

Split Enforcement: How Central Local Relations Affect Pollution Law Enforcement in China

Benjamin van Rooij, Zhu Qiaoqiao, Li Na, Wang Qiliang

Abstract

This paper analyses how central-local relations shape environmental enforcement in China. It does so by seeking to understand how existing decentralized structures as well as recent trends towards centralization relate to temporal and geographical variation in enforcement since 1999-2011. The paper finds that enforcement over time has become stricter and more frequent, however without yet matching the development of pollution and industry. Moreover it finds a situation of “split enforcement” with richer and more urbanized areas having much stronger and more frequent enforcement than inland areas. Split enforcement points on the one hand to the influence of centralizing influences that may have spurred stronger enforcement, and may also have allowed for an uneven development. At the same time it shows the continued local influence keeping enforcement below pollution needs, and allowing for local inequalities depending on the local level of development. While split enforcement can be rational as a development strategy, eventually it may cause environmental justice problems with the poor living in pollution that the rich create.

Introduction

Regulation in larger systems requires a delicate balance. It necessitates matching regulatory ambition to achieve regulatory goals with regulatory efficiency and feasibility requiring adaptability to a variation of different and changing local contexts ((Van Rooij 2006)). Finding the right balance hinges upon the allocation of regulatory powers to different levels of administration. Generally in the Western regulatory literature there have been two extreme positions. One position opts for a centralized form of regulation questioning regulation that leaves too much power to lower levels of administration. Proponents of this view warn that under certain conditions locally formed and operated regulation will create a “race to the bottom” with a downwards spiral of less and less stringent norms and enforcement in local jurisdictions competing for investment and growth opportunities ((Wilson 1996); (Van Zeben 2014)). Decentralization coupled with limited oversight of local level officials may breed corruption and undermine regulatory quality. (i.e. (Dimitrov 2009)) In such extreme cases the flexibility of the local approach undermines the ambition and control necessary for successful regulation. In contrast, others argue that regulation and especially its implementation should be left as local as possible. Supporters of such localist view point to the benefits of local level regulatory authority as it allows for the most efficient approach ((Oates 1972)) while also

enabling local level learning and experimentation, as well as positive form of competition and technological innovation towards, and potentially even positively influencing a larger jurisdiction's overall regulation ((Van Zeben 2014); (Oates 2001)). Following this view we see that the rigidity of a centralist approach undermines regulation's adaptability ((Van Rooij 2006)), efficiency ((Oates 1972)) and ultimately also feasibility and reasonableness ((Bardach and Kagan 1982)).

Scholars of governance and policy in China have had similar debates. Some also favor a localist approach to regulation. Sebastian Heilmann, for instance, argues that China has had successful local level experimentalist governance that creates local laboratory for national level policies ((2008)). On the other hand we have the rich body of work that argues that in many fields of policy and law, implementation of national level rules is hampered due to "local protectionism" (地方保护主义) ((Dimitrov 2009); (Mertha 2005b); (Andrews-Speed et al. 2003, Pringle and Frost 2003, Sapio 2005, Li 2003); (Van Rooij and Lo 2010)) as local governments obstruct strong implementation of laws that can hamper local industry, economic growth and jobs.

In the study of Chinese environmental law enforcement an anti-local implementation view is most dominant, much in contrast to the federalist views that have come to dominate debates amongst environmental scholars in the US (i.e. (Revesz 1992)). Most scholars find that the localist regulatory enforcement set-up is detrimental to implementation of environmental law (for an overview see (Van Rooij and Lo 2010)). They find that the delegation of key enforcement powers to the local government as well as to environmental protection bureaus (EPBs) that are funded and managed by such local government is the chief reason for China's continued troubles in enforcement. By leaving enforcement under the purview of the local government, regulatory independence is compromised as the local government maintains direct economic, fiscal and also social and employment ties to polluting industry

This paper seeks to analyze how central local relations affect environmental law enforcement. It does so by seeking to understand temporal and geographical variation in enforcement and how this relates pre-existing decentralized structures as well as recent trends towards centralization.

The paper is based both on first hand data the author gathered during prolonged periods of fieldwork in the first part of the 2000s in South-West China (Van Rooij 2006), as well as through governmental statistics about national and provincial level environmental law enforcement from 1998-2010 ((SEPA 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008); (Ministry of Environmental Protection 2009, 2010, 2011)). In addition to that the study draws on the rich body of academic studies about environmental governance and enforcement in China (including (Jahiel 1997, 1998); (Ma and Ortolano 2000); (Sinkule and Ortolano 1995); (Lo, Fryxell, and Van Rooij 2009a, b, Lo and Fryxell 2003, Lo, Fryxell, and Van Rooij 2014, Lo et al. 2012, Lo, Fryxell, and Wong 2006, Lo and Leung 2000, Lo and Tang 2006, Lo, Yip, and Cheung 2000); (Tilt 2007); (He et al. 2014); (Zhan, Lo, and Tang 2014); (Lin 2013); (He et al. 2012); (Kostka 2013)) . As in any study of enforcement practices data used here have severe limits. Qualitative data contained

in the authors' own studies as well as the literature used is limited to the place and time collected and also may contain social sensitivity bias ((Parker and Nielsen 2009); (Elffers, Weigel, and Helsing 1987)). Survey data in the literature used often does not get to actual enforcement effectiveness but rather at self-reported effectiveness, and moreover is also limited to a population and time. Governmental data used here as a background to trace broader patterns, trends and regional variation, suffers from reporting and publication biases and distortions by governments at the local and central level seeking to portray favorable performance.

The paper finds first that since 1999 enforcement has become more frequent and stringent. However, the data show that even though enforcement has become stronger it does not match either pollution or industrial development. Moreover, the paper also finds that enforcement has been highly uneven with some localities, mostly the more developed coastal areas or provincial level municipalities enforcing more cases as well as more strongly. Instead of a race to the bottom or pull to the top type of enforcement, the paper thus finds a form of split enforcement in which richer areas may become cleaner at the expense of environmental enforcement in poorer areas. Third, it finds that such a split has occurred even though during this period several centralizing trends were present. These trends do not seem to have been able to create a more level and equal form of enforcement. Fourth, a fuller centralization that can overcome these inherent limits and weakness is possible through a greater space for civil regulation as well as a broader dual governance structure. This would truly recentralize but might also result in local level enforcement that may become inefficient and unreasonable, and stifle local experimentation and adaptation.

The remainder of this paper will outline these arguments as follows. First is a section detailing the background of decentralized enforcement, then comes a section detailing the effects of such decentralized practices, this is then followed by a section outlining several centralizing trends, followed finally by an evaluation of their potential effects as well as limits, ending with a concluding section.

The Logic of Decentralized Governance in China

According to its constitution, the People's Republic of China is a unitary centralist state. According to the Law on Lawmaking that governs the legislative process as well as the hierarchy and sources of law, lower level rules may not contravene national rules and such national rules preempt lower level rule making. China as such has a unitary legal system in which national law is supreme and local rules can only play a role where national law leaves space for it.

