Political Connections, Environmental Violations and Punishment: Evidence from Heavily Polluting Firms in China

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Abstract

Using hand-collected data on corporate environmental violations of heavily polluting firms in China over the period of 2012-2015, I examine the relationship between political connections and the probability of environmental punishment. For identification, I exploit a regulatory reform, the enactment of Rule 18 in October 2013, which forced a large number of politically-connected independent directors to resign from their positions. Using difference-in-differences specifications, I find that firms with resigned official directors due to Rule 18 experience a significant increase in the likelihood of being punished for environmental-related violations as well as the severity of punishment. The effect of Rule 18 on environmental punishment is more pronounced among firms located in regions with low judiciary efficiency and high levels of corruption, and firms without state ownership.

Keywords: Political connection disruption; Independent directors; Corporate environmental punishment; Judiciary efficiency; Local corruption culture

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1. Introduction

It is known that firms connected to politicians can be extremely valuable (Fisman, 2001; Goldman et al., 2009; Amore and Bennedsen, 2013). Specific benefits accrued to the establishment of political connections are salient, for example, easier access to finance through commercial bank or capital market (Claessens et al., 2008; Houston et al.,2014; Liu et al., 2013), as well as a wide range of advantages over the government bailout and contract competition (Faccio et al., 2006; Goldman et al., 2013; Schoenherr, 2019). However, there has been little research on how political connections affect environmental enforcement. In this paper, I investigate the relationship between political connections and the probability of environmental punishment.

China provides an ideal setting for conducting this research for two reasons. First, while it has been one of the highest global carbon emitters and experienced high levels of air pollution, the enforcement of environmental law is relatively weak.[1] According to a report issued by the Greenpeace, as of the end of 2017, only 107 of China's 338 major cities had reached the WHO's interim standard of 35μg/m³.[2] In order to address environmental degradation, China's environmental regulation system was established in the late 1970s.[3] Up to now, more than 20 environmental laws have so far been promulgated at a national level and over 140 executive regulations have been issued by the state council. However, the weak enforcement and implementation of relevant environmental laws often render the whole system ineffective in deterring violations. This failure is primarily due to the conflicts of interests between local government divisions and environmental protection bureaus (EPB).

In the current framework of environmental administration hierarchy, local EPB are under the control of local governments which are endowed much discretion over environmental regulation with devolved power from the central government. Since economic growth is used as the top criterion for political promotion, local officials who are career-minded often prioritize economic development at the cost of the environment (Golding, 2011; Sun et al., 2012). This creates a space for a set of polluting firms successfully obtaining exemptions from sanctions for violations through personal connections and even corruption (e.g., bribes, patronage, etc.,), as long as they can make a lasting contribution to the local economy, employment or other social goods provision (Wang et al., 2003; Maung et al., 2016). This is

[1] See https://www.scmp.com/news/china/science/article/2166542/air-pollution-killing-1-million-people-and-costing-chinese.
[2] See http://www.greenpeace.org.cn/air-pollution-2017-city-ranking/ (in Chinese).
[3] See http://www.mee.gov.cn.

particularly common in heavily polluting industries, since most of industrial pollution and greenhouse gas emissions come from large-scale manufacturing and production during which most contributors are large state-owned enterprises (SOEs) or capital-intensive private enterprises with different patterns of political capital (Maung et al., 2016).

Furthermore, it is also possible that local governments and polluting firms tend to form a special interest group which has been one of the biggest obstacles to environmental enforcement action.[4] For instance, in 2013, 19 large companies publicly named by the Ministry of Ecology and Environment (MEE) were penalised for repeatedly faking desulfurization figures, including China's five major electrical power companies, the largest state-owned coal producer China Shenhua, as well as the largest oil and gas producer PetroChina.[5] Despite consistently manipulating environmental data, these large firms with state ownership can receive tens of millions of yuan in subsidies each year under the umbrella of local authorities. Thus, to investigate to what extent political connections hamper environmental enforcement, I explore how the probability of corporate environmental punishment varies following the regulatory change.

Second, China is a relationship-based country where the business success heavily relies on the personal relationships and social networks (Lin et al., 2018). Firms establishing political connections through board members represents an important form of social relationship. According to Shi et al. (2018), government officials account for approximately 45% of all independent directors in the Chinese A-share market by 30 September 2013. Meanwhile, previous literature provides insights into the effectiveness of politically connected independent directors either by examining the relationship between official directors and firm value (Wang, 2015; Sun et al., 2016; Chen et al., 2017; Shi et al., 2018) or by exploring how their prevalence affects firm behaviours (Wang, 2015; Lin et al., 2015; Lee and Wang, 2017; Lin et al., 2018). Since politically connected directors have dominated corporate boards in China, particularly prior to the regulatory change in 2013, exploring the effect of official director resignations caused by the Rule 18 on firm-level environmental punishment is helpful to understand the political economy of environmental enforcement in a transition economy.

