		
Observations	4,304	4,303	4,267	4,242	4,242
R-squared	0.114	0.162	0.246	0.205	0.208

Standard errors in parentheses.

* p < 0.10, ** p < 0.05, *** p < 0.01

Table 2. Heterogeneous effects

	(1) Whether Respond High GDP	(2) Whether Respond Low GDP	(3) Whether Respond High Secondary	(4) Whether Respond Low Secondary
Public Promotion	0.005***	0.003***	0.007***	0.002***
	(0.001)	(0.000)	(0.000)	(0.001)
Whether	0.031*	0.075***	0.051***	0.043**
Organization	(0.017)	(0.014)	(0.012)	(0.020)
Whether @ Upper	0.803***	0.841***	0.868***	0.836***
	(0.075)	(0.102)	(0.062)	(0.116)
Large-Firm	-0.002	-0.003***	-0.004***	-0.002
Dominance	(0.002)	(0.001)	(0.001)	(0.002)
Year FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
Observations	2,127	2,177	2,314	1,836
R-squared	0.121	0.090	0.178	0.059

Standard errors in parentheses.

* p < 0.10, ** p < 0.05, *** p < 0.01

Table 3. Break of bargaining power by introducing superior supervision

	(1)	(2)	(3)	(4)	(5)
	Whether Respond	Whether Respond	Whether Respond	Whether Respond	Whether Respond
Public Promotion	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Whether Organization	0.049***	0.040***	0.035***	0.047***	0.049***
	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)
Government Level	-0.067***	-0.057***	-0.047***	-0.058***	-0.058***
	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
Whether @ Upper×Large-firm	0.005	0.002		0.004	0.004
Dominance	(0.010)	(0.010)		(0.010)	(0.010)
Whether @ Upper	0.883***	0.808***	0.923*	0.782***	0.784***
	(0.062)	(0.061)	(0.489)	(0.061)	(0.061)
Large-Firm Dominance	-0.004***	-0.002**		-0.003***	-0.003***
	(0.001)	(0.001)		(0.001)	(0.001)
Whether @ Upper×log(Output)			-0.012		
			(0.041)		
log(Output)			-0.007**		
			(0.003)		
Whether SOE					-0.002
					(0.012)
Whether Listed					0.008
					(0.025)
Firm Age					0.001***
					(0.000)
Year FE	Yes	Yes	Yes		
Month FE	Yes	Yes	Yes		
Province FE		Yes			
Province by Year FE				Yes	Yes
Province by Month FE				Yes	Yes
City FE			Yes		
Observations	4,304	4,303	4,267	4,242	4,242
R-squared	0.114	0.162	0.246	0.205	0.208

Table 4. Effects of public complaints on pollution concentrations

	(1)	(2)	(3)	(4)
	All Sample	With Response	Industrial Giants	Non-Giants
	ln(SO2)	ln(SO2)	ln(SO2)	ln(SO2)
Complaint	-0.047***	-0.099***	0.017	-0.052***
	(0.011)	(0.025)	(0.031)	(0.012)
Day	0.001***	-0.001*	0.001	0.001***
	(0.000)	(0.001)	(0.001)	(0.000)
Complaint×Day	-0.002	0.003***	-0.001	-0.002***
	(0.000)	(0.001)	(0.001)	(0.000)
Year FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	69,146	14,167	6,083	63,063

Standard errors in parentheses.

* p < 0.10, ** p < 0.05, *** p < 0.01

Appendix

Table A1. Summary statistics

Variable	Obs	Mean	Unit	Std. Dev.
Whether Respond	4,304	0.110	Rates	0.313
Response Length	4,304	15.184	Word counts	62.687
Response Time	473	4.175	Days	10.392
Public Promotion	4,304	6.030	Counts	13.980
Whether Organization	4,304	0.297	Rates	0.457
Whether @ Upper	4,304	.006	Rates	0.077
Large-Firm Dominance	4,304	2.331	Percentage	5.089
Whether SOE	4,304	0.244	Rates	0.429
Whether Listed	4,304	0.041	Rates	0.199
Firm Age	4,304	20.957	Years	17.129
log(Output)	4,304	11.454	10,000 RMB	1.638
Province Level	4,304	0.406	Rates	0.491
Prefecture Level	4,304	0.502	Rates	0.500
County Level	4,304	0.092	Rates	0.288
SO2 Concentrations	69,161	168.078	mg/m^3	304.703