All of this does not mean that China actually operates in a centralized and neatly vertically managed manner. Depending on the policy area ((Huang 1996); (Edin 2003)) the Chinese central state has more or less everyday vertical control. Political scientists studying China have coined the term "fragmented authoritarianism" to capture the counterintuitive idea that a successful authoritarian party-state such as the Chinese, might not have optimal control from top to bottom ((Lieberthal 1992, 1995); (Lampton 1987)). Such fragmentation does not always exist. There are priority policy areas, such as maintaining GDP growth,

social stability management and population control, where the party state has exercised the strongest possible oversight and control using cadre evaluation incentive structures binding local leaders to “hard targets” ((Huang 1996); (Edin 2003)). Until recently, environmental policy was not one of these policy areas and environmental enforcement was managed through a fragmented bureaucratic structure with limited vertical control.

To understand China’s de-facto decentralized structure in these non-priority areas we must understand China’s geographical, historical and political conditions. At its most basic level the fragmentation is a natural result of China’s sheer size. Its size, both in landmass, in terms of number of areas that are very difficult to reach due to natural barriers, as well as its size in sheer number of people, stands in stark contrasts with a unitary centralist state structure. Moreover its inherent heterogeneity as well as the speed of change since reform creating even more variation do not fit at all with a centralized system. In other words, China’s size, variation and speed of change would warrant a system that is adaptable to the localities (Van Rooij 2006).

At least since Deng Xiaoping’s reforms from 1978 onwards, but also at many other earlier times as well, a de-facto decentralized system of governance has developed. Under Deng it did so because of several fundamental shifts in the relationship between the central and local levels, but also in between the relation between state, market and society. The most important shift has been that Deng and his reform allies needed to get as much support for their reforms as possible. To get such support they turned to local leaders and offered them a fiscal decentralization ((Shirk 1993)). Through such fiscal income local governments could build their own political and economic power structures and ironically used these to resist those reform policies that would undermine their local power ((Shirk 1993)). Moreover the fiscal decentralization reduced the spending and distributive power of the centre it could have used to shape local governance ((Saich 2011)). The fiscal decentralization was extra influential in creating localist power as the reform-induced private sector took off, rapidly generating ever more sources of local production and income, outside of the central controls that had been so important in the public sector. As local leadership became empowered through their support of the reform program and their local sources of revenue, they were able to steer party-state policy away from overly centralist tendencies. A clear indication of this is 1983 decentralization of the leadership appointment system, easing central level control over leadership appointments from “two levels downward” to “one level downward”. ((Li and Bachman 1989); (Burns 1987); (Saich 2011)) Moreover, several rounds of administrative reform have decreased the number of central ministries and have attempted to downsize the central bureaucracy ((Saich 2011)). The net result has been that central level regulatory agencies have very small staffs compared to the large amount of staff at all lower levels. A good example is how in 2010, the Ministry of Environmental Protection had a total staff of 2584, compared to a total staff of 191.327 at sub-national levels. More subtly, central party-state power over localities was further reduced through the professionalization of the bureaucracy which has eased the amount of ideological control that so vitally controlled lower level cadre under Mao ((Lee 1992); (Tong, Straussman, and

Broadnax 1999); (White III 1999)). The end result has been a situation of de-facto decentralization, which some have even named “federalism, Chinese style” ((Montinola, Qian, and Weingast 1995)). As Saich summarizes this: “Local governments have primary control over behavior, policy and economic outcomes with each autonomous in its own sphere of authority” ((Saich 2011):199).

The de-facto local autonomy within China’s unitary legal system is exacerbated by the factual challenges of vertical oversight (Dimitrov 2009). Chinese idioms capture such challenges very well: “The Mountains are High and the Emperor is Far Away” 天高皇帝远 or “Above there is Policy, Below there is counter-policy” 上有政策下有对策. In China’s authoritarian party-state a key challenge for superior leaders is to know what goes on at lower levels of administration. It is hard for superiors to verify reports and data from below, especially since a truly independent press and vibrant civil society are lacking. What rests are second-best alternatives of internal circulars from local branches of Xinhua, complaints and petitions mechanisms ((Minzner 2006)), as well as local level study tours and investigations. Overall this creates a fundamental principal agent problem, with an information asymmetry between the uninformed principal superior level of the party state and the well informed agent at the more local level.

China’s de-facto local autonomy thus has developed within China’s geographical, historical and political realities. It is not a planned structure that follows a model or design. Instead it is the logical albeit far from perfect outcome of the interplay of different forces. Some are highly positive about this. The de-facto decentralization may well have been able to adapt top-down policies to local level interests, concerns and complexity ((Montinola, Qian, and Weingast 1995)). Moreover such autonomy has fostered competition towards economic growth at the local level. And as Saich states, referring to pre-reform policy disasters: “Given the mess that the centre has often made in directing the national economy, perhaps it is just as well that its capacity is curtailed.” ((Saich 2011): 199) Many others meanwhile have pointed to the challenges it brings for implementing national law and policy (for an overview see (Van Rooij 2005, 2014a)), as well as the inequality it has created between different localities. ((Saich 2011))

Localist Environmental Enforcement

It is within this context of the originally existing form of formal unitary centralism and de-facto local autonomy that environmental enforcement has been set-up. The set-up of such enforcement has been one that only strengthens the local power influence on enforcement of environmental pollution law. First of all the most stringent power of enforcement, ordering closure of highly polluting plants has been vested directly with the local government.¹ All other sanction powers ranging from warnings to fines to permit revocations have been vested with China’s local level environmental agencies, the so-called Environmental Protection Bureaus (EPBs). These EPBs have been set up like most Chinese local level bureaus to serve two masters: the local government as well as the EPB at the superior level of

¹ See article 39 of the 1989 EP Law, as well as article 49 and 50 of the 2000 Air Pollution and Control Law, and article 49, 50, 51 and 52 of the 1996 Water Pollution Prevention and Control Law.

administration. Of these two masters the local government is the strongest as it pays most of the budget and has the strongest say in leadership appointments ((Jahiel 1998, Van Rooij 2006, Bachner 1996, Yao 1999, Sinkule and Ortolano 1995, Ma and Ortolano 2000)). Internally, EPBs have a strongly centralized enforcement structure where for more serious offenses leadership takes the final decision on sanctions above a certain cut-off point (Van Rooij 2006). And these EPB leaders have the strongest ties with local government officials and therefore are most susceptible to undue influence. Enforcement authority thus rests either with the local government, or with an office that is strongly influenced by the local government. The result has been a situation where the local government can refrain itself or keep its EPB from strongly enforcing the law against important local enterprises who either serve as large sources of tax revenue, are under their ownership, provide employment or are in one or another way connected to local leaders ((Ma and Ortolano 2000)).

