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RESEARCH ARTICLE

Curbing Elite Capture or Enhancing Resources: Recentralizing Local Environmental Enforcement in China†

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Abstract
Decentralization is believed to ensure better environmental governance. However, recent studies have shown that some governments recentralize local enforcement to increase the effectiveness of policy implementation. Under what conditions is recentralization the better option for environmental enforcement? This study attempts to differentiate two possible mechanisms through which recentralization can deliver better environmental outcomes: curbing elite capture and enhancing local resources. In the context of recentralization reform and with a unique dataset of local investigations into China's environmental enforcement, we demonstrate that although decentralization has been successful from many perspectives, recentralizing local environmental enforcement can produce better outcomes for pollution reduction in China, by curbing local protectionism rather than enhancing local resources. Further qualitative analysis reveals why recentralization cannot necessarily enhance local resources and capacity, even though it is designed to do so.

摘要
学界一般认为，地方分权能够改善环境治理。然而，最近的研究发现，一些政府尝试以地方执法权再集中来提高政策实施的质量。环境执法权再集中在何条件下更有利于提高政策实施质量？本研究试图识别和区分执法权再集中影响环境执法的两个潜在机制：遏制精英控制和保障地方执法资源。在环保垂改推行背景下，结合数据分析中国基层环境执法，我们发现：尽管地方分权在许多方面效果显著，但地方环境执法权再集中仍然可以有效减轻污染，而这一效果主要通过遏制地方保护主义而非保障地方执法资源实现。对此，本文进一步对环保垂改在保障地方执法资源方面存在的现实困境进行了定性分析和解释。

Keywords: recentralization; local protectionism; environmental governance; China
关键词: 执法权再集中; 地方保护主义; 环境治理; 中国

Environmental protection has been a key policy goal for China over the last two decades. China's environmental enforcement has largely adopted a decentralized structure, in line with many other policies. The decentralization of administrative power in China has been credited with various governance achievements and great economic development in the reform era.[1] It is argued that decentralization enhances the flexibility of decision making for street-level bureaucrats, fosters their accountability and increases local public participation.[2] However, recent studies have started to question such arguments, pointing out that local bureaucrats may be vulnerable to elite capture

† The online version of this article has been updated since original publication. A notice detailing the change has been published at https://doi.org/10.1017/S030574102400136X.

1 Ang 2016.

2 Inman and Rubinfeld 1997.

and suffer from a lack of resources.[3] In recent decades, several countries have attempted to address such challenges by recentralizing local governance.[4] Similarly, in China, scholars have started to observe something they call "soft centralization," whereby decision-making power is "semi-centralized" from the grassroots level to the provincial level.[5] In recent years, we have also witnessed an increasing trend of recentralization regarding various policy issues. This study attempts to tackle the question of whether such recentralization efforts improve local environmental regulation and policy implementation in China and examines the conditions under which a recentralized structure is more effective than a decentralized structure.

Despite the abundant literature on the decentralization/recentralization of local policy implementation, two issues have prevented scholars from fully answering these questions. First, the current literature draws mixed conclusions. Some studies support the centralization of power or argue that decentralization may have negative impacts, while others demonstrate the positive influences of decentralization.[6] Second, while there is evidence of the positive effect of (re)centralization, we still do not understand what mechanisms are involved. Centralization orients decision-making power at higher levels of government, making it more difficult for the local elite to capture decision makers and simultaneously ensuring that there are more resources for policy implementation. Although the literature often does not differentiate between these two mechanisms, they can have dramatically different implications. Under the elite capture mechanism, decentralization can be effective in areas where local interests are relatively weak or local monitoring is effective. However, under the resource mechanism, decentralization is useful only if street-level bureaucrats are provided with sufficient resources. Last, while recentralization has been observed in some fields, its application in environmental regulation has been little studied. However, since local environmental regulations are very likely to be implemented by local elites in China and require technical expertise and capacity, it seems necessary to reconsider whether a recentralized structure would be more efficient.

This article focuses on the recentralization of local environmental regulatory enforcement in China and its effect on local air pollution reduction. Air quality has become a particularly salient issue in China in recent years, with increasing public awareness adding to its political significance.[7] Recentralization has been one of the more prominent measures adopted in recent years to address environmental issues. In 2016, China began its "vertical reform" (*chuigai* 垂改) of the country's environmental enforcement agencies by recentralizing authority over local environmental enforcement from the county to the municipal level. Under this reform, local environmental agencies no longer fall under the control of the county government. Instead, their responsibility and tasks are "delegated" by the corresponding city environmental bureaus and they report directly to these bureaus. Based on a detailed and original national dataset as well as fieldwork undertaken in five provinces, this study argues that recentralization can have a positive effect on reducing air pollution. Furthermore, it finds evidence that such improvements are more likely to be owing to the elite capture mechanism rather than the resource enhancement mechanism. It also demonstrates that the inability to enhance resources for local implementation derives from administrative hurdles created in the process of recentralization, which can only be addressed through further institutional designs and reform of China's government structure.

This study has three unique advantages. First, the vertical reform, the implementation of which varies across provinces, provides a unique opportunity to apply a generalized difference-in-differences (DID) design to identify the causal effect of recentralization.[8] This approach is very similar

3 Malesky, Nguyen and Tran 2014; Bardhan and Mookherjee 2000; Mattingly 2016; Landry 2008, 7.
4 Dickovick 2011.
5 Mertha 2005.
6 Coggburn 2005; Treisman 2007.
7 Alkon and Wang 2018.
8 Angrist and Pischke 2008.

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to that used in other recentralization research.[9] Second, it utilizes a unique dataset on local environment investigations, which is shared by government agencies, to study the recentralization mechanism. Such data provide valuable evidence on how recentralization may affect the behaviour and performance of local bureaucrats. Third, based on fieldwork in five provinces and interviews with local environmental officials, it offers in-depth evidence to explain why recentralization is not effective in ensuring adequate local resources.