Identifying the causal effect of political connections on corporate environmental punishment is an empirical challenge since the appointment of official independent directors is

[4] See https://www.scmp.com/news/china/politics/article/3010679/chinas-green-efforts-hit-fake-data-and-corruption-among-grass.

[5] See https//finance.sina.com.cn/chajing/gsnews/20140612/140619392694.shtml (in Chinese). Also see https://www.reuters.com/article/us-china-power-emissions/false-emissions-reporting-undermines-chinas-pollution-fight-idUSKCN0UV0XS.

endogenously determined. For example, heavily polluting firms may strategically select politicians as independent directors to match their needs for communicating with environmental agencies. Firms appointing official directors differ from those without official directors in many aspects that might confound corporate environmental punishment. To overcome the endogeneity issue, I exploit a regulatory change, the enactment of Rule 18 in October 2013, which forced a large number of politically-connected independent directors to resign from their positions. As an important part of China's anti-corruption campaign, the Rule 18 was issued by the Chinese Communist Party (CCP) on October 19, 2013, which targets at both incumbent Party officials and former politicians who resigned or retired within the past three years.[6] According to this policy, those targeted people above certain ranks are prohibited from holding any part-time or full-time position in enterprises. The tough restriction thus resulted in many official director resignations within a short period of time. The enactment of Rule 18 mitigates the endogeneity problem, since it is fully unexpected and is not endogenously driven by firm-specific conditions. I can therefore examine whether the variation in corporate political connection affects corporate environmental punishment. Specifically, I first employ the propensity score matching (PSM) approach to match a group of firms with resigned official directors due to the issue of Rule 18 (treated firms) with those unaffected by the enactment of Rule 18 (control firms) conditional on similar firm characteristics. Using a difference-in-differences framework, I find that firms with resigned official directors due to Rule 18 experience a significant increase in the likelihood of being punished for environmental-related violations and the severity of punishment. The main results are robust to the parallel-trend assumption, which is a key identification assumption underlying the DID approach.

I then examine whether the effect of Rule 18 varies with institutional development. First, the effectiveness of the anti-corruption campaign largely depends on the quality of regional legal system. A legal environment with lower judicial efficiency is often associated with an increase in the number of environmental cases pending in courts as well as a decrease in professionalism and accountability of judicial personnel, which results in a delayed judiciary decision-making over environmental cases (Zhang et al., 2019). In these areas, firms tend to take advantage of political connections, which are an effective way to substitute for the weak

[6] Corruption has been prevalent in China. According to a worldwide survey conducted by the global watchdog Transparency International, China ranked 87 out of 180 countries in the Global Corruption Perception Index for 2018, with a score of 39 out of 100. The magnitude of corruption in China is far greater than that in most high-income economies (e.g., the top two countries Denmark and New Zealand with scores of 88 and 87, respectively). This anti-corruption reform is unprecedented, and more than 2.9 million people have been punished so far, including seven national leaders and hundreds of high-ranking officials. For more details, see www.ccdi.gov.cn/toutiao/201902/t20190221_188914.html (in Chinese).

legal system, to avoid being charged with environmental misconduct behaviours and to result in a lower probability of receiving environmental punishment. Thus, I split the sample based on the efficiency of judiciary system in China and find that the effect of Rule 18 on environmental punishment is more pronounced among firms located in regions with lower judiciary efficiency. Second, local corruption culture may also contribute to the effectiveness of anti-corruption campaign. In regions with high corruption culture, rights and interests of victims of environmental crimes are less likely to be protected by official channels, since these official channels are too corrupted to penalise environmental crimes (Zhang et al., 2018; Emery and Faccio, 2020). In this case, political connections tend to be more pervasive so that the shock of the anti-corruption campaign is expected to be greater in these areas. Therefore, I split the sample based on the magnitude of regional public corruption and find that the effect of Rule 18 on environmental punishment is more pronounced among firms located in regions with higher levels of corruption.

In further tests, I examine whether ownership structure matters. SOEs have inherent political connections as well as considerable advantages over non-SOEs (e.g., Hu et al., 2020). Thus intuitively, SOEs may not need to rely on official directors for receiving the preferential treatment while the presence of official directors is relatively more important for non-SOEs instead. Hence, I expect the effect of Rule 18 to be more pronounced among non-SOEs. The findings provide supporting evidence of this view.