Table A2. Effects on response length

	(1) Response Length	(2) Response Length	(3) Response Length	(4) Response Length	(5) Response Length
Public Promotion	0.832***	0.738***	0.732***	0.755***	0.761***
	(0.074)	(0.074)	(0.076)	(0.078)	(0.078)
Whether Organization	11.604***	10.391***	9.313***	14.527***	14.906***
	(2.435)	(2.436)	(2.519)	(2.648)	(2.652)
Government Level	-10.132***	-7.475***	-6.918***	-6.606***	-6.670***
	(1.633)	(1.737)	(1.791)	(1.791)	(1.791)
Whether @ Upper	87.928***	76.009***	69.655***	71.325***	71.191***
	(13.185)	(13.066)	(13.085)	(13.156)	(13.186)
Large-Firm Dominance	-0.817***	-0.484**		-0.560**	-0.642***
	(0.200)	(0.211)		(0.232)	(0.236)
log(Output)			-1.873**		
			(0.745)		
Whether SOE					1.306
					(2.631)
Whether Listed					4.691
					(5.703)
Firm Age					0.141**
					(0.070)
Year FE	Yes	Yes	Yes		
Month FE	Yes	Yes	Yes		
Province FE		Yes			
Province by Year FE				Yes	Yes
Province by Month FE				Yes	Yes
City FE			Yes		
Observations	4,304	4,303	4,267	4,242	4,242
R-squared	0.069	0.099	0.162	0.152	0.153

Standard errors in parentheses.

* p < 0.10, ** p < 0.05, *** p < 0.01

Table A3. Effects on response time

	(1) Response Time	(2) Response Time	(3) Response Time	(4) Response Time	(5) Response Time
Public Promotion	-0.188***	-0.147***	-0.141***	-0.141***	-0.142***
	(0.019)	(0.019)	(0.019)	(0.020)	(0.020)
Whether Organization	-2.874***	-2.383***	-2.025***	-2.776***	-2.893***
	(0.632)	(0.626)	(0.636)	(0.683)	(0.684)
Government Level	3.696***	3.096***	2.537***	3.168***	3.173***
	(0.424)	(0.446)	(0.452)	(0.462)	(0.462)
Whether @ Upper	-43.712***	-39.086***	-38.021***	-37.599***	-37.822***
	(3.422)	(3.358)	(3.304)	(3.395)	(3.400)
Large-Firm Dominance	0.267***	0.142***		0.170***	0.193***
	(0.052)	(0.054)		(0.060)	(0.061)
log(Output)			0.383**		
			(0.188)		
Whether SOE					0.162
					(0.678)
Whether Listed					-0.046
					(1.470)
Firm Age					-0.061***
					(0.018)
Year FE	Yes	Yes	Yes		
Month FE	Yes	Yes	Yes		
Province FE		Yes			
Province by Year FE				Yes	Yes
Province by Month FE				Yes	Yes
City FE			Yes		
Observations	4,304	4,303	4,267	4,242	4,242
R-squared	0.098	0.147	0.231	0.191	0.193

Standard errors in parentheses.

* p < 0.10, ** p < 0.05, *** p < 0.01

Table A4. Robustness check by government level

	(1) Whether Respond Provincial	(2) Whether Respond Prefectural	(3) Whether Respond County	(4) Response Length Provincial	(5) Response Length Prefectural	(6) Response Length County	(7) Response Time Provincial	(8) Response Time Prefectural	(9) Response Time County
Public	0.004***	0.004***	0.003***	1.271***	0.815***	0.737***	-0.222***	-0.229***	-0.140***
Promotion	(0.001)	(0.001)	(0.000)	(0.297)	(0.111)	(0.097)	(0.064)	(0.032)	(0.022)
Whether	0.024	0.091***	0.012	20.723	21.762***	-0.015	0.133	-5.640***	-0.847
Organization	(0.049)	(0.018)	(0.012)	(12.620)	(3.636)	(3.084)	(2.728)	(1.047)	(0.694)
Whether @		0.905***	0.937***		29.543	103.599***		-55.843***	-45.146***
Upper		(0.192)	(0.045)		(39.143)	(11.705)		(11.276)	(2.632)
Large-Firm	-0.011***	-0.005***	-0.002**	-2.717***	-0.800***	-0.575**	0.563**	0.297***	0.177***
Dominance	(0.004)	(0.001)	(0.001)	(1.019)	(0.269)	(0.293)	(0.220)	(0.078)	(0.066)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	394	2,162	1,748	394	2,162	1,748	394	2,162	1,748
R-squared	0.131	0.070	0.246	0.112	0.057	0.101	0.130	0.073	0.187

Standard errors in parentheses.