This study contributes to the literature in two dimensions. First, it evaluates the recent trend towards recentralization in China with regard to its effect on local policy implementation. With detailed and direct measurements of performance and implementation, the study provides evidence that recentralization can improve local implementation by reducing elite capture and, albeit more speculatively, it rules out the alternative mechanism of resource insufficiency. This finding offers insights into why decentralization boosts policy implementation in some policy areas but not in others. Second, since China has severe domestic air pollution problems and is arguably one of the most important countries in the global effort towards environmental protection, whether China's reform can successfully reduce its environmental pollution is critical for both the Chinese population and international environmental communities. Studies have shown that local officials in China respond to the institutional structure and cadre evaluation motivations related to implementing environmental policies.[10] This study, based on a novel dataset and detailed empirical evidence, quantitatively evaluates China's local environmental investigatory behaviour under recent, significant recentralization reforms and discusses how it affects China's fight against pollution. Although "vertical reform" in China's environmental policy implementation is effective at reducing air pollution, it may create new administrative obstacles to long-term success that require further institutional reforms.

Effects of Decentralization and Recentralization on Policy Implementation

Conventional arguments for decentralization propose various kinds of benefits for local politics and implementation. Barry Weingast argues that decentralization promotes internal competition, which boosts performance.[11] Decentralization can empower street-level bureaucrats to implement policies that suit local tastes and needs.[12] A large body of literature on various aspects of public services has shown the positive effects of the decentralization of decision making and policy implementation.[13] However, scholars have also noted controversies over the benefits of decentralization. Empowered local officials are not necessarily more knowledgeable about local needs than their upper-level counterparts.[14] Implementation at the local level may undermine the economic scale and thus reduce the effectiveness of public services.[15] Some argue that centralization of power can facilitate the diffusion of innovation and enhance training and development in the public sector.[16]

The mixed findings indicate that the conventionally touted benefits of decentralization may be "fiercely contested."[17] The effects of centralization and decentralization may be contingent on other factors.[18] Among all the possible drawbacks of decentralization, two challenges are particularly salient. One is elite capture, or local protectionism, which is commonly associated with decentralization

9 Malesky, Nguyen and Tran 2014.
10 Ding 2020.
11 Weingast 1995.
12 Besley and Coate 2003.
13 Walker et al. 2000.
14 Treisman 2007.
15 Bardhan and Mookherjee 2006.
16 Zhu, Xufeng, and Zhang 2019; Coggburn 2005.
17 Malesky, Nguyen and Tran 2014.
18 Andrews et al. 2009.

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and is a severe problem in China.[19] Local officials may deliberately implement policies ineffectually to protect the interests of local elites; such capture is less likely to occur at higher levels of government.[20] The other challenge with decentralization can be the lack of adequate resources and expertise at the local level to carry out the work required. Many tasks at the local level require resources and capabilities that local bureaucrats simply may not have; indeed, the most immediate issue for the success of decentralization reforms is local technical capacity.[21] Further, the decentralized structure might not support resource provision if local governments are unwilling to invest in grassroots enforcement.

Many countries have decentralized the enforcement and implementation of environmental regulation.[22] However, most studies in this area tend to focus on the benefits of decentralization in democratic countries; few examine the challenges associated with decentralization in developing countries without a Western democratic system. Such countries usually have weak accountability systems, so it is difficult for the public to monitor officials.[23] The lack of monitoring at the local level is accompanied by a unique feature of decentralization in environmental issues – pollution externalities – which makes local environmental enforcement more challenging. Under a decentralized system where grassroots officials are responsible for environmental enforcement, a county might be reluctant to enforce strict environmental regulations, as neighbouring counties may share the adverse effects of pollution while the polluting county receives all the economic benefit.[24] In other words, local officials might be more incentivized towards local protectionism because they reap the full rewards (either in the form of local economic development or personal bribery), while the costs are shared by other localities. (Re)centralization might provide a solution to this negative externality problem by providing a cross-county investigatory force or by coordinating investigation resources across multiple localities.

The China Case: Decentralization, Recentralization and the Implementation of Environmental Regulation

This study focuses on the implementation of environmental regulation in China. Since the beginning of China's economic reform, local governments have had the flexibility to make and implement policies with respect to local economic development.[25] In this context, a significant portion of administrative functions and powers were devolved to local authorities by the central govern.[26]

In recent years, however, the Chinese government has begun to put in place measures to reverse this decentralized structure. Andrew Mertha describes this trend as "soft centralization," whereby the central government recentralizes regulatory bureaucracies, from the local to the provincial level, to curb localism and corruption.[27] This is consistent with recentralization efforts in other countries.[28] In recent years, recentralization has become much more frequent in China. The central government is unable to manage everything at the grassroots level and has been rolling out widespread "soft centralization," with authority being centralized to a higher level of government – although not central government – across many different fields and to deal with many issues.[29]

19 Bardhan and Mookherjee 2000; Mattingly 2016.
20 Lorentzen, Landry and Yasuda 2014; Wang 2018.
21 Guess 2005.
22 Singleton 2002.
23 Seligsohn, Liu and Zhang 2018.
24 Van Rooij et al. 2017.
25 Zhu, Xufeng, and Zhang 2019.
26 Landry 2008.
27 Mertha 2005.
28 Dickovick 2011.
29 Mertha 2005.

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This paper adopts a definition of recentralization that encompasses the soft centralization of grassroots enforcement to the upper-level government. This soft recentralization still reflects the core aim of recentralization, i.e. to manage grassroots-level activities, decision making and resources more centrally at a higher-level government. In China, the objectives behind soft centralization are to cut ties of influence between local agencies and corresponding local governments and to standardize local practices, both of which are key functions of centralization.[30]

Decentralized environmental enforcement in China

For decades, environmental governance in China has been decentralized, with environmental regulation devolved to local environmental agencies, which are largely supported by each locality in terms of decision making, personnel management and resource allocation. Environmental agencies are a part of their corresponding local government and make decisions according to local needs and issues. This organizational structure has been regarded as a crucial part of the Chinese government's attempt to address its previous failures in environmental protection.[31] While general policy goals are set at the national level, local officials implement policies and conduct investigations in their corresponding jurisdictions.[32]

Although this decentralized structure produces good outcomes, it is also beset by the challenges outlined above. First, the county-level environmental agencies' fiscal and personnel matters are managed by their corresponding county governments. Given that environmental protection usually has a lower priority than economic development at the local level, the implementation of environmental policies is commonly undermined by other local objectives.[33] Local environmental officials are pressured to protect local firms for the sake of economic development.[34] They may even collude with polluting firms.[35] Since local government controls both the finances and staffing of local environmental agencies, local elites can easily capture and influence environmental enforcement via their connections with local leaders. Local protectionism is perhaps one of the greatest obstacles for local environmental enforcement in China, as Chinese officials openly admit.[36]