To validate the findings, I also carry out several robustness checks. First, the inferences might be affected by other confounding events occurred around the issue of Rule 18. I choose two important events: the Eight-Point Regulation in 2012 and the Smart City Program with the first batch of smart city pilot projects launched in 2012. The main results still hold when controlling for these two events. Second, I conduct two sets of placebo tests. To ensure the results are exactly driven by political connections, I construct a pseudo-treated group by choosing firms with resigned directors from universities, SOEs and publicly funded organizations (non-official directors) following the issue of Rule 18 and employing the procedure of PSM-DID again. The results show that these non-official director resignations do not affect the change in corporate environmental punishment. In addition, I use other years as "pseudo-event" years and do not find significant differences in the probability and severity of environmental punishment between the matched treated firms and matched control firms around the pseudo-event years.

This paper contributes to the literature in several ways. First, it builds upon a strand of literature that emphasizes the importance of political connections for a firm's environmental

decisions and performance (Chang et al., 2015; Lin et al., 2015; Maung et al., 2016). To the best of my knowledge, I am the first to examine how political connections affect corporate environmental punishment in China. Importantly, I exploit a regulatory change, the enactment of Rule 18 in October 2013, which forced a large number of politically-connected independent directors to resign from their positions. This unforeseen event also helps address the endogeneity issue. Among the existing literature, Maung et al. (2016) is the closest to this work, who find that firms with state ownership are more likely to pay less environmental levies than those without state ownership. However, the sample period in their paper is very short, only one year of 2014, coupled with a failure to effectively solve the problem of endogeneity as well. Rather than using charged pollution fee as a proxy for actual implementation of legal system as Maung et al. (2016), this paper focuses on the number of environmental punishment records, an alternative form of environmental enforcement, which is more effective in measuring the outcome of environmental enforcement because of its higher deterrence effect on corporate reputation and brand image in the long term.

Second, I use a unique data source to collect firm-level environmental performance data in China. Because the detailed information on corporate environmental outcome is rarely reported in annual reports, most measures related to environmental outcomes are at an aggregate level (e.g., a province or country level). To address this issue, I hand collect the high-quality information on firm-level environmental quality from the Institute of Public and Environmental Affairs (IPE). Relying on big data analytics, IPE platform provides complete records of corporate environmental-related violation and punishment that covers a wide range of enterprises, not merely the publicly listed companies and their subsidiaries. Specifically, I start by searching all environmental punishment records with the full name of my interested publicly listed company (or stock code) through IPE website. Next, I focus on two main categories of punishment – the "Decision of Administrative Punishment" and the "Publication of Information about Administrative Punishments" and calculate the total number of records allocated to these two categories for both the parent company (publicly listed company) and its subsidiaries for each firm-year. Accordingly, I have a final sample of 816 environmental punishment records in total for 386 firms over the sample period from 2012 to 2015.

Finally, this paper also adds to broader literature investigating the impact of China's anti-corruption campaign (Giannetti et al., 2020; Cao et al., 2018; Kong and Qin, 2021; Lin et al., 2016). Following this far-reaching anti-corruption campaign, the policy Rule 18 has been utilized by other scholars to show either the announcement effect on firms' stock return (Shi et al., 2018) or its impact on corporate activities, such as financial reporting quality (Hope et al.,

2020) and labor costs (Wei et al., 2020). This paper is the first to examine the impact of Rule 18 on corporate environmental punishment.

The remainder of the paper proceeds as follows. The next section provides background information on China's anti-corruption campaign and Rule 18, discusses the related literature, and develops the hypotheses. Data sources, sample construction and research design are discussed in Section 3. Section 4 presents the summary statistics, identification checks, and empirical results. Section 5 provides results for additional tests and robustness checks. Finally, section 6 concludes the paper.

2. Institutional background, literature review, and hypothesis development

2.1 Institutional background

In 2012, a far-reaching anti-corruption campaign took place in China.[7] Following this nationwide anti-corruption campaign, a series of regulations has been issued to constrain the power of public servants and the behaviour of party and government cadres. The most influential one, the 18th Decree, entitled "Opinion Regarding Further Regulating Party and Government Officials' Part-Time (and Full-Time) Careers in Enterprises" (hereafter Rule 18), was issued by the Organization Department of the Communist Party of China (CCCPC) on October 19th, 2013.

Before its release, the presence of government officials as independent directors on corporate boards was prevalent.[8] This is because China is a relationship-based country where business success heavily relies on the personal relationships and social networks (Lin et al., 2018). To gain competitive advantages in the market, firms tend to build a close relationship with the government through hiring politicians as independent directors. In turn, those officials holding the position in connected firms are more likely to be well-paid and enjoy a range of perks.