There is a general agreement in the English and Chinese literature that local governments use the de-facto decentralized structure to protect local industry from strong environmental enforcement (e.g. (Jahiel 1997, 1998), (Ma and Ortolano 2000), (Zhang 2002); (Tang, Lo, and Fryxell 2003); (Sinkule and Ortolano 1995); (Tang et al. 1997); (Swanson, Kuhn, and Xu 2001); (Van Rooij and Lo 2010); (Van Rooij 2002); (Economy 2004); (He et al. 2014); (Lorentzen, Landry, and Yasuda 2014); (He et al. 2012)). Most of this research points to local protectionism in individual case studies. Chinese investigative media provides further evidence of local protectionist practices. Good recent examples are in the 2015 documentary “Under the Dome” detailing several cases in which local governments kept enforcement at minimum even in cases of severe and dangerous pollution that were unearthed on camera².

Sometimes, as we found in our study in Yunnan in 2004, such protectionism may have some justification as central level rules simply do not fit the local context, and local adaptation takes place resulting in local level rules that are less stringent and thus under-enforcement of the national rules (Van Rooij 2006). Furthermore, local protectionism does not occur in a local vacuum but is spurred by central level incentive structures that according to Ran provide “more incentive for local governments' non-implementation or poor implementation of its environmental policies than it provides for full implementation.” ((2013): 17) On the positive side, the de-facto discretion has at times led to local experimentation with better enforcement, such as for instance in Zhejiang where in 2002 a system of rewards for pollution complaints was used to enhance the inspection power (Van Rooij 2006).

Apart from individual cases of local protectionism there is also more general data that points towards such practices. Lo and Fryxell have for instance empirically shown through systematic surveys of enforcement agents that local governments affect enforcement effectiveness ((2005)). My local level fieldwork carried out between 2000 and 2004 showed that local level EPBs in South-Western China generally will only seek 33% of fines they are allowed to issue, not wanting to upset local industry. Kotska ((2013)) shows that local leaders appoint EPB directors that will act at the behest of the overall local interest rather than on the more narrow

² See <https://www.youtube.com/watch?v=T6X2uwI0GQM>

environmental interest. Lorentzen et al. show for instance that cities with large industrial firms have lagged even simply in implementing environmental transparency rules, especially those with highly polluting firms ((Lorentzen, Landry, and Yasuda 2014)). Another study by He et al. ((2014):166) shows that even rural enterprises are protected and that “parallel (economic) interests of and intricate ties and collaboration between the local government and local industry management enabled the companies to continue business as usual.”

Centralizing Trends

Over the last decade or more there have been several trends away from China’s de-facto decentralized reform structure. A first method to centralize enforcement has been through limiting legal discretion, especially by introducing ever higher minimum sanction amounts. The 2000 Air Pollution Prevention and Control Law (APPCL) amendment for instance introduced a minimum punishment of 10.000 RMB for any emissions excessive of standards and for any EIA violations. Another example is the 2002 Environmental Impact Assessment Law which provided minimum sanctions for EIA violations regardless of circumstances. This trend has continued in subsequent national environmental law from the 2005 Solid Waste Pollution Prevention and Control Law to the 2008 Water Pollution Prevention and Control Law. Specific rules combined with minimum sanctions clearly legally reduce the decision making room for local EPBs and governments. In theory it can deal with weak and uneven enforcement. By dictating minimum sanctions and leaving less interpretation in substantive law more uniform and stronger enforcement should result. There are several problems however. First is that changing the rules need not mean that such rules will be complied with by local level leaders and enforcement agents. Unless there is sufficient oversight that EPBs actually follow such minimum sanctions there is no way to guarantee that they do so. Such oversight mechanisms have not fully developed. There is legal oversight through administrative reconsideration (*xingzheng fuyi*) or administrative litigation (*xiengzhengsusong*). However these do not function as a clear check towards compliance with stricter standards. First of all most cases will likely be initiated by polluters against sanctions they deem unjust or too high. And second, the deterrent effect of such procedures is very low: national data from 1999-2010 show that it has been rare (0.4% of cases get reconsideration on average, and 0,6% litigation) and EPBs win most cases (65% of reconsideration and an amazing 95% in litigation). Apart from the legal checks there is a system of bureaucratic checks of higher EPBs overseeing enforcement work at lower levels. Here higher EPBs suffer from an information asymmetry as they do not know exactly what happens in day-to-day enforcement practices ((Van Rooij 2003)). In practice we see that sometimes the limiting of discretion can backfire. When substantive law and sanctions leave too little discretion it can become unreasonable at the local level. During research in Kunming I learned that the combination of mandatory air pollution standards and fines were not feasible for smaller restaurants that would either go bankrupt out of compliance or out of paying mandatory fines. Instead of mass liquidation of the cities great street and small eateries the local authorities adopted their own air pollution rules for local restaurants that provided for municipal standards and

sanctions that far below the mandated national standards, a clear case of illegal lawmaking that ended up guiding local level enforcement practices (Van Rooij 2006).

China has also centralized environmental enforcement through its enforcement campaigns. Since 1996 the central level has continually organized politically driven rounds of concentrated and prioritized enforcement. In these campaigns central level defined priorities are to be enforced at the local level. The first campaign for instance focused on closing down small heavily polluting industries with outdated technology. This resulted in the closing down of over 60.000 of such enterprises in the course of three months ((Van Rooij 2002)). In 2000 a national multi-year campaign ended that forced companies to update their environmental technology to meet key standards or else be forced to close down (Van Rooij 2002). Ever since there have been annual national campaigns to enforce pollution law and a so-called campaign enforcement style has developed ((Van Rooij 2014a)). Campaigns have had mixed effects. On the positive side they have been able to overcome local protectionism for a short period of time, and also have been able to generate public participation and allow for nationwide experimentation with locally adopted enforcement methods (Van Rooij 2006, 2014). On the downside, the campaigns have had more trouble generating long term effects and because of their ad-hoc nature disrupt the development of routine enforcement, at times breach due process and undermine the consistency and procedural justice necessary to create sustainable compliance (Van Rooij 2006,2014). Also the campaigns do nothing to change either the central local conflicts of interest that exist between national environmental law and local jobs, income and relationships, nor the de-facto power local governments still have.

There have also been attempts to centralize through the bureaucratic structure itself. One way this has been done outside of the environmental domain has been through the so-called “vertical management” (垂直管理) (*chuizhiguanli*). This reform began in the late 1990s in bureaucracies such as the Industry and Commerce Administration Bureau (1998), the Bureau of Quality Technical Supervision (1999), the Securities Regulatory Commission (1999), the Drug Administration Bureau (2000), the State Statistics Bureau (2004), and the Management Bureau of the Ministry of Land and Resources (2004). ((Mertha 2005a); (Chen 2006); (He and Tang 2006)). These reforms were initiated from the center and assigned budget and management authority over sub-provincial bureaus to provincial-level bureaus. (Mertha 2005a) In the environmental domain another approach was adopted. Under this approach the central level agency establishes branch offices at lower levels. This approach was first tried in 1998 when the People’s Bank of China establishing branch offices in nine regions across various provinces to strengthen regional macro-control and to foster greater independence from provincial governments ((He and Tang 2006)). In 2006, SEPA established five branches overseeing environmental law enforcement work and six branches overseeing nuclear pollution law regulation in each of several provinces, all directly funded by and controlled from the center ((Chen 2006)). This approach looks promising since it creates a direct vertical line of control from the centre towards