Second, resource scarcity is also an important issue for local environmental enforcement. Local governments often view environmental protection as a low priority and local environmental agencies are usually underfunded. Agencies lacking the necessary financial resources and manpower often resort to the formalistic implementation of policy.[37] Street-level environmental bureaucrats have identified the lack of fiscal and personnel resources as among the most challenging institutional impediments to their work.[38]

Finally, there is the negative externality problem. Local economic performance is critical for the career advancement of local officials in China.[39] As such, county leaders are strongly motivated to develop the local economy at the expense of environmental pollution, especially if the pollution is shared by neighbouring counties. Air pollution spreads across to other counties and it is difficult to pin responsibility to any one county. Consequently, local officials can put pressure on local environmental enforcement teams to tolerate polluting factories if they contribute to local GDP.

30 Ibid.
31 Shi and Zhang 2006.
32 Economy 2011.
33 Ibid.
34 Lorentzen, Landry and Yasuda 2014; Economy 2011; Wang 2015.
35 Economy 2011, 114.
36 Van Rooij 2010.
37 Zhan, Lo and Tang 2014.
38 Ran 2017.
39 Landry 2008.

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Recognizing these challenges, the Chinese government has made efforts in recent years to recentralize environmental enforcement.[40] The authority of central agencies and provincial environmental agencies has been strengthened, and various monitoring channels have been established to ensure the compliance of grassroots officials.[41] This trend towards centralization has led to "enforcement over time [becoming] stricter," although the impact on pollution has been minor.[42] To further address the enforcement problem, a new series of reforms introduced after 2015 sought to completely transfer the management of local environmental agencies from the county to the municipal level. We focus on this recentralization reform in our study.

The vertical reform of local environmental enforcement

Prior to the implementation of vertical reform, county-level environmental enforcement agencies were supervised by county-level governments. The vertical reform in this area has now placed county-level environmental enforcement officials directly under the control of city-level agencies. County environmental enforcement agencies are no longer constituent departments of county governments but are instead "delegated" agencies, managed and sent by city environmental bureaus to each county. Consequently, environmental officials at the county level no longer need to rely on county governments for financial resources or personnel management, and they report only to city environmental bureaus. County governments no longer have direct control over local environmental officials since the county no longer supervises them, funds them or manages their career advancement. As such, vertical reform of local environmental enforcement is very similar to "soft centralization," since both systems recentralize power to a higher-level government (but not to the central government). Figure 1 offers more detail on China's vertical reform in local environmental enforcement with a graph demonstrating how the reform changes the supervisory relations within China's local government structures.

The vertical reform was clearly designed to address the issues of elite capture and inadequate resources. Recentralization makes it more difficult for local elites to capture officials.[43] Environmental officials do not need to consider local interests because their salaries and career prospects are not controlled by the governments that they are investigating. Therefore, they are able to properly investigate cases of pollution and issue severe penalties to deter potential polluters. In addition, city governments have greater financial and technical expertise resources to support local enforcement. Bringing the management of all the counties' local enforcement together at the city level can also achieve economies of scale and increase the efficiency of investments, since the centralization of administrative costs frees more resources for investment in implementation. The vertical reform also ensures that there are the necessary financial resources to provide sufficient manpower for the investigatory teams. This is because the salaries of the investigatory teams are now provided at the municipal level rather than at the lower level. Chinese officials cite these two major reasons to justify the reform.[44] Based on this logic, we posit the following hypotheses:

H1: The vertical reform reduces overall environmental pollution.

40 Kostka and Nahm 2017; Van Rooij et al. 2017.

41 Liu 2020; Zhu, Xiao, Qiu and Liu 2022.

42 Van Rooij et al. 2017.

43 Malesky, Nguyen and Tran 2014; Wang 2018.

44 See "Wei rao '4 ge tuchu wenti' tuijin huanbao jiance zhifa chui guan zhidu gaige. Fang huanjing baohu bu fubuzhang Li Ganjie" (Base the promotion of the reform of the vertical management system for environmental monitoring and law enforcement around the "4 outstanding issues." Interview with vice-minister of the Ministry for Environmental Protection, Li Ganjie). *Xinhua*, 27 September 2016, http://www.mee.gov.cn/ywdt/hjywnews/201609/t20160927_364730.shtml. Accessed on 29 December 2021.

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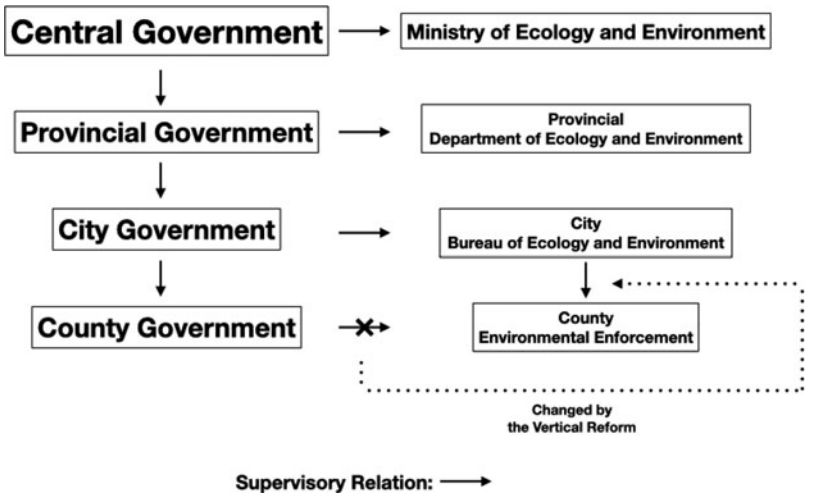

Figure 1. Chinese Government Structure and Vertical Reform

Notably, different players can capture different levels of government.[45] The elite capture mechanism is clearly based on the assumption that most polluters are less likely to capture investigatory agencies at the upper level. This is mostly true, but we acknowledge that even after recentralization, some large SOEs might still be able to capture higher-level governments. In fact, studies have shown that they may even have a greater advantage in doing so, as they are the only ones that can still capture investigatory officials.[46] Nevertheless, the overall pollution level should still be reduced even if only small- to medium-sized polluting factories are no longer able to capture the investigatory forces.