* p < 0.10, ** p < 0.05, *** p < 0.01

Table A5. Heterogeneous effects on response length and response time

	(1) Response Length High GDP	(2) Response Length Low GDP	(3) Response Length High Secondary	(4) Response Length Low Secondary	(5) Response Time High GDP	(6) Response Time Low GDP	(7) Response Time High Secondary	(8) Response Time Low Secondary
Public Promotion	1.380***	0.567***	1.526***	0.612***	-0.305***	-0.139***	-0.384***	-0.115***
	(0.134)	(0.084)	(0.123)	(0.103)	(0.035)	(0.022)	(0.029)	(0.029)
Whether	6.268*	17.454***	6.969**	16.741***	-1.998**	-4.228***	-2.891***	-2.605**
Organization	(3.680)	(3.208)	(3.118)	(4.033)	(0.973)	(0.820)	(0.721)	(1.152)
Whether @ Upper	41.509**	176.003***	108.679***	39.197*	-37.348***	-44.682***	-40.308***	-44.696***
	(16.697)	(23.149)	(15.427)	(23.713)	(4.413)	(5.916)	(3.565)	(6.776)
Large-Firm	-0.108	-0.659***	-0.670***	-0.666	0.181	0.182***	0.227***	0.141
Dominance	(0.498)	(0.211)	(0.232)	(0.415)	(0.132)	(0.054)	(0.054)	(0.119)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,127	2,177	2,314	1,836	2,127	2,177	2,314	1,836
R-squared	0.073	0.080	0.106	0.044	0.103	0.079	0.153	0.055

Standard errors in parentheses.

* p < 0.10, ** p < 0.05, *** p < 0.01

Table A6. Effects on response time using three months as the response time of the nonresponses

	(1) Response Time	(2) Response Time	(3) Response Time	(4) Response Time	(5) Response Time
Public Promotion	-0.287***	-0.226***	-0.217***	-0.216***	-0.219***
	(0.028)	(0.028)	(0.029)	(0.030)	(0.030)
Whether Organization	-4.289***	-3.548***	-3.037***	-4.127***	-4.311***
	(0.942)	(0.933)	(0.947)	(1.018)	(1.019)
Government Level	5.639***	4.737***	3.891***	4.838***	4.848***
	(0.632)	(0.665)	(0.673)	(0.688)	(0.688)
Whether @ Upper	-69.587***	-62.664***	-60.687***	-60.500***	-60.815***
	(5.099)	(5.002)	(4.918)	(5.057)	(5.064)
Large-Firm Dominance	0.394***	0.206**		0.247***	0.283***
	(0.078)	(0.081)		(0.089)	(0.090)
log(Output)			0.590**		
			(0.280)		
Whether SOE					0.224
					(1.010)
Whether Listed					-0.258
					(2.190)
Firm Age					-0.094***
					(0.027)
Year FE	Yes	Yes	Yes		
Month FE	Yes	Yes	Yes		
Province FE		Yes			
Province by Year FE				Yes	Yes
Province by Month FE				Yes	Yes
City FE			Yes		
Observations	4,304	4,303	4,267	4,242	4,242
R-squared	0.103	0.153	0.237	0.196	0.199

Standard errors in parentheses.

* p < 0.10, ** p < 0.05, *** p < 0.01

Table A7. Effects on response length without nonresponses

	(1) Response Length	(2) Response Length	(3) Response Length	(4) Response Length	(5) Response Length
Public Promotion	2.207***	2.495***	2.638***	2.260***	2.387***
	(0.460)	(0.451)	(0.496)	(0.461)	(0.464)
Whether Organization	30.526**	31.093**	25.683*	53.385***	50.979***
	(13.082)	(13.182)	(13.969)	(14.224)	(14.340)
Government Level	-4.596	-1.072	-4.380	3.944	2.870
	(11.113)	(11.412)	(12.145)	(11.443)	(11.433)
Whether @ Upper	-42.835	-38.181	-59.064**	-52.950*	-61.723**
	(29.544)	(28.765)	(29.824)	(28.645)	(28.889)
Large-Firm Dominance	-2.081	-3.256*		-1.832	-1.221
	(1.639)	(1.875)		(2.290)	(2.313)
log(Output)			-5.558		
			(4.709)		
Whether SOE					2.143
					(16.997)
Whether Listed					65.316**
					(31.944)
Firm Age					-0.280
					(0.384)
Year FE	Yes	Yes	Yes		
Month FE	Yes	Yes	Yes		
Province FE		Yes			
Province by Year FE				Yes	Yes
Province by Month FE				Yes	Yes
City FE			Yes		
Observations	473	467	448	435	435
R-squared	0.122	0.223	0.334	0.319	0.327