the lower level where enforcement takes place. Unfortunately, we still lack an in-depth study about how the central level branch level offices have fared in law enforcement. We can learn some lessons from other attempts at recentralization through the earlier vertical management reforms. First we see that after recentralization the power of local governments remains and can continue to obstruct the now recentralized enforcement authorities (Mertha 2005a). Imagine that branch offices of MEP issue sanctions against locally protected industry. How will the branch office execute its sanctions lacking its own police, prosecutors or courts and surely lacking support from the local governments that controls such vital executive and judicial institutions? Moreover adding a recentralized layer on top of a localized system adds to coordination problems that and can create departmental protectionism from both the local institution and the branch of the central institution (Mertha 2005a; (Dimitrov 2009)). Additionally, recentralized bureaus are in danger of being even more pressed for resources than local units (Mertha 2005a) and may have to partly rely on local governments (Van Rooij 2006). In some cases, the salaries of recentralized personnel have remained lower than those of personnel working in locally paid bureaucracies (Mertha 2005a), in other cases salaries are much higher creating resentment in the local institutions with the same jobs (Chen 2006). When salaries of centralized staff are low, of course this raises concerns for corruption. This is especially so when agents are placed in field offices far away from their direct managers and local people's congresses do not have the authority to supervise such branch level units (Mertha 2005a, Chen 2006).

The centre has also sought to deal with the local protectionism problem by changing the incentive structures for local leaders. According to Ran (2013) central level incentive structures have stimulated poor and weak enforcement rather than stronger enforcement. Changes in such incentive structures may thus be a way towards better local level implementation without altering the overall central local relations. All leaders in China are evaluated and rewarded on the basis of performance on key indicators ((Minzner 2009); (Birney 2012)). For years GDP growth, social stability and population control were chief indicators, a so-called "veto targets" with failure resulting automatically in punishment while environmental protection was at best a "soft guidance target" without clear consequences for substandard performance. With the 11th Five Year Plan (2006-2011), the centre introduced hard targets for emission reductions such as 10% reduction of sulfur dioxide and chemical oxygen demand emissions ((Lo and Tang 2006). The 11th year plan also shifted the burden of responsibility to meet environmental targets from regulatory agency leaders to the most powerful local level and even industry leaders (Wang 2013). As such local leaders including mayors, governors, county magistrates and even state owned enterprise leadership were made personally accountable to meeting these targets (for an overview see (Wang 2013)). These targets were further expanded since the 12th Five Year Plan (2012-2017), adding reductions in fine particulate matter and heavy chemicals to the target systems (Wang 2013). In his analysis of the implementation of the target plan Alex Wang (2013:403) finds that the targets were chiefly met through the massive central investment in environmental equipment (such as flue gas desulfurization and waste water treatment plants) as well as through campaign

driven through shutdowns of heavily polluting industry using outdated equipment. The target system, according to Wang, however, failed to achieve significant reductions through better regular monitoring and enforcement, which “amounted to little of the total pollution reduction recorded in the 11th five-year plan” (Wang 2013:404). On the positive side Wang finds that the cadre evaluation system changes created strong governmental support, better coordination amongst agencies, and empowered environmental agencies and actors. On the negative side he finds that at times the strong central push has led to goal displacement with local governments seeking to show that their compliance with central commands resulting in adverse results. This happened for instance when premier Wen Jiabao in May 2010 warned that there would be strong consequences if local leaders did not shape up to meet the 11th Five Year Plan environmental targets in time. This resulted for instance in a surge in random power outages well beyond the original design resulting not in less but actually more pollution due to the fact that hospitals, residential areas and city services were forced to use dirtier diesel fuel alternatives for their energy (Wang 2013). We can add to that the question what introducing environmental achievements as a hard veto target when such green performance negatively affects another hard target, namely economic growth, and indirectly because of lack of growth undercuts jobs and potentially social stability. In cases where there is a contradiction between achieving multiple hard targets, which will local leaders chose and which will they be most strongly evaluated on? Equally problematic is that the target system ultimately depends on trustworthy information about local level environmental performance, under the purview of local governments. There is a fundamental information asymmetry that can undermine the implementation of environmental targets. Wang details this problem stating that “assertions of success can only be accepted largely on faith.” (Wang 2013:424) Wang details that with the new targets also new methods for verification of local data were introduced that relied less on local monitoring data and more on estimates calculated from emission factors such as GDP levels, urbanization rates and coal consumption rates, as well as the amount of new pollution control equipment and closed down industrial equipment. Even with the new indirect method of verification problems remain as installation of pollution equipment does not mean that it gets used, as China has clearly had problems of so-called *toupai* (偷拍) secret discharges from facilities that have the pollution control equipment but only use it when they fear inspections to cut costs (Van Rooij 2006). Additionally, redundant industrial facilities might be reported and calculated as a reduction while production can continue later nonetheless (Wang 2013). Wang (2013) further argues that technological solutions to the data verification as through continuous monitoring equipment continue susceptible to tempering. Lin illustrates this problem at the firm level by showing how firms that receive more inspections report more pollution, as they no longer falsify their data anymore ((2013)). The problem Chinese central level regulators face is a fundamental game of Cat and Mouse, with each new improvement in central verification being thwarted by local control of data and shrouding of factual realities (cf. (Plambeck and Taylor 2015)).

Apart from these clearly directed forms of centralization there are more indirect forms. First we can look at the role of society. There has been a rise in the role citizens and civil organization play in implementing environmental law and providing for regulatory oversight. We know that in the late 1990s some local EPBs have turned to societal actors and citizens to bolster support from their local government ((Lo and Leung 2000)) Also, we see that there has been a rise in complaints, from about 250.000 in 1999 to about 700.000 in 2010 ((SEPA 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008); (Ministry of Environmental Protection 2009, 2010, 2011)). We also know that complaints have been correlated with administrative sanctions ((Van Rooij and Lo 2010)). Furthermore there have been several highly publicized cases where local collective action organized by citizens sought counter local level support for highly polluting projects. The best documented case was in Xiamen in 2007, where over a 100.000 citizens organized a peaceful march against the local EIA approval of a highly polluting PX plant in their city. The result of the protest was to force the local authorities to redo the EIA and refuse approval and relocate the project outside of the city area ((Van Rooij 2010)). Also we see that environmental NGOs have started to engage in regulatory action against polluters who were able to pollute with local impunity. They did so for instance by leveraging international pressure targeted at brand sub suppliers, as for instance Greenpeace did in its Detox campaign against polluting textiles industry ((Furst 2015)). There are also instances where NGOs or quasi NGOs have sought to aid pollution victims in environmental litigation or sue polluters themselves through public interest suits ((Furst 2015); Van Rooij 2010). Finally we see that the media can play a role as well, especially in unearthing local protectionist practices. Especially investigative journalists have over the years increasingly reported on continuing illegal pollution, the role of local governments and the plight of pollution victims. In 2015 all of this culminated in a full-length documentary “Under the Dome” that documented several clear instances of local protectionism and illegal forms of pollution. The documentary received over a 100 million views before it was taken off the internet in China after a week. In all these cases we see that society can play a role as a watchdog over local protectionist and illegal polluting practices. Societal actors have the potential to overcome the negative consequences of the decentralized structure. The potential is, however not fully met. While the party-state has stimulated some participation, especially through easing litigation and incentivizing complaints ((Van Rooij 2012)), it has also sought to restrict citizen’s involvement in regulation. We see since the mid-2000s clear limits on petitioning, collective action, and collective lawsuits ((Van Rooij 2012)). This makes it more difficult for citizens to play regulatory roles. In addition because of internal stability maintenance standards that incentivize local governments to keep activism at the local level ((Cai 2010)), local governments seek to quell complaints against their action from moving upwards. Citizens meanwhile learn that activism is risky and will only succeed if they can create sufficient escalation to force the local government’s hand, creating unrest rather than a sustainable form of regulation and oversight on pollution. ((Van Rooij 2014b)) Also we see that there are continuing impediments on societal action through limits of freedom of association and free press making it hard to form and fund NGOs ((Hildebrandt 2011)) and hard to