Recognizing the potential risk of bribery and corruption in relations between firms and bureaucrats, the CCCPC thus promulgated the Rule 18 to prevent possible rent seeking behaviours. In practice, Rule 18 placed restrictions on all incumbent government and party

[7] President Xi launched a far-reaching anti-corruption campaign since late 2012. He stressed that corruption has been the biggest threat to the ruling party and will destroy the nation if not constrained. He vowed to punish every corrupt official by cracking down on both "tigers" (high-ranking officials) and "flies" (low-level officials). See https://www.theguardian.com/world/2013/jan/22/xi-jinping-tigers-flies-corruption; https://cn.nytimes.com/china/20121120/c20corruption/zh-hant/?mcubz=0.

[8] According to Shi et al. (2018), government officials account for approximately 45% of all independent directors in the Chinese A-share market by 30 September 2013.

officials above certain levels and prohibited them from holding any independent directorship on the boards. Former politicians who resigned or retired within the past three years were also prohibited from holding this position in firms whose business activities and fields fall into the scope of their prior supervision.[9] Within eight months after being released in 2013, Rule 18 triggered a large-scale wave of independent director resignations: about 300 government officials voluntarily leaving boards of publicly-listed companies.[10] As shown in Figure 1, among 1,544 firm-year observations, more than 60% have at least one politically connected independent director on the board in the pre-rule period, whereas only 24.61% in 2015 after the release of Rule 18. The observed significant decrease in the proportions of firms with official directors from 2012 to 2015 provides supporting evidence that Rule 18 effectively cut the political connections of firms by forcing the officials to resign.

In this study, I use Rule 18 as a quasi-natural experiment which enables me to explore the effectiveness of the anti-corruption campaign in improving environmental regulatory enforcement. For one, the announcement of Rule 18 is a shock to the market, and it is unforeseen by any firm. More importantly, the departure of official directors from politically connected firms, as an exogenous shock to political connections, does not result from firm environmental punishment. Thus, the enactment of Rule 18 provides a useful setting to study the causal effect of political connections on corporate environmental punishment.

2.2 Literature review

Originally pioneered by Fisman (2001), a large body of literature has investigated the importance of political connections to firms around the world. One stream of literature has found evidence that, political connections tend to be value-enhancing.[11] For example, using an international sample of firms from 47 countries, Faccio (2006) shows a positive stock market reaction for firms whose directors and/or large shareholders have become involved in politics. A burgeoning stream of literature has explored different channels through which political connections matter, such as preferential access to finance (Houston et al.,2014; Khwaja and Mian, 2005; Claessens et al., 2008; Li et al., 2008), higher likelihood of receiving government

[9] See http://renshi.people.com.cn/n/2013/1031/c139617-23383982.html.
[10] See http://company.cnstock.com/company/scp_dsy/tcsy_tt1/201411/3245518.htm.
[11] There is another stream of literature showing that political connections can be value-destroying. For example, Schoenherr (2019) shows that political connections lead to a lower efficiency of contract allocation. Sun et al. (2016) find that board political capital can have a dark side by enabling block-holder rent appropriation. However, this stream of literature is irrelevant to my research question in this paper.

bailout (Faccio et al., 2006), lighter taxation (Kim and Zhang, 2017; Adhikari et al., 2006; Lin et al., 2018), and higher chance of winning government contracts (Goldman et al., 2013; Schoenherr, 2019).

Politically connected firms also receive preferential treatment in the form of lax regulatory enforcement. Using corporate lobbying expenses as a proxy for political connections, Yu and Yu (2011) reveal that lobbying firms are more likely to evade fraud detection. This implies that, through discretionary enforcement, regulatory agencies can favour specific subsets of firms – for example, firms with ties to the government (Gordon and Hafer, 2005). For instance, Nuclear Regulatory Commission (NRC) tends to spend less time monitoring those nuclear plants whose operators make large contributions to the political campaign (Gordon and Hafer, 2005). Likewise, the Internal Revenue Service (IRS) was also accused of selectively conducting enforcement activities. In states with greater political influence arising from representatives and senators sitting on the IRS's oversight committee, the percentage of individual income tax returns audited by the IRS is significantly lower (Young et al. 2001; Hunter and Nelson, 1995). Turning to the Federal Trade Commission (FTC), Faith et al. (1982) as well as Weingast and Moran (1983), show that FTC's policy choices concerning the target of sanctions is subject to political pressure from congressional committees which have the budgetary and oversight powers to control the FTC. Some recent studies, which focus on the impact of political connections on the Securities and Exchange Commission (SEC) enforcement, show significant negative relations between the probability of enforcement actions and political connections as measured by firms' long-term PAC contributions (Correia, 2014), firms' long-term lobbying expenditures (Correia, 2014) and individual executive political contribution (Fulmer et al., 2012). One explanation for these findings is that the SEC tends to avoid triggering an enforcement action against politically important firms by simple means, such as issuing fewer comment letters to them (Heese, 2015).