Next, we explore the mechanism through which recentralization could reduce air pollution by evaluating how it affects local officials' enforcement and implementation behaviour. Pressure from local protectionism could lead to officials performing their investigation and enforcement duties in a formalistic fashion.[47] They may still conduct investigations, but those investigations are unlikely to be substantial. Recentralization of enforcement, however, can shield officials from local pressure, allowing them to conduct consequential investigations with real deterrence power, which in turn can reduce pollution. Thus, we should expect that investigations will become more effective after the reform. In addition, the resource mechanism of the vertical reform improves enforcement through the provision of sufficient resources. With more resources, one implication is that local bureaucrats can conduct more investigations. Therefore, we posit the following hypotheses:

H2a: The marginal effect of the number of investigations on pollution reduction is greater after the vertical reform.

H2b: The total number of investigations increases after the reform.

Confirming H2a will provide some evidence to support the elite capture mechanism. We would, however, need to confirm H2b to support the resource mechanism.

45 Wang 2018.
46 Wang 2015.
47 Zhan, Lo and Tang 2014.

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Empirical Design

Owing to data availability, this study focuses on the vertical reform of China's local environmental agencies in 2015–2018. We identify the time when each province started its vertical reform based on when the provincial reform instructions were issued. Among all provinces, Hebei was selected as the pilot province, launching its reform in 2017. Eight other provinces began their reform in 2018. Other provinces rolled out their reform after 2018; within the period covered by this study, these provinces did not experience any reform. There are no official reasons as to why provinces launched the reform at different times, and the central government issued no specific instructions on which provinces should go first. Additional analysis in the Appendix (available online) shows that there is no clear pattern to explain the differences in timing. We suspect that the reason is linked to the different bureaucratic capacities of each province. More details are offered in the Appendix (Section III).

Since the reform was not implemented concurrently across all provinces in China, we can use a two-way fixed effect model – a generalized DID model – for our analysis.[48] We also conduct a strict DID analysis in the robustness check after removing the pilot province (Hebei) from our data and show that the parallel trend assumption holds. In addition to using the fixed effect model, we use a lagged outcome model by including one-year lagged pollution data to solve the potential autocorrelation problem and control for past effects.

The unit of analysis is the city-year. A city is regarded as being treated by the reform in any given year if its province *already started* the reform in that year or before.[49] We define the start of the reform as the date on which the province announced the official plan for the vertical reform. In total, our data cover 271 cities in four years from 2015 to 2018; 11 cities in Hebei province were treated in 2017, and 98 cities were treated in 2018. Figure A1 in the Appendix presents the schedule of the vertical reform rollout across all provinces in China. According to our generalized difference-in-differences model, cities subject to the vertical reform are in the treatment group, while cities not affected by this reform are in the control group. Further analysis indicates that the parallel trend assumption is likely to hold (see the robustness check section and Section III in the Appendix).

Owing to data availability, we only cover four years in our main analysis, which means that the panel data are not very balanced regarding pre- and post-treatment years. We attempt to address this issue by adding data from one additional year (2019) from before the Covid-19 pandemic for a robustness check and by providing more discussion in the Appendix (Section III). We also discuss why some provinces adopted the reform earlier than others and conclude that no socio-economic or environmental factors were involved (Appendix, Section III).

Pollution data – effect of local environmental enforcement

We collected data on two major air pollution items, SO_2 and industrial dust. Air pollution has been an important issue, both politically and scientifically, for China's environmental governance. The Chinese government has put great effort into reducing air pollution, and air quality has become a key target in evaluating local environmental performance. In this sense, the effect of vertical reform on reducing air pollution can reflect how such reforms may affect a key aspect of China's local environmental enforcement.

We do not use more common measurements of air quality, such as PM2.5, because those measurements are determined not only by the absolute level of pollution emission but also by other meteorological factors (for example, wind). They may also stem from other sources (car emissions, construction sites, dust storm, etc.). Since local investigatory officials are responsible for regulating

48 Angrist and Pischke 2008.

49 For six provinces (Fujian, Gansu, Guangxi, Hebei, Jiangxi, Qinghai), we code the following year as the reform year as their reform instructions were issued in the last quarter of the year.

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and investigating mainly industrial pollution at the locality, it is more appropriate to make a direct measure of the absolute level of industrial pollution, which informs the measurements we use.

In the empirical analysis, we measure air pollution in two ways. First, we measure these two items separately. Second, we generate a comprehensive air pollution index by factor analysis and re-scale it on a 0–1 scale. We realize that government data might be manipulated. However, official pollution data are still the only available data source for this study that covers all counties in China. We believe that even though the absolute values of the data might be inaccurate, the trends of the changes are still comparable.

Investigation data – local enforcement behaviour

We also collected data on the number of environmental investigations, since boosting investigative capacity is one of the central focuses of the reform. All investigations conducted locally are reported to the central environmental agency via an internal reporting system, and these reported data were shared with our team by the relevant central government ministries. All investigations are reported in five categories based on the final punishments issued: penalties, impoundments, production limits, detentions, and criminal prosecutions.[50] Furthermore, based on the information released for each investigation, we count the number of air-related cases for penalty investigations.[51] In the Appendix, we present a breakdown of investigation numbers by punishment type and discuss the reliability of these self-reported investigatory data.

Control variables and models

We collect a series of control variables, including GDP (log), population (log), total budget (log), urbanization rate (urbanized land area in total land area), FDI, and share of GDP of the industrial sector. For robustness checks, we also replace GDP with GDP per capita (log) and include the fixed assets of industrial firms, the consumption of LNG, and whether a city had a central environmental inspection. Both city fixed effects and year fixed effects are included, and standard errors are clustered at the provincial level.

Results

We first present the effect of the vertical reform on the overall pollution level, measured according to the 0–1 pollution index. Table 1 shows the results. Overall, cities with the vertical reform suffer approximately 3 per cent less pollution than those without. The effect is consistent across all models that include different sets of covariates. These results support the argument of H1 that the recentralization of investigative agencies increases the effectiveness of local policy implementation, as measured by the extent of pollution alleviation. An additional robustness check indicates that these findings are stable, and the parallel trend assumption is likely to hold.