publish sensitive reports such as the Under the Dome documentary. This has kept the overall number of NGOs playing any regulatory role to a very small number precluding a broader check on local protectionism and weak enforcement. Moreover, depending on society to keep environmental regulation in check will not solve the problem of uneven enforcement. It is clear that richer citizens in urban areas are more likely to complain about pollution and in line with the current uneven trend. Moreover citizens generally complain more about noise than they do about air, solid waste and especially water pollution ((SEPA 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008), (Ministry of Environmental Protection 2009, 2010, 2011)). And as such their oversight may be misdirected at the most noticeable rather than at the most harmful forms of pollution.

Finally an overall centralizing recent trend is Xi Jinping's ongoing anti-corruption campaign ((Fu 2014)). Since his elevation to the most powerful party-state position Xi has waged a strong campaign against corrupt officials. This campaign can be seen as a form to reassert central level oversight into local party-state structures. The campaign circumvents normal policy oversight and policy delivery channels and rather depending on the disciplinary inspection apparatus's vertical reach into the party-state. Moreover the campaign also plants temporary anti-corruption cells across national and local parts of the party-state bureaucracy and state owned industries. This directly inserts central level power into many formerly quite autonomous political and economic units. Through this coupled with the massive wave of arrests and prosecutions the center can directly keep an eye on local practices and deal with leaders that do not toe the line. The question of course is whether Xi will use this centralization, if truly that is what it is, towards achieving better policy implementation also in the domain of environmental protection? This is not clear yet. Another view is that the anti corruption effort may "break" bad leadership at large polluting State Owned Enterprises, as an increasing number of such leaders have been sentenced on pollution related charges. ((Wang 2015)) Of course here also the question is whether corruption sentences of SOE leaders can serve as a form of pollution deterrent and thus replace defunct pollution enforcement. It is as of yet not at all clear that it will. We agree with Fu Hualing (2014) that the centralizing effects of anti-corruption serve clearly political goals, but we doubt that such goals include pollution regulation.

Environmental Enforcement Variation in Practice³

This paper seeks to understand how central-local relations affect environmental law enforcement. Uniquely, it uses governmental enforcement data to understand how over a longer period of time (from 1999-2013) enforcement has worked out in China's different provinces. This allows us an understanding of actual enforcement practices across China and over a longer period of time. In this manner we can understand trends and patterns in enforcement, in order to relate these to the prevailing view on decentralized local protectionism and the moves towards

³ The data and some of the text in this section has also been used in a chapter by the authors in the forthcoming Handbook on China's Environmental Policy.

centralization. We shall first discuss national trends over time, and then look at provincial variation during the whole time period, before discussing what this means for central-local relations.

National changes over time

In Table 1 below we can see the annual national level frequencies of sanctions against polluting firms. In the first row are administrative sanctions, which chiefly consist of fines issued by EPBs. We clearly see a steady rise in the frequency of such fines between 1999 and 2013, with some peaks and some declines.

INSERT TABLE 1 ABOUT HERE

The second row covers the height of the fines overall, and the third row the average fine for each case. We only have such data for the period between between 2001 and 2006. Here we see that in both rows there is a large rise. Overall fines have gone up from 333.8 million RMB in 2001 to 1255.4 million RMB in 2006. And the average fine per case has gone from 4685 RMB in 2001 to 13586 RMB in 2006.

In the fourth row we see forced relocations and closures, recording polluting firms that have relocated, suspended production temporarily, and or that have been closed down. Decisions on such relocations and closures are under the jurisdiction of the local governments, and not the EPBs. Moreover, these decisions are not always made because of pollution, but they may also concern economic policy considerations. It is not clear from the data what number of cases concern pollution sanctions or economic decisions nor what number concern closures or relocations. The data are important though as these concern the strongest form of governmental interventions, whether for economic or environmental reasons, in the operation of polluting firms. The table shows that there is a clear rise in the frequency of such relocations and closures from 9175 in 1999 to 22488 in 2008 (the last year this type of data was published). So for all three data points on enforcement we see a trend that is similar to the existing survey and case study based literature, showing stronger enforcement. ((He et al. 2014); (Lo, Fryxell, and Van Rooij 2009a); (Zhan, Lo, and Tang 2014))

All of these data on pollution enforcement must be related to China's overall pollution problem and its development over time. To do so we have divided the frequencies and height of sanctions by a pollution composite consisting of 6 main types of pollution we have data for⁴. The first row in Table 2 below provides the frequency of sanctions divided by such pollution composite, showing the same rapid increase in sanction frequencies as we saw in table 1 even when controlled for pollution. Row three similarly shows that fines still rise rapidly when controlling for

⁴ This composite was developed by adding up the following pollution types: 100 million tons of industrial waste water, 10000 tons of total amount of industrial COD, 10000 tons of total amount of industrial SO₂, 10000 tons of total amount of soot, 10000 tons of industrial dust, and 10000 tons of industrial solid waste.

pollution. And row five shows an overall rise with some peaks and declines in relocations and closures that is similar to the absolute numbers presented in table 1.

INSERT TABLE 2 HERE

However, it should be noted that the pollution data themselves may not be fully trustworthy. Local governments reporting such data will want to show a decline in pollution over time, which the data do indeed show, quite in contrast to what one would expect happened. To gain a more balanced picture we thus also look at whether the sanctions relate to the growth of industry, by calculating sanctions per industrial GDP (as valued in 2014 price levels). Row 1 in Table 2 presents such data. We see this yields a highly different picture showing that administrative sanctions have increasingly not kept up with industrial development. We see an overall decline of more than 50 percent over the period between 1999 and 2013. The increase in fines has however kept up with industrial GDP growth, as can be seen in row 4 of Table 2. Relocations and closures, when divided by Industrial GDP growth have largely declined somewhat, with some peak years such as 2000 and 2007. All in all we get two completely different pictures. One is a picture of more and stricter sanctions, even when related to pollution, and one is a picture of the frequency of sanctions not keeping up with industrial development. We cannot be sure which of these pictures is the most biased, the sanctions divided by pollution (with a bias of low pollution reporting) or the sanctions divided by industrial growth (with a bias on high growth reporting). Neither can we be sure that industrial GDP development is fully linked to more illegal pollution.