Like other government authorities, the Environmental Protection Agency (EPA) also has the discretion in deciding whether to launch an investigation to a particular firm (Heitz et al., 2021). Mixon (1995) finds that urban centres with more registered lobbyists are less likely to be punished by the EPA for carbon emissions violations and to receive the severe penalties when a punishment occurs. This evidence is consistent with Gulen and Myers (2020) who utilize a sample of 39,047 unique facilities between 1976 and 2018 and find that the Clean Water Act of 1972 (CWA) is not uniformly enforced by EPA in the swing state as in the non-swing state as facilities located in the swing state experience the lower violation rates on average. After using a difference-in-differences approach to further examine whether changes

in the swing state status can result in the variation of facilities' violation rates in such state before and after a presidential election, they argue that EPA's biased enforcement is attributed to its lax oversight of state-level regulators in the swing state. Heitz et al. (2021) provide further evidence that politically connected firms and non-politically connected firms are treated equally by EPA in the investigation process, while former ones receive fewer penalties in the process of enforcement actions.

2.3 Hypothesis development

In China, there are many ways to build corporate political connections, resulting in diversified definitions of political connections in the existing literature.[12] Empirical research based on the Chinese context has investigated a range of impacts stemming from different types of political connections. For instance, Fan et al. (2007) investigate the effect of politically connected CEO on post-IPO performance and find that firms with connected CEO underperformed their non-connected peers in terms of post-IPO performance, which is consistent with the "grabbing hand" argument of Shleifer and Vishny (1998). Chen and Kung (2019) examine the role of politically connected firms in the land market and suggest that firms connected to members of China's supreme political elites enjoy a price discount in the primary land market with purchasing slightly more land as well. In return, local officials offering the cheap price to connected firms are more likely to be promoted, while the anticorruption campaign reduced the likelihood of such cases. Lu et al. (2015) examine the importance of state ownership in the judicial decision. They report that SOEs have an 8.6% higher win rate at trial than non-SOEs due to judicial bias.

Hiring former or incumbent politicians as independent directors is another common way for firms to cultivate a good relationship with the government in China (Zhang and Truong, 2019).[13] There is no doubt that independent directors play a pivotal role in shaping the Chinese corporate governance system (Zhang and Truong, 2019). According to the resource dependency theory (Pfeffer and Salancik, 1978), directors in conjunction with the board can benefit organizations through preferential access to resources. Politically connected

[12] Political connections can be defined in different ways. For example, Fan et al. (2007) use the CEO's political connection as a proxy for politically connected firms, which is defined based on whether the CEO is a current or former officer of the central or local governments or the military. Other similar proxies widely used in the literature include politically connected chairman (Wu et al., 2012), political connected independent directors (Zhang and Truong, 2019), and firms with state ownership (Lu et al., 2015).

[13] The hiring of politicians-directors is pervasive across Chinese firms. Unlike many western countries, which have strict rules and regulations for enforcing the post-employment restrictions against the civil servants once they leave the civil service, China has no specific post-employment policy for civil servants after leaving office (Lin et al., 2018).

independent directors are therefore expected to fulfill their roles in firms' value enhancing by introducing scarce resources. This conjecture is supported by Wang (2015) who finds that appointing independent directors with political background can add value to the privately controlled companies through getting easier access to external debt financing and receiving more subsidies from the government. Zhang and Truong (2019) also find that politically connected directors are perceived as an important channel for reducing the information asymmetry between the firm and the government. This is particularly useful to firms engaging in the business closely related to the government.

When it comes to broader regulatory enforcement, politically connected firms generally seem to be subject to less scrutiny and encounter less regulatory burden. Indeed, as Berkman et al. (2010) suggest, minority shareholders in firms with a state bureaucrat as the controlling shareholder are less likely to benefit from the enforcement of new regulations on improving minority shareholder protection. Lin et al. (2018) show that firms with a politically connected board are less likely to be detected and fined by tax authorities, which results in a less effective tax enforcement on constraining tax avoidance. Apart from tax agencies, courts can also be biased towards firms with state ownership (Lu et al., 2015). Taken together, it is possible that politically connected firms are more likely to escape the environmental regulation through at least one way, for example, suppressing the reports of news about corporate environmental violations (Schweizer et al., 2020). The favourable regulatory outcome can also result from the official directors' personal influence on environmental agencies based on their familiarity of the procedure of enforcement actions, their professional knowledge accumulated within a certain area, their long-term personal relationships and experiences in communicating with environmental agencies. Since officials' ability to exercise the discretion over the decision is limited in the aftermath of the anti-corruption campaign, with other factors being the same, the value of firms with resigned official directors due to Rule 18 may be diminished. I therefore expect that a larger fraction of official directors sitting on the board leads to a lower probability that firms receive environmental punishment and a greater reduction in the severity of environmental punishment.