Next, we explore the effect of recentralization by evaluating the outcomes for two types of air pollution separately. The results of both the fixed effect model (Appendix Table A2, Model 4 and 5) and lagged outcome model (Appendix Table A4) are presented in Figure 2. In both models, cities treated by the vertical reform present a significant reduction of approximately 9 Kt in SO_2 pollution, an approximately 35 per cent reduction from 2016 (the year before the vertical reform). Dust pollution is also reduced by the reform (an approximately 29 Kt reduction, although it is

50 If investigative actions do not lead to any penalties, the investigation is not recorded in the database; no data reflecting such actions exist. We discuss how this may affect our findings in the online Appendix (Section III). In short, we conclude that the changes of investigatory actions and reported investigation cases should be proportionately the same.

51 Data limitations prevent us from undertaking similar analyses of other types of investigations.

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Table 1. Effect of the Vertical Reform on the Overall Air Pollution Index

DV: Overall Air Pollution Index	(1)	(2)	(3)
Reform	−0.025**	−0.026**	−0.027**
	(0.011)	(0.011)	(0.011)
GDP of city (log)		0.023	0.026
		(0.022)	(0.022)
Area of city (log)		0.013	0.026
		(0.047)	(0.050)
Population of city (log)		−0.012	−0.021
		(0.057)	(0.064)
Total public expenditure (log)		−0.021	−0.022
		(0.022)	(0.022)
Urbanization rate		0.002***	0.002***
		(0.000)	(0.000)
FDI/GDP ratio			−0.004
			(0.007)
Ratio of the industrial sector			0.000
			(0.001)
Constant	0.089***	−0.043	−0.129
	(0.005)	(0.501)	(0.487)
Year fixed effect	Yes	Yes	Yes
City fixed effect	Yes	Yes	Yes
Observations	983	983	932
Number of cities	271	271	263

Notes: We dropped 7 cities in Model 3 because of missing FDI data for FDI, and 1 because of missing industrial sector data. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

barely insignificant in the fixed effect model). This further supports H1 and indicates that the pollution reduction effect can be significant at the 95 per cent level, at least for SO_2 pollution, across different models.

Next, we evaluate the effect of the vertical reform on investigative behaviour. Table 2 presents the effect on the number of investigations. The vertical reform generally did not increase the number of investigations. However, when we further evaluate the effect of air-related investigations (penalties) on the corresponding types of pollution (SO_2 and dust) before and after the vertical reform (Figure 3, Table A6 in the Appendix), we find that the vertical reform significantly increases the effect of investigations on pollution reduction. One more investigation in air-related cases has no effect on any type of air pollution before the reform, but it reduces SO_2 emissions by approximately 0.7 Kt and industrial dust by approximately 1.75 Kt after the reform. Air-related investigations can reduce air pollution only after the reform is implemented.

In short, we find that the vertical reform did not increase the total number of investigations and this result was consistent across different types of investigations. However, the vertical reform makes investigations more "deterring" and thereby effective at reducing pollution, as the marginal effect of investigations become significant after the reform. These findings support H2a but not H2b, which further corroborates our hypothesis on the elite capture mechanism. If recentralization enhances the

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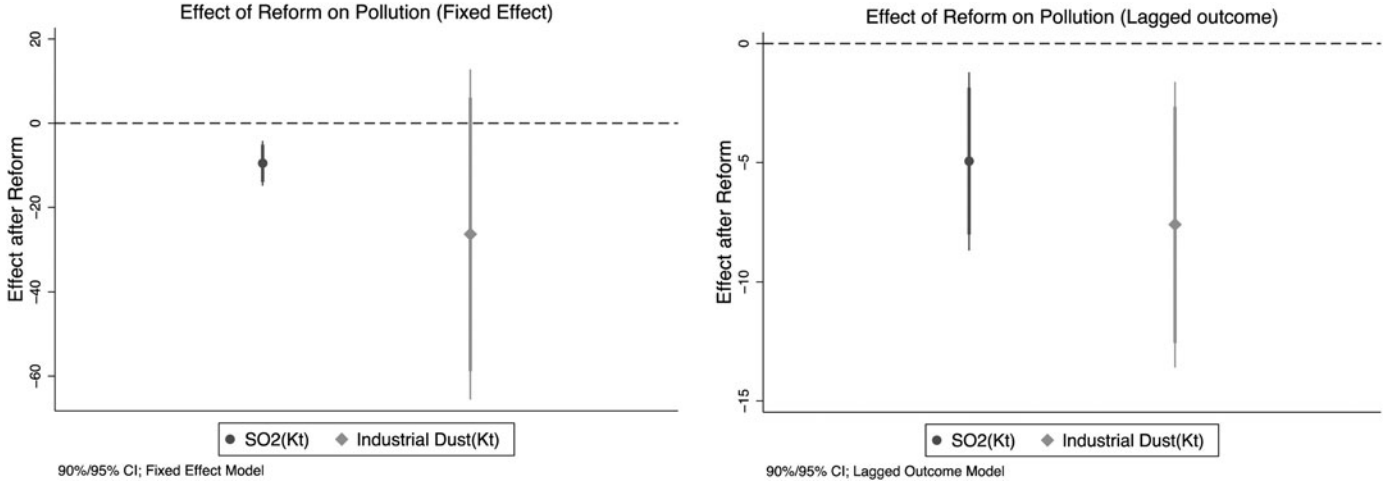