We conducted some further statistical testing to better understand the relationship between enforcement and pollution. We did so using the data reported for each province for each year of data. First of all we did find a significant positive correlation between pollution and sanction frequencies as well as relocations and closures, but no correlation between fines and pollution. Second we ran follow up OLS and Fixed Effect regressions to gain a more detailed understanding about how pollution levels feature in the provincial numbers on sanctions and relocations and closures. Here we found that pollution, when controlled for effects of staff and complaints, did not significantly predict variation in administrative sanction frequencies, fines severity, or in the amount of relocations and closures. This is true as well after we control for average differences across provinces in fixed effects models (Appendix, B, C, D).

As such, although enforcement has become more frequent and stricter, it largely fails to match the growth of pollution and industry. We saw that none of the enforcement measures studied here are clearly related to provincial pollution levels. Moreover, the absolute level of fines has remained very low, at least until 2006, the last year for which we have data, at about 13000 RMB. Relocations and closures were the exception where we did see a clear relation with pollution, finding that the more pollution there is in a province in a given year the more likely that province will force firms to relocate or close.

Regional Trends

There is not just variation over time in China's environmental enforcement. There is also much regional variation, fitting China's size and geographical differences. Our data set covers environmental enforcement in all provinces in China and allows us to understand regional differences in the frequency of sanctions, the average fine per case and the amount of relocations and closures. In order to make meaningful comparison we do not compare absolute frequencies of sanctions and forced relocations and closures, but rather their ratio related to the six main water, solid waste and air pollutants as explained above. This allows us to compare in each region how much enforcement there has been relative to how bad local pollution is. For fines this is not necessary as we can study the average fine per case, by dividing the total fines by the number of administrative sanction cases. Moreover to understand regional differences we have divided the provincial level data into five regions with Coastal Provinces (Guangdong, Fujian, Zhejiang, Jiangsu, and Shandong), Central Provinces (Hebei, Henan, Hubei, Hunan, Anhui, Shanxi, Jiangxi), City-level Provinces (Beijing, Shanghai, Tianjin, Chongqing), Northeast (Jilin, Heilongjiang, and Liaoning), and Western Provinces (Ningxia, Inner Mongolia, Xinjiang, Yunnan, Guizhou, Sichuan, Guangxi, Shaanxi, Gansu).⁵ Table 3 below outlines the data.

INSERT TABLE 3 HERE

The data show large variation. We see that the largest frequency of sanctions (over the total period from 1999-2011) (in relation to pollution) is in City, Coastal, and especially Northeastern regions. Central and Western China are clear outliers in having far fewer sanctions (in relation to pollution), well below average. City and Coastal areas have the highest average fines (over the period of 2001-2006), while Western and Central China, and especially Northeastern China have fines lower than average. In terms of closures and forced relocations City and especially Coastal regions score above average with Central and especially Western and Northeastern scoring well below average.

Thus we see that China has developed a form of uneven enforcement. In richer regions of the Coastal or City provinces we see more frequent as well as more stringent enforcement in terms of fines and relocations and closures. In Western and Central China enforcement is less frequent and less stringent. Finally, in Northeastern China we have an interesting combination of frequent yet non-stringent enforcement. Such uneven enforcement complements our picture of overall enforcement trends: enforcement has become stricter while also developing an imbalance with stricter and more frequent enforcement in coastal and city-level provinces, and weaker enforcement elsewhere. Together with the fact that enforcement largely already does not match pollution development and industrial development, this can explain why the trend towards stronger enforcement found in other studies need not translate into more effective results in terms of compliance and pollution control.

⁵ Qinghai, Xizang and Hainan were not used in the data here because they have such limited industrial development and therefore are such outliers.

Discussion: Enforcement Variation and Central Local Relations

The existing literature on environmental enforcement has shown that within China's de-facto decentralized governance structure local protectionism is a core problem obstructing environmental enforcement. Our data here however show a dynamic and varied picture. The question is how such picture fits with the notion of a local protectionism in a decentralized structure. Moreover, we seek to understand how the changes towards more central control over the last decade have affected local level enforcement.

A first finding we see from the data discussed above is that enforcement has become more frequent and overall speaking also stricter. This does not match a continued and unchanging dominance of local interests trumping environmental protection. Maybe the centralizing trends are at play here. Central level legal changes in the increase fine limits for pollution may well explain the rise of fine levels. Moreover, campaigns seem to have coincided with peaks in enforcement frequencies. The 2000 campaign against large pollution enterprises might for instance explain the peak in relocations and closures in 2000 we discussed above.

The linkage between centralizing trends and more frequent and stricter enforcement is complex though. For example, the central level changes in environmental targets during the 11th and 12th five year plan periods are only partly linked to the enforcement trends studied here. The 11th 5 year plan targets may be linked to a spike in 2007 relocations and closures concurring with the start of the introduction of the new hard environmental targets. However by 2008 we see a strong drop in closure, probably due to the global financial crisis that started to unfold. The data on administrative sanctions show a similar story with a small peak in 2007 when the targets were just introduced, followed by a severe drop in 2008 and 2009 as the crisis unfolded, after which there was a very high peak in sanctions in 2010 coinciding with former premier Wen Jiabao's issuing a strong message towards meeting the 11th five year pollution targets (Wang 2013). Also we see that extra central investment in environmental protection has helped develop greater levels of local level EPB staff. However, our statistical analyses show that while such increase in staff is significantly related to the increase in the frequency of administrative sanctions (see Appendix B) and to relocations and closures (Appendix D) it is less clearly related to higher fines (Appendix C). Similarly, the increase in citizens complaints over this time period (see Table 4 below) is significantly related to the increase in the frequency of administrative sanctions (see Appendix B) and higher fines (Appendix C), it is less clearly related to relocations and closures (Appendix D).

INSERT TABLE 4 ABOUT HERE

All of this might point to some waning of local protectionism and some, maybe only partial, trends that strengthen central environmental targets and thus enforcement. However, our second key finding is that enforcement has not kept up either with pollution or with industrial development. The data thus indicate a

continued form of protectionism, where the economy trumps pollution enforcement. This may point on the one hand to the limits of the centralizing trends in overcoming local protectionism. As indicated above each form of centralization has its own limits and the data studied here may show how over the period studies these trends have not been effective in overcoming resistance. Another, and perhaps concurrent conclusion, could be that recentralization itself does not overcome the fundamental conflict of interest between pollution control and economic growth that also plays out at the central level, and that central level policy itself may suffer from balancing economic growth with strong environmental enforcement.