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A8. Effects on response time without responses

	(1) Response Time	(2) Response Time	(3) Response Time	(4) Response Time	(5) Response Time
Public Promotion	0.011	0.017	0.018	0.030	0.042
	(0.033)	(0.034)	(0.038)	(0.037)	(0.037)
Whether	-0.037	-0.277	-0.148	-0.275	-0.291
Organization	(0.947)	(0.990)	(1.059)	(1.132)	(1.139)
Government Level	-1.310	-1.210	-1.409	-1.426	-1.516*
	(0.804)	(0.857)	(0.920)	(0.911)	(0.908)
Whether @ Upper	8.924***	8.764***	7.446***	8.979***	8.314***
	(2.138)	(2.161)	(2.260)	(2.281)	(2.294)
Large-Firm	0.211*	0.360**		0.402**	0.432**
Dominance	(0.119)	(0.141)		(0.182)	(0.184)
log(Output)			-0.263		
			(0.357)		
Whether SOE					1.072
					(1.350)
Whether Listed					6.434**
					(2.536)
Firm Age					0.010
					(0.030)
Year FE	Yes	Yes	Yes		
Month FE	Yes	Yes	Yes		
Province FE		Yes			
Province by Year FE				Yes	Yes
Province by Month FE				Yes	Yes
City FE			Yes		
Observations	473	467	448	435	435
R-squared	0.163	0.205	0.295	0.247	0.260

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Translation of the complaint content: [Application Information Disclosure]: In response to the one-kilometer-long black canal next to Tianjin Tianfeng Iron and Steel, apply to the @ Tianjin Environmental Protection Bureau for the information on Tianjin Tianfeng Iron and Steel Co., Ltd. Environmental Impact Assessment Report (full copy) and its approval opinions, wastewater discharge permit, acceptance test report, acceptance approval report and daily monitoring report. We look forward to a timely reply. @Jinghai Environmental Protection Bureau

Figure A1. Screenshot of public appeal

Translation of the response content: [Regarding the COD level of the Penglai Beigou Town Comprehensive Sewage Treatment Plant constantly exceeding the standard] The Penglai Beigou Town Comprehensive Sewage Treatment Plant is responsible for treating sewage from industrial enterprises and households within Beigou. On December 6, 2016, the online monitoring platform showed that the COD of the comprehensive sewage treatment plant in Beigou Town, Penglai City, exceeded the standard. According to the on-site investigation of the Penglai Environmental Protection Bureau, due to the sudden failure of the sand filter and the inclined plate sedimentation tank of the enterprise, the sewage treatment efficiency was reduced, resulting in the export COD concentration exceeding the standard. The Penglai City Environmental Protection Bureau immediately asked the company to take emergency measures to repair the sand filter and inclined the plate sedimentation tank to speed up the recovery of the system. In the process of equipment maintenance, due to the inability to ensure the effect of sewage treatment, the sewage treatment plant has continuously exceeded the standard in recent days. At present, equipment maintenance has been completed, and the effluent water quality has returned to normal. To ensure the stability of the water inflow to the sewage treatment plant, our city has launched the "one-to-one management of enterprises" plan, which manages all the sewage outlets of enterprises in the industrial zone separately and installs online monitoring equipment. At present, the renovation project has been 90% completed. When completed, the stability of the sewage inlet will be improved, thereby ensuring the normal operation of the sewage treatment plant. At the same time, the Penglai Municipal Environmental Protection Bureau will further strengthen environmental supervision and conduct random night inspections of key industrial enterprises to prevent enterprises from illegally discharging pollutants and exceeding the standard. @Yantai Environmental Protection Bureau @PECC_LN @Shandong Environmental Protection Bureau