Figure 2. Effect of the Vertical Reform on Air Pollution

Table 2. Effect of the Vertical Reform on the Number of Investigations

	Total Investigations	Investigation (Penalty)	Investigation (Impound)	Investigation (Limits)	Investigation (Detention)	Investigation (Prosecutions)
Reform	−0.453	−0.829	7.753	−8.297*	−0.432	−0.382
	(12.173)	(0.913)	(12.860)	(4.190)	(0.532)	(0.389)
GDP of city (log)	151.917***	4.873*	91.059**	23.730	3.632	−0.682
	(50.731)	(2.435)	(39.034)	(14.333)	(2.356)	(0.576)
Area of city (log)	41.866	8.979	−112.648	48.850*	8.317	−0.372
	(215.089)	(7.109)	(91.540)	(24.464)	(5.130)	(1.386)
Population of city (log)	94.977	−12.856	205.822*	−27.464	−9.072	−0.718
	(210.650)	(7.897)	(101.840)	(28.588)	(5.481)	(1.792)
Total public expenditure (log)	−17.585	2.020	24.292	−36.695*	−0.245	0.133
	(33.411)	(3.299)	(17.840)	(18.266)	(1.408)	(0.650)
Pollution level index (0–1)	−25.886	−0.697	9.288	−0.265	−6.073	0.715
	(44.618)	(4.879)	(27.881)	(11.512)	(3.872)	(1.060)
Urbanization rate	2.645**	−0.067	0.769	0.971*	−0.027	0.010
	(0.964)	(0.081)	(0.868)	(0.505)	(0.058)	(0.032)
FDI/GDP ratio	−16.984**	1.681***	−21.682***	5.378*	0.422	0.119
	(7.464)	(0.507)	(7.465)	(2.644)	(0.297)	(0.210)
Ratio of the industrial sector	−1.465*	−0.005	−0.483	−0.502**	0.004	−0.018
	(0.819)	(0.053)	(0.718)	(0.208)	(0.042)	(0.023)
Constant	−3,105.497***	−116.456*	−2,004.112***	−108.729	−79.253**	18.513
	(1,039.237)	(66.252)	(549.100)	(232.947)	(30.258)	(11.991)
City fixed effect	YES	YES	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES	YES	YES
Observations	932	932	932	932	932	932
Number of cities	263	263	263	263	263	263

Notes: We dropped 7 cities because of missing FDI data and 1 because of missing industrial sector data. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

resources for local enforcement, it is difficult to explain why the total number of investigations did not increase. However, the change in the marginal effect of investigation cases before and after the reform indicates that local environmental investigations became more effective after the reform, which should reflect the fact that the vertical reform successfully released local officials from local elite capture and protectionism. Thus, we are more confident that recentralization reduces China's air pollution mostly by reducing elite capture and local protectionism.

One may question whether the resource mechanism may have had an effect if the Chinese government could have put more effort into enhancing local resources for enforcement. While this is theoretically true, we do note that the vertical reform already entails a very specific institutional design to enhance local resources. The fact that we cannot observe evidence of a resource mechanism with such an explicit design to enhance resources can at least indicate that recentralization alone is not an effective method for addressing resource problems, even with a specific design. We also conduct a qualitative study to explain why the vertical reform failed to enhance local enforcement capacity despite its deliberate design of resource enhancement. We present our qualitative analysis in the next section.

Robustness check and extended discussions

We conduct the following robustness check regarding the identified causal mechanisms and alternative explanations. The results are all consistent with our major findings and indicate that our conclusions are robust. We briefly summarize our robustness checks here and present more details in the Appendix.

Strict DID and parallel trend assumption

We remove all cities from Hebei province because Hebei was the pilot for the reform. With the removal of the cities from Hebei, all the cities treated adopted the reform in the same year (2018); this setting allows us to conduct a strict DID analysis with a parallel trend test. The results (Appendix Table A6) show that the findings are consistent, and the parallel trend assumption holds.

Confounders

We include possible confounders in our model, i.e. the FDI and share of the industrial sector in the GDP of each city, and replace GDP with GDP per capita to better measure the wealth level of each city. The results remain unchanged.

Central inspection

We control for Central Environmental Inspection in each city by adding a binary variable indicating whether a city was inspected in that year. The results remain the same.

Alternative measurement of pollution potentials

In a robustness check, we use the measurement of pollution-intensive industrial fixed assets and consumption of LNG as a proxy for pollution-related factors.[52] The results remain unchanged.

52 Liang and Langbein 2015.

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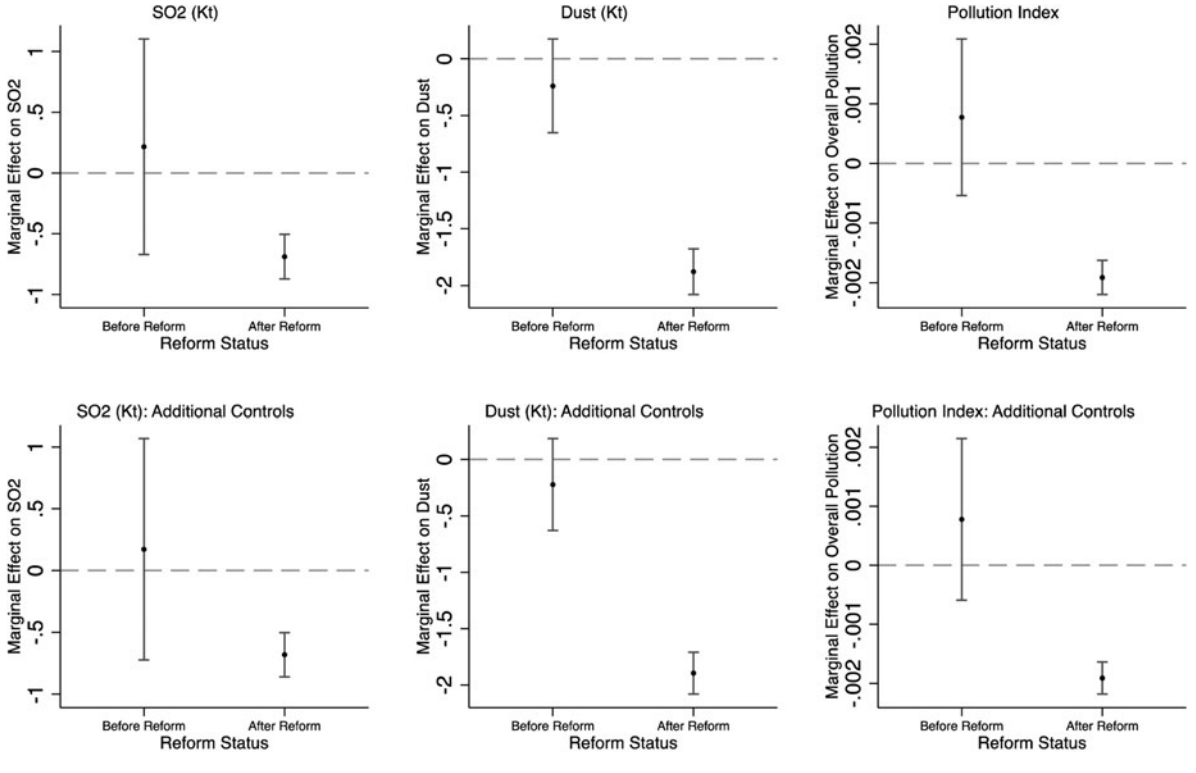