Finally, our data clearly point towards a split form of enforcement, where richer coastal and urban provinces do more and stricter enforcement than poorer inland provinces. Clearly it seems that the amount of economic development and level of urbanization is important. We generally can point towards the role of local governments. In many of the richer coastal and urban provinces local governments⁶ have become more committed to the environment, investing more in environmental protection and providing stronger support for local EPBs. The most prime examples are “State Environmental Protection Model Cities” such as the coastal cities of Dalian, Zhuhai, and Xiamen, whose governments boast strong environmental reputations matched with environmental spending and support. ((Lo, Fryxell, and Wong 2006): 401; (Lo and Fryxell 2005):578) and introducing pro-environment rhetoric in their general policy plans. Our data are not sufficient to look at this quantitatively however. We can look also at the role of local citizens. Here we see clearly that in the richer coastal and urban areas there are more citizen complaints about pollution. Table 5 below captures such variation by comparing the total amount of complaints in relation to pollution across different regions (column 1).

INSERT TABLE 5 ABOUT HERE

What we also see from this table is that there is variation in the extent to which a complaint is likely to generate a sanction, with this being far less likely in Western and Central China. Statistical analysis further shows that complaints, as in both letters and visits to the office correlate with both the frequency of administrative punishment, the amount of fines, fine per case, as well as closures and relocations. (Appendix A) Regression analysis shows, however that especially written complaints are significantly related to the frequency of administrative sanctions (Appendix B) and the severity of fines (Appendix C), however complaints are not clearly related to closures or forced relocations (Appendix D).

The split form of enforcement complicates our view of how central local relations affect enforcement. It is clear that there is geographical variation in the way enforcement plays out within China’s central local relations. In some localities it seems local economic interest are more aligned with environmental protection either economically, politically or socially, and thus we see stronger enforcement, while in others a conflict of interest remains continuing weak enforcement. The uneven enforcement exists even with the centralizing trends. This means either that

⁶This paragraph draws on Van Rooij’s earlier work (see (Van Rooij and Lo 2010)).

such trends have not been able to overcome local autonomy to create a more level playing field. Alternatively such split enforcement might also be partially encouraged by central level policies, such as for instance the “Go West” policy that stimulated economic development in poorer Western provinces (Holbig 2004, Tian* 2004, Lin and Chen* 2004).

Conclusion

China’s de-facto decentralized structure of environmental governance has affected the enforcement of pollution regulation. We do not, however clearly see, the most negative or positive scenarios presented in the existing economics and political economy theory. The data do not indicate a “race to the bottom”, where there is a competition leading to ever weaker enforcement from one province to another. Instead what we see is that overall enforcement trends point towards more and stricter enforcement (cf. (He et al. 2014); (Lo, Fryxell, and Van Rooij 2009a); (Zhan, Lo, and Tang 2014)). This, however does not point to a “pull to the top” with successful local experimentation enhancing enforcement across the board. There continues to be weak enforcement, especially by EPBs and surprisingly less so directly by local governments. The decade long provincial level data we have studied shows stronger pollution does not lead to local level EPBs issuing more administrative sanctions or higher fines. Moreover, a trend towards higher frequency and stringency of enforcement need not mean better enforcement effectiveness or compliance. (cf. (Zhan, Lo, and Tang 2014); (He et al. 2014)). What we see can perhaps be best characterized as a form of “split enforcement” most clearly with richer coastal and urban provinces enforcing more and more stringently (cf. (Li and Higgins 2013)). Instead of a nationwide trend downwards or upwards the split picture of enforcement points towards a future of green and rich zones separated from poor pollution havens.

Such split enforcement exists it seems in part due to the continued local autonomy and influence of local governments on enforcement, and in part because the center has been unable and maybe also unwilling to alter such trend and create a more even and equal form of enforcement. Such split enforcement might in the short run not be a problem and be wholly rational. It allows poorer provinces to develop industry and local economies while richer provinces diversify their economy into cleaner production and service industry matching the needs of richer citizens for a cleaner environment. However one could also argue that such split enforcement just spreads pollution from the developed parts to the originally cleaner inland areas. Moreover in the longer run, it can create a situation of environmental injustice, where especially the poorer people suffer most directly from pollution from sources based in their localities.

The key question is thus how can environmental concerns play a prominent role at all levels to create an equally strongly enforced context that successfully regulates pollution. Most likely such balance playing field will require central level intervention to overcome local differences and keep all localities to an equal level of enforcement. Such central level intervention first of all requires a full strong central

level commitment not just to place environment first but also to do so in a fair way that prevents and overcomes the unbalanced situation that seems to be developing.

Overcoming both the persisting trend of enforcement that does not match pollution or industrial development as well as the split form of enforcement also requires a more comprehensive form of centralization. As long as environmental protection stands opposed to local governmental interests, which currently varies across the country, a fuller decoupling of environmental governance from the localities is vital. There are two ways in which this can be achieved. First, there can be a fuller recentralization of power, one that sets up a complete judicial, police, prosecutorial and regulatory set of central level agencies at the local level, maybe comparable to how the US has federal courts, police (FBI), prosecutors, and regulators (EPA) operating within each state. Such deconcentrated central level branches should then get jurisdiction over matters in which local governments have direct or indirect conflicts, as is the case with most pollution cases. Of course this requires a massive restructuring of central- local relations, which may be something the current administration may be able to pull off given its trajectory so far (Fu 2014). Second, and probably more difficult if not simply completely unfeasible, is for the central party-state to allow society to play its regulatory potential (cf. (He et al. 2012)) and provide a more independent and capable form of oversight on pollution and local authorities. This would mean a move towards a more fuller form of freedom of association and speech that is completely opposed to the policies and practices of the current administration.

Pollution Enforcement in China: Understanding National and Regional Variation

TABLES and FIGURES

Year	1999	2000	2001	2002	2003	2004	2005	2006
Number of Administrative Sanctions	53101	55209	71089	100103	92818	80079	93265	92404
Fines (10.000RMB) 2015 price level	NA	NA	33308	41981	46007	62324	84799	125540
Fine Per Case (RMB)2015 prices	NA	NA	4685	4194	4957	7783	9092	13586
Number of Relocations and Closures	9175	19498	6574	8184	11499	13348	10777	10030
Year (continued)	2007	2008	2009	2010	2011	2012	2013	
Number of Administrative Sanctions	101325	89820	73719	112025	119333	117308	139059	
Fines (10.000RMB) 2015 price level	NA	NA	NA	NA	NA	NA	NA	
Fine Per Case (RMB)2015 prices	NA	NA	NA	NA	NA	NA	NA	
Number of Relocations and Closures	25733	22488	NA	NA	NA	NA	NA	

Table 1: Development of Administrative Sanctions, Fines, Fines per Case, and Relocations and Closures of polluting firms in China 1999-2013 (China's Annual Environmental Statistic Yearbooks (1999-2013))