Figure A2. Screenshot of government response

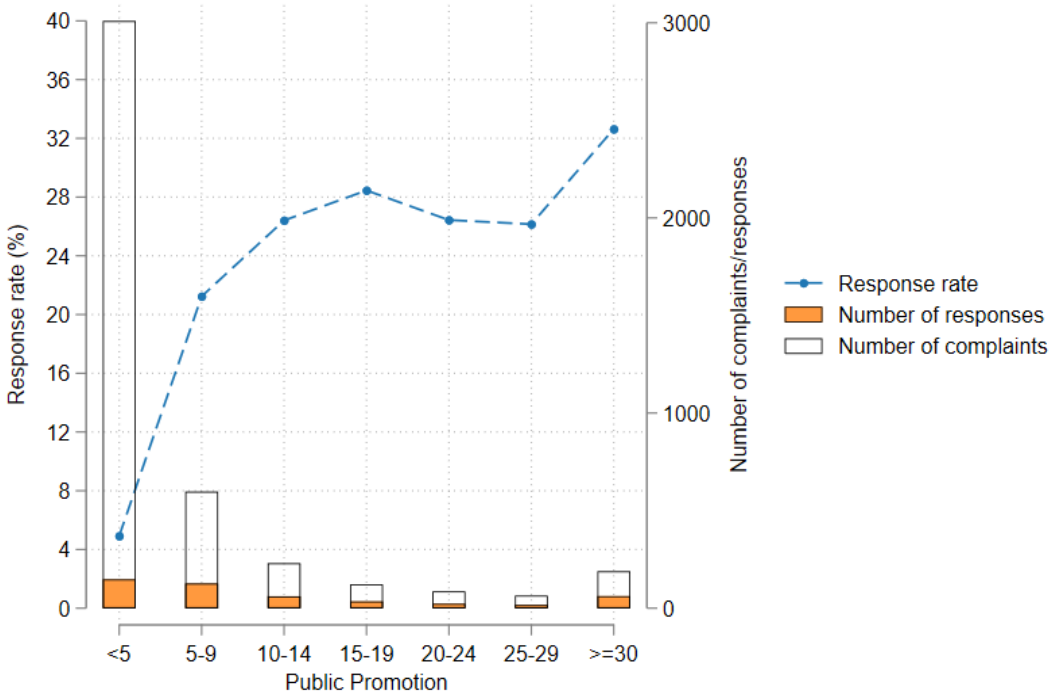

Figure A3. Number of complaints/responses and response rate by public promotion

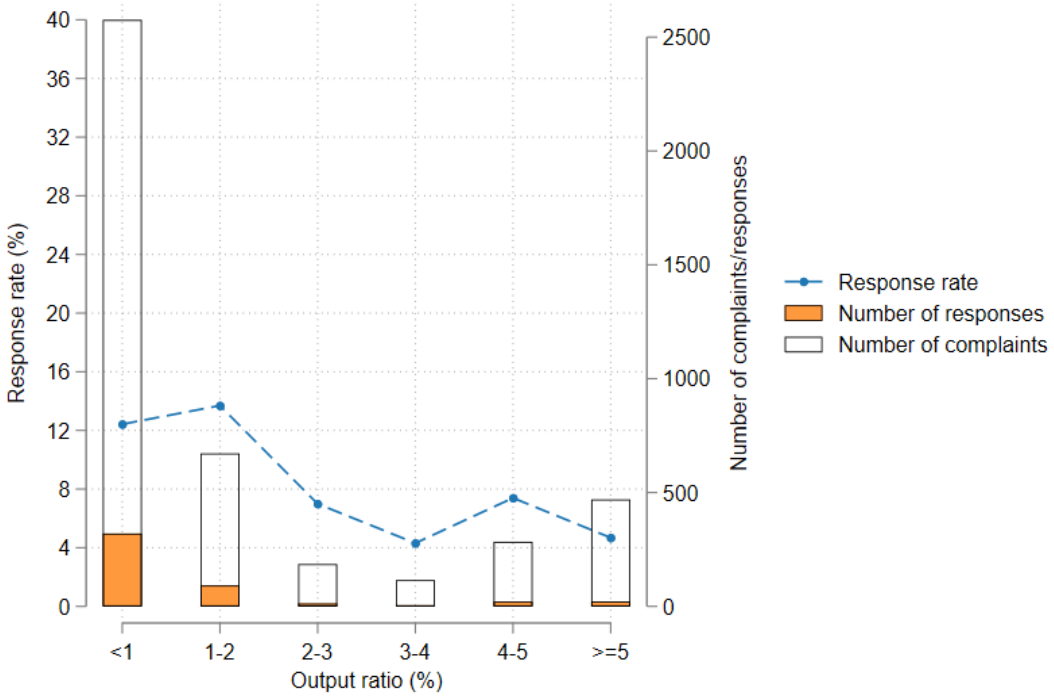

Figure A4. Number of complaints/responses and response rate by output ratio