Figure 3. Marginal Effect of Investigation (Penalty) before and after the Reform

2019 data

One possible issue with our analysis is that we have only one post-treatment year after the reform. We acknowledge that this is a limitation with our data that we cannot completely overcome. However, we still manage to perform the main analysis by including the additional data from 2019. The results remain unchanged (Appendix, Section III).

Heterogeneity analysis

We conduct two heterogeneity analyses to provide further evidence for our identified mechanism (Appendix, Section III).

Data reliability

We provide a discussion of whether our investigation data are reliable in the Appendix, Section III.

Case Study: Why Does Recentralization Not Enhance Capacity?

As our data analysis shows, recentralization under the vertical reform affected local environmental enforcement by reducing local protectionism and elite capture rather than by enhancing enforcement capacity. However, since one of the core design elements of the vertical reform was to provide support for local bureaucrats from a higher level of government, why did recentralization not enhance enforcement capacity?

In this section, we rely on qualitative evidence collected from four provinces to demonstrate potential reasons why recentralization failed to enhance local enforcement capacity. Our local team conducted interviews in four of the provinces (Hebei, Shandong, Jiangsu and Shaanxi) that were among the first to adopt the vertical reform.[53] The interviews were conducted in July and August 2020 with local leaders and street-level bureaucrats in environmental agencies at the provincial, city and county levels. We also collected evidence from Zhejiang province in separate fieldwork in September 2021.

We identify three potential reasons why the vertical reform failed to enhance local enforcement capacity in China. Some of these reasons are closely linked to the cadre management system, which is deeply embedded in China's administrative system. Thus, the potential reasons that we identify are rooted in features of the institutional design of a decentralized system that may prevent any recentralization efforts from being effective at enhancing capacities and resources.

Increases in administrative costs

One significant drawback of the vertical reform is the associated increase in administrative costs because every enforcement decision now requires approval at the city level. The legality of the investigative decisions made by the environmental agencies delegated to work at the county level might therefore be in question. The county-level investigation agencies are no longer separate legal entities, as they were before the vertical reform. Following recentralization, they become internal subordinates of city-level agencies and cannot make administrative decisions on their own authority. Thus, if stakeholders challenge investigation decisions in court, it creates additional trouble for investigatory officials. Additional work needs to be done to address this issue as it further reduces the financial and human capacities that can be used for investigation.

53 Owing to the Covid-19 related travel restrictions, we had to enlist the help of journalists in the local official media for interviews. We designed the questions and provided instructions to the journalists in each province, and they conducted the interviews. Thus, connections with local journalists were also a factor in our case selection.

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Furthermore, street-level bureaucrats may need to obtain approval at the city level for every investigation conducted to ensure its legality. This means additional documentation and even physical travel between counties and cities. This is particularly troublesome in areas where infrastructure is poor. For example, some local officials in Hebei pointed out that every disposition notice that they make requires a stamp from the city environmental bureau, so they must physically travel to the city centre for the stamp. It takes them at least a day every week to complete this process, and sometimes they might need to make the journey multiple times because the official with the stamp is not present at the office. For street-level bureaucrats in remote counties, this is clearly an onerous process and limits their enforcement capacities.

In general, although recentralization provides local officials with more resources, it also imposes additional administrative costs. Because of the strict bureaucratic system in China, such costs are almost inevitable and cancel out some of the positive effects of the increase in resources.

Difficulties in personnel recentralization

Another major hurdle is personnel recentralization. One core design element of the vertical reform is transferring the *bianzhi* 编制 (budgeted posts) of local bureaucrats from the county to the city level. However, city-level governments maintain higher qualification standards for their civil servants than do county-level governments. As a result, many local bureaucrats cannot be transferred to the city level, as originally planned, because they are qualified for civil service only at the county level.

The consequences of this personnel issue are significant. Because of their ineligibility, many are still considered county-level bureaucrats and receive their salaries and welfare from the county-level government. However, since they work for city-level agencies, the county-level government is naturally unwilling to provide them with full support. In Hebei, Shaanxi and Shandong provinces, this issue was cited frequently by local officials as a major challenge in their daily work.

Another issue related to personnel recentralization is the limited career paths for street-level civil servants. Before the recentralization, the county environmental agency was part of the county government, and the county environmental officials could be transferred or promoted to other government agencies as a part of normal civil service transfer. However, since county environmental agencies have become delegated agencies of city-level environmental bureaus, most local officials at the county level can no longer be promoted to other positions in the county government. Their career path is, therefore, limited to posts within the environmental enforcement system. Clearly, there are far fewer promotions within this system than within the whole government. The shortage of promotion opportunities reduces the motivation of many local bureaucrats to perform their jobs well. Local officials in Shandong cited this as a major problem for their investigatory teams.

In general, the institutional design that China uses to address the potential problems associated with decentralization currently prevents the full implementation of personnel recentralization. This disincentivizes many street-level bureaucrats from performing their duties to the best of their ability and thus erodes the potential positive effects that recentralization should have on local enforcement capacity.

Disconnection from local political powers

Finally, recentralization cuts the connection between environmental officials and other local officials and the local government. Because the county environmental agency is no longer a constituent department of the county government, its political influence within the locality has fallen dramatically. Although this change can help to prevent local elite capture and interference, it also means that local environmental bureaucrats do not receive as much cooperation in their investigations from the local government as they did before recentralization. According to a local official in Zhejiang province:

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> We [the county environmental agency] used to sit in the front row with other government departments during the government meeting because we were in "the (county's) cabinet." Nowadays, we can only sit remotely in the third row together with representatives from the county branches of state-owned enterprises! [54]

Losing a front row seat in the local government is not merely symbolic – county environmental officials no longer have any influence on local policies or resource distribution. However, their local investigations still require the support and cooperation of other local agencies. The disconnection from local political powers creates additional challenges and hurdles for local bureaucrats when conducting environmental investigations, yet a disconnect is necessary to reduce local elite capture. Thus, there appears to be an inevitable problem.