The bureaucrats' career concerns might be a plausible alternative explanation for the impact of firm-level political involvement on environmental enforcement (Correia, 2014). As discussed by Zhang et al. (2019), the selective enforcement of environmental regulations stems from conflicts of interests between local government divisions and EPB. Under the central government, local government is given substantial power to determine the pathway through which the central government's initiatives can be successfully accomplished, including making

appropriate personnel appointments and setting realistic agency budgets at the same level. The EPB, one of critical government agencies at a province level, which is under the leadership of the local government, have limited regulatory power to exert their influences on polluters, which eventually affects consequences of curbing environmental violations. Additionally, China's cadre promotion system is a GDP-based evaluation framework, where the local economic development is regarded as a key performance indicator. The hidden achievements, such as environmental improvement and poverty reduction, are largely ignored chronically. Anecdotal evidence suggests that "green politicians", compared with officials in other branches of local government, are less likely to be promoted in China, possibly because their efforts to improve the quality of environment may not be immediately reflected on GDP or other performance metrics.[14] Hence, in the absence of adequate regulatory power and brighter promotion prospects, it is reasonable to expect EPB to be more likely to fudge environmental enforcement responsibility. On the other hand, it is plausible that firms with political connections, particularly those in the heavily polluting industries yielding the high profit and tax, are more important to local economies. For the sake of their major roles in increasing the local employment opportunities and providing the local revenue, local government is more likely to take advantage of enforcement discretion to provide certain environmental-related concessions, such as requiring EPB to lax the enforcement of environmental standard and collect lower environmental levies (Wang et al., 2003; Maung et al., 2016; Zhang et al., 2018). Since firms with resigned official directors induced by the issue of Rule 18 can get less benefits from local government, I accordingly conjecture that the possibility and extent to which firms with resigned official directors can benefit from the environmental regulatory enforcement will decrease following the enactment of Rule 18.

In summary, the primary hypothesis is stated as follows:

Hypothesis 1: Politically connected firms exhibit an increase in the likelihood and severity of punishment for environmental violations after the enactment of Rule 18.

While political connections can benefit firms through affecting the regulatory decision making, the magnitude of this effect depends upon the development of institutions. For example, the legal environment, including the system of legislation and enforcement,

[14] See http://www.telegraph.co.uk/news/worldnews/asia/china/9895100/Green-politicians-less-likely-to-be-promoted-in-China.html. Also see http://news.sina.com.cn/c/2013-07-03/143327566129.shtml (in Chinese).

profoundly affects the extent to which individual firms can benefit from the political affiliation (Allen et al., 2005). In a cross-country study, Faccio (2006) finds that rewards that firms "reap" from maintaining a close relationship with the government are much higher in countries where the protection of property rights is weaker and where the government intervenes more frequently to the economy. In the context of China, Lu et al. (2015) show that firms with links to the government are more likely to achieve the satisfied settlement from courts if they are located in regions with less developed legal institutions and business-unfriendly legal environments.

To a large extent, the effectiveness of the anti-corruption campaign and the efficiency of judiciary are inextricable. The greater judicial efficiency basically relies upon a reliable legal enforcement mechanism through which the main contributor, the court, is capable of processing cases in a professional and fair manner without unreasonable delays and backlogs (Voigt, 2016). In China, not all regions' judiciaries operate at the same level of efficiency, particularly in terms of the environmental enforcement. In provinces with lower judicial efficiency, the traditional court system plays a very limited role in properly dealing with environmental cases, which is often associated with delayed judiciary decision-making. This can be partly attributed to the decentralization of judicial institutions. Under the current Chinese judicial system, a single environmental case, compared with the common types of cases, might be assigned to different divisions of the court at different stages according to the nature of the claim. Hence, the performance of the court on the dispute resolution regarding environmental cases is possibly even worse than that of common types of cases. Meanwhile, unlike other types of cases, environmental cases are referred to a broader scope of knowledge of law, such as the land and resources, waste discharge and operations, and so on. Yet, it is difficult for judges, especially those in areas with fewer resources but more enforcement capacity constraints, to receive the specialised training around the knowledge related to environmental cases and hence provide efficient adjudication (Zhang et al., 2019). Therefore, owing to the presence of court delay in these areas and correspondingly high costs of environmental litigation, firms being victims of environmental cases are unwilling to launch the environmental lawsuit even if they receive unfair treatment from environmental agencies. Firms have strong incentives to establish political connections as a tool for resolving conflicts. Since the extent to which local environmental agencies can deter environmental crimes is subject to the strength of corporate political connections, I expect the effect of political connections on reducing the probability of environmental punishment to be more pronounced in provinces with lower judicial efficiency. Thus, the marginal effect brought by the enactment of Rule 18 on undermining the positive

relationship between environmental enforcement and political connections should be more significant among firms located in provinces with less efficient judiciary system. These suppositions lead to the second hypothesis as follows:

Hypothesis 2: The effect of Rule 18 on the relationship between political connections and environmental enforcement is more pronounced among firms located in provinces with lower judiciary efficiency.