Year	1999	2000	2001	2002	2003	2004	2005	2006
Sanctions/Pollution Composite ⁷	38.12	42.78	59.96	89.20	88.07	77.80	86.34	92.53
Sanctions/Industrial GDP	1.29	1.21	1.44	1.86	1.49	1.08	1.06	0.89
Fines (10.000RMB)(2015 Indexed) / Pollution Composite	NA	NA	28.10	37.41	43.65	60.55	78.50	125.71
Fines (10.000RMB)(2015 Indexed) / Industry GDP	Na	NA	0.67	0.78	0.74	0.84	0.97	1.21
Relocations and Closures / Pollution Composite	6.6	15.1	5.5	7.3	10.9	13.0	10.0	10.0
Relocations and Closures / Industrial GDP	0.22	0.43	0.13	0.15	0.18	0.18	0.12	0.10
Year (continued)	2007	2008	2009	2010	2011	2012	2013	
Sanctions/Pollution Composite	109.26	113.98	101.02	164.47	292.22	NA	NA	
Sanctions/Industrial GDP	0.81	0.60	0.47	0.60	0.54	0.50	0.56	
Fines (10.000RMB)(2015 Indexed) / Pollution Composite	NA	NA	NA	NA	NA	NA	NA	
Fines (10.000RMB)(2015 Indexed) / Industry GDP	NA	NA	NA	NA	NA	NA	NA	
Relocations and Closures / Pollution Composite	27.7	28.5	NA	NA	NA	NA	NA	
Relocations and Closures / Industrial GDP	0.20	0.15	NA	NA	NA	NA	NA	

Table 2: Administrative sanctions, fines and relocations and closures relative to pollution composite and industrial GDP development total China 1999-2013 (Annual Statistic Reports on the Environment in China (1999-2013) and China Statistical Yearbooks (1999-2013))

⁷ This composite was developed by adding up the following pollution types: 100 million tons of industrial waste water, 10000 tons of total amount of industrial COD, 10000 tons of total amount of industrial SO₂, 10000 tons of total amount of soot, 10000 tons of industrial dust, and 10000 tons of industrial solid waste.

Region	Sanctions /Pollution	Average Fine	Relocations and Closures /Pollution
Central	9.90	5972	2.40
City	31.22	12851	2.65
Coastal	33.30	10961	4.60
Northeastern	43.20	3423	1.59
Western	5.91	5465	1.35
<i>Average</i>	24.71	7734	2.52

Table 3: Regional Variation in Sanction/Pollution (1999-2011), Average Fines per case (2001-2006) and forced Relocations and Closures of Polluting firms (1999-2008). (Annual Statistic Reports on the Environment in China (1999-2011))

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Number of Complaints	268592	309800	450287	526166	611016	682744	696491	687409	NA	748989	738306	735756
Complaints/Pol.	192.8	240.1	379.8	468.8	579.7	663.3	644.8	688.3	NA	950.5	1011.7	1080.2
Complaints/Ind GDP	6.5	6.8	9.1	9.8	9.8	9.2	8.0	6.6	NA	5.0	4.7	3.9

Table 4: Number of Environmental complaint (letters and visits) total complaints per main six types of pollutants, and total complaints per Industrial GDP 1999-2006

Region	Complaints / Pollution	Complaints/ Sanction
Central	47.08	0.36
City	225.36	0.16
Coastal	208.57	0.17
Northeast	116.39	0.15
West	45.55	0.33
<i>Average</i>	128.59	0.23

Table 5: Regional Variation in Total Complaints/Pollution, and Total Complaints/Sanction. (Annual Statistic Reports on the Environment in China (1999-2011))

Appendix A: Pearson Correlations of Administrative Sanctions, Relocations and Closures, Fines (10000RMB 2015 price level), Pollution Composite, Number of EPB Personnel, Number of Citizen Pollution Petition Letters, and Number of Citizen Pollution Petition Visits.

	Adm S (1)	Fine (2)	Fine/Ca (3)	R&C (4)	Pollution (5)	Staff (6)	Letters (7)	Visits (8)
Adm Sanctions (1)	1	.472**	-0.044	.265**	.125*	.396**	.417**	.340**
Fine (2)		1	.511**	.354**	0.121	.311**	.623**	.244**
Fine/Case (3)			1	0.144	-0.045	-0.047	.389**	-.165*
Reloc Closures (4)				1	.425**	.573**	.230**	.125*
Pollution (5)					1	.423**	0.029	.253**
Staff (6)						1	.292**	.331**
Letters (7)							1	.276**
Visits (8)								1

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Appendix B: OLS and FE Regression Administrative Sanctions

VARIABLES	Dependent Variable: Administrative Sanctions					
	(1) OLS	(2) OLS	(3) OLS	(4) Fixed Effects	(5) Fixed Effects	(6) Fixed Effects
pollution	3.110** (1.294)	-1.171 (1.316)	-1.041 (1.262)	-3.235** (1.464)	-0.571 (1.613)	-0.683 (1.663)
staff		0.422*** (0.0538)	0.274*** (0.0554)		0.457*** (0.125)	0.299** (0.139)
letters			0.0650*** (0.0112)			0.0342*** (0.0119)
visits			0.407*** (0.112)			-0.0438 (0.0969)
Constant	2,163*** (333.0)	797.6** (354.0)	-447.7 (377.3)	3,406*** (308.7)	499.6 (854.0)	829.5 (922.4)
Observations	366	366	336	366	366	336
Adjusted R-squared	0.013	0.154	0.276	0.722	0.732	0.721
Province FE				YES	YES	YES

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix C: OLS and FE Regression Fines

Dependent Variable: Fine Amount (10000 RMB at 2015 prices)				
VARIABLES	(1)	(2)	(3)	(4)
	OLS	OLS	Fixed Effects	Fixed Effects
staff	0.297*** (0.0674)	0.168*** (0.0597)	1.384*** (0.348)	0.971*** (0.328)
letters		0.122*** (0.0126)		0.127*** (0.0239)
visits		0.00846 (0.115)		-0.306* (0.165)
Constant	629.0 (435.6)	-827.0** (413.1)	-4,911*** (1,783)	-4,131** (1,719)
Observations	183	183	183	183
Adjusted R-squared	0.092	0.408	0.570	0.639
Province FE			YES	YES

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Appendix D: OLS and FE Regression Relocations and Closures

Dependent Variable: Relocations and Closures						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	Fixed Effects	Fixed Effects	Fixed Effects
pollution	1.473*** (0.181)	0.768*** (0.176)	0.787*** (0.158)	-0.859** (0.370)	-0.153 (0.382)	-0.192 (0.350)
staff		0.0747*** (0.00793)	0.0669*** (0.00790)		0.143*** (0.0287)	0.0994*** (0.0281)
letters			0.00484*** (0.00158)			-3.84e-05 (0.00229)
visits			-0.0421*** (0.0147)			-0.0490** (0.0190)
Constant	142.6*** (49.67)	-89.95* (50.18)	-72.04 (51.62)	631.4*** (81.63)	-244.8 (192.6)	65.82 (182.4)
Observations	302	302	272	302	302	272
Adjusted R-squared	0.178	0.364	0.391	0.471	0.514	0.515
Province FE				YES	YES	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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