Addressing negative externalities

Although not the focus of our fieldwork, we still find some evidence that helps us to evaluate whether the vertical reform addresses the negative externalities of pollution that motivate local officials to engage in local protectionism and whether the reform provides a stronger capacity to conduct cross-county investigations. Our preliminary conclusion is that although the design of the vertical reform has some elements that address the negative externalities, the overall effects are limited.

The municipal environmental agencies had their own investigatory teams even before the reform. These municipal teams already investigated cross-regional pollution cases that a single county could not handle. The reform has effectively turned grassroots enforcement officials into the county-level representatives of municipal environmental agencies, but they are still primarily responsible for investigating the pollution in the county where they are stationed. The municipal investigatory teams are still primarily responsible for cross-regional pollution. As such, the major component of the vertical reform does not enhance enforcement capacity or provide stronger protection against elite capture.

Ideally, vertical reform should allow the flexible transfer of manpower from one county to another, or even to the municipal team, as all investigatory officials are now managed by municipal agencies. If this could be done, it would ameliorate the externality problem because municipal agencies could transfer officials from less polluted counties to the municipal team to conduct more cross-regional investigations or else coordinate local officials from multiple counties as one large investigatory team to investigate pollution that spreads across multiple counties. However, we did not observe any such flexibility in the provinces where we conducted our fieldwork. The administrative hurdles discussed above prevent the flexible flow and transfer of manpower. We suspect that this might improve when the vertical reform is implemented more thoroughly, but we have yet to observe municipal agencies utilizing reform measures to enhance their capacity to handle negative externalities. Further studies may be needed when the reform is more mature.

In general, the qualitative evidence points to three potential reasons why recentralization does not enhance enforcement capacity. We do not argue that these reasons are exhaustive; rather, we try to reveal the potential difficulties that the recentralization effort may face. In China's widely decentralized system, a "soft recentralization" may struggle to increase local capacities because of institutional design features rooted in the original decentralized systems. This observation again supports our theory and findings that recentralization is more likely to be effective by reducing local elite capture than by enhancing the capacity for local policy implementation, even though the designers of such recentralization efforts often aim to do both.

54 Interview with a county environmental official in Zhejiang, September 2021.

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Discussion and Conclusions

This paper evaluates how the recentralization of local environmental enforcement in China can affect local investigatory behaviour and its effectiveness in reducing air pollution, and finds that recentralization can reduce local air pollution. Furthermore, such improvements might be driven mainly by reducing the potential for elite capture that was present under the previous decentralized system. On the other hand, we do not find evidence that recentralization enhances local enforcement capacity, even if its aim is to provide more resources to local officials.

This study does not argue that all decentralization is bad; many decentralized environmental enforcement policies in China produce great outcomes. However, these findings have several implications for the effects of decentralization and recentralization on local environmental enforcement in China. First, this study joins several recent studies in challenging the conventional assumption that decentralization leads to better environmental outcomes. Although this assumption is true in many cases, our findings indicate that recentralization may be a better option in areas where local protectionism is a severe problem. However, if the main issue is resource scarcity in a decentralized system, the government may need to look for other ways in which to improve local enforcement. Scholars and practitioners should pay more attention to which aspects should be recentralized and which should not.

Second, this study does not find strong evidence to support the resource enhancement argument for recentralization. Environmental enforcement requires technical expertise, financial resources and a large amount of manpower for the tasks of monitoring, investigation and implementation. This study, however, indicates that recentralization may not solve the capacity problem effectively. Our qualitative study further indicates that recentralization efforts may conflict with some of the other institutional design aspects of the original decentralization system. If only a part of the system is recentralized, it may be very difficult to address the resource problem in the absence of other measures. This implies that for any recentralization policy, extra efforts to enhance local resources might be necessary to address any potential new conflicts that may arise between the recentralized and the decentralized systems. However, it is likely that the resource mechanism requires a longer time to have any effect, and the short time span of this study does not allow for any observation of such changes to come. Therefore, we encourage further studies on this issue.

This study also provides insights into new environmental protection efforts in China. China has been investing heavily in addressing its pollution issues, and the vertical reform is one of the most important steps it has taken towards improving its environmental enforcement. Our findings are both reassuring and alarming: the reform improves environmental quality and reduces local protectionism, but it appears to be ineffective in areas where the major challenge is resource and enforcement capacity. It does not enhance local bureaucrats' capacity for enforcement, as it was originally designed to do. Therefore, better institutional designs, in addition to recentralization, are still needed to address China's environmental challenges.

Some limitations deserve attention. First, although there is evidence of elite capture in all countries, we admit that the logic and extent of elite capture in China may be different. Compliance among local officials, despite being a universal problem, is particularly challenging in China because of information dilemmas, and any non-state monitoring is heavily resisted in environmental enforcement.[55] Therefore, the effects of recentralization may be different in a context where the non-state monitoring of local officials is strong and robust. Second, the vertical reform is new, and its long-term effects are still unconfirmed. We cannot rule out the possibility that the effect that we observed will change and evolve in the future when both local officials and polluters are more familiar with and adaptive to the new system. We call for future studies to evaluate the long-term effects of recentralization on China's environmental enforcement and the ways in which various stakeholders may change strategies.

55 Zhu, Xiao, Qiu and Liu 2022.

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After decades of championing the decentralized system, some scholars argue that China has started to recentralize local power in certain areas to increase the quality of policy implementation.[56] The vertical reform is an example of this trend and may be critical to understanding China's future environmental development.[57] As the largest and perhaps the most successful developing country in the world, China's (albeit partial) deviation from its previous decentralized mode should be a significant factor in estimating China's future development and may provide an example for the many other developing countries that are also struggling to fight pollution and address other governing and administrative challenges. This paper is one attempt to dissect the effects and mechanism of this trend, but the topic certainly deserves more scholarly attention.

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