Local corruption culture can also affect implications of the anti-corruption campaign. In essence, it is legal institutions, rather than only laws and regulations themselves, that determine the quality and consequences of regulatory enforcement. In regions with a higher level of corruption, courts and regulators are more likely to be "captured" by politics or interest groups resulting in a failure of independent and impartial decision-making on environmental cases. Environmental violators are inclined to build the relationship with the government and even, in some cases, "grease" regulators through bribery payments in exchange for the less-frequent scrutiny. In turn, environmental officials, who are less monitored due to the prevalence of local corruption culture, may maximise their opportunities to collect bribes through misusing their power to reduce regulatory oversight of the briber (Zhang et al., 2018). This "win-win" mechanism encourages the widespread revolving door phenomenon between polluters and regulators in more corrupt states (Emery and Faccio, 2020). Given that the anti-corruption campaign targets corruption at all levels, the environmental law enforcement officials are targeted as well. I thus expect that, for firms in more corrupt provinces, the enactment of Rule 18 has a more pronounced effect on weakening the positive relationship between environmental enforcement and political connections. I further state the third hypothesis:

Hypothesis 3: The effect of Rule 18 on the relationship between political connections and environmental enforcement is more pronounced among firms in provinces with higher levels of corruption.

3. Sample selection and research design

3.1 Data sources

The data for this paper are compiled from various sources. I obtain firm characteristics and financial information from the China Stock Market and Accounting Research (CSMAR), which

is developed by GTA, one of leading data providers in China. I collect independent directors' personal biographical information from CSMAR database, and from corporate annual reports, financial news websites and generalized internet searches with combined keywords (e.g., company name/stock code plus directors' name) if information in the CSMAR database is insufficient.[15]

Data on corporate environmental punishment is manually collected from a publicly available online environmental database established by the IPE, an influential non-profit environmental research organization located in Beijing.[16] This database comprehensively contains the collection of environmental quality, emissions and pollution source supervision records which are published by local governments of 31 provinces and 338 cities, as well as information mandatorily or voluntarily disclosed by enterprises based on relevant legislation and corporate social responsibility requirements since the year of 2006. Apart from corporate violation records, IPE also provides data regarding corporate environmental-related punishment records. This enables me to retrieve detailed information on the name of publicly listed companies and their affiliated enterprises (e.g., branches, subsidiaries and related parties) being punished, the reason for punishment, the type of punishment (e.g., warning, censure and penalty), the amount of penalties, the time for compliance with the order, the name of institutions that release the announcement of punishment, and the date on the enforcement document disclosed by the supervisor.

In the data collection procedure, I start by searching for all corporate environmental punishment records via IPE platform with the full name of my interested publicly listed company (or stock code) during the period from 2012 to 2015. Though I believe the initial data from IPE are valuable, it is challenging to work with them as certain records retained are presented differently to others. That is, I cannot treat all initial records equally and aggregate them directly for further analysis. To address this issue, I restrict myself to two frequently appearing categories that jointly account for more than 55% of total records of all firms in the sample period: the "Decision of Administrative Punishment" and the "Publication of Information about Administrative Punishments", respectively. For each firm-year, I calculate the total number of records falling into my focused two categories for both the parent company (publicly listed company) and its subsidiaries. Given that when an environmental violation occurs, it might take several days to finish inspection and issue a penalty order, I only focus on

[15] See https://www.sina.com.cn; http://www.cninfo.com.cn; http://www.baidu.com.
[16] See http://www.ipe.org.cn.

records whose enforcement date of violation falls into the sample period, regardless of the date when the violation occurs. Depending on specific category of the record, the exact date of enforcement is determined either by the issuing date on the enforcement document or by the date when the notice of punishment is available to the public.[17] In this way, I find 816 environmental punishment records in total for distinct firms over 2012 to 2015.

3.2 Sample construction

The starting point of the sample is the list of A-share firms publicly listed on the Main and SME boards of China's stock markets. I remove firms under financial distress or any other abnormal condition (ST stock) and those at the risk of termination (*ST stock) from 2012 to 2015. Firms appearing in the year of 2012 or later are also excluded to ensure all firms have observations over a time span where certain regulatory changes take place. I further restrict the sample of firms to heavily polluting industries, since these firms are more likely to receive severe punishment due to non-compliance with environmental-related laws and regulations. Despite the lack of an official definition of heavily polluting firms, a list of heavily polluting industries contained in the decree of environmental information disclosure issued by Chinese Ministry of Environmental Protection in 2010 is often referred to as a justification for sample screens in practice, enabling me to identify firms in these certain industries from the universe of firms.[18] While industries labelled in the decree are identified by subsectors, I bundle them into broader industry classifications to define heavily polluting firms as those bearing following industry codes in the CSMAR: B06, B07, B08, B09, C13, C14, C15, C17, C19, C20, C22, C25,C26, C27, C28, C30, C31, C32, and D44. After this basic data screening, 556 individual firms in heavily polluting industries with 2,224 firm-year observations remain as the primary sample.

For firms within the primary sample, I hand collect all corporate announcements on

[17] The "Decision of Administrative Punishment" is a legal document, which generally includes the following items: the fact and evidence investigated by the regulators; the type of punishment; the way and time limit of discharging the decision of punishment; and the way and time limit of applying for administrative reconsideration. Though the "Publication of Information about Administrative Punishments" can be displayed in a different format depending on preferences of local environmental agencies, I go through each of them and extract related information to make a judgement.

[18] According to the decree of environmental information disclosure published by the Chinese Ministry of Environmental Protection in 2010, heavily polluting industries mainly include 18 subsectors, which are thermal power industry, iron and steel industry, cement industry, electrolytic aluminium industry, coal industry, metallurgical industry, architectural material industry, mining industry, chemical industry, petrochemical industry, pharmaceutical industry, paper industry, fermentation industry, sugar industry, textile industry, leather industry, brewing industry, as well as vegetable oil processing industry.

independent director resignation disclosed from October 19, 2013, the date of enactment of Rule 18, to the fiscal year end of 2015. Over this period, there are 303 unique firms with 476 resignations involving 434 independent directors. For each announcement, I retrieve the information on the name of resigned directors, the date of resignation and more importantly, the reason for departure. To ensure all departures are due to the enactment of Rule 18, I then retain those announcements with the reason containing the phrases or keywords "according to Rule 18", "according to the new requirements", "adopting the new rule", or any other similar expressions in Chinese. After eliminating 103 firms whose resigned directors are nonofficial, I am left with 70 firms and 86 official directors affected by Rule 18.[19] It is worthwhile noting that one of reasons stated in the announcement may not reflect the director's true motive for leaving, which is embodied in a statement "due to personal reasons". To ensure such announcements are informative, I check the working experience of these resigned directors to identify whether Rule 18 does indeed apply to them. This step allows me to augment the sample with 141 resigned directors, of whom 51 (36%) are identified as official directors. Finally, I discard 61 firms which do not completely lose political connections after Rule 18 with at least 1 official director sitting on the board by the end of 2015. To this end, the final sample contains 386 firms with a total of 1,544 firm-year observations between 2012 and 2015, among which 224 officials (in 56 firms) are assigned to the treated group. Table 1 summarizes the sample selection process.

3.3 Research design

I adopt a difference-in-differences (DID) method to analyse how political connections affect the deterrent effect of environmental enforcement. This approach allows me to mitigate the concern for reverse causality and omitted variables through investigating an exogenous shock to political connections, which forces independent directors to resign. For example, politically connected directors may endogenously choose to resign from firms with a higher likelihood of being punished.

To the extent that the probability of firms entering the treated group may be correlated with certain firm characteristics, I, before employing the DID procedure, use the propensity score matching (PSM) approach to create a matched control sample conditional on similar firm

[19] Although Rule 18 mainly applies to government officials, in practice, it also affects other groups of independent directors without explicit political connections but having civil-service ranks, such as university professors, leaders in state-owned enterprises (SOEs) and publicly funded organizations.

characteristics to those of treated firms. For each treated firm, I select a control firm by using the nearest neighbour matching technique without replacement based on the information in 2013. Specifically, I generate estimates of probabilities of being affected by Rule 18 from a logit model (whether the firm has at least one resigned official director due to the issue of Rule 18) estimated for all firms with available data for variables listed in Appendix B.

To shed light on the effect of political connections disruption, I estimate the following difference-in-differences model:

$$\begin{aligned} Enforcement_{i,t} = {} & \beta_0 + \beta_1 Offical_i + \beta_2 Post_{i,t} + \beta_3 Official_i \times Post_{i,t} + \beta_4 FirmSize_{i,t} \\ & + \beta_5 Leverage_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Age_{i,t} + \beta_8 CashFlow_{i,t} + \beta_9 PPE_{i,t} \\ & + \beta_{10} Growth_{i,t} + \beta_{11} SDSale_{i,t} + \beta_{12} MB_{i,t} + \beta_{13} Top_{i,t} \\ & + \beta_{14} InternalControl_{i,t} + \beta_{15} Auditor_{i,t} + \beta_{16} BoardSize_{i,t} \\ & + \beta_{17} Analyst_{i,t} + \beta_{18} SOE_{i,t} + Fixed\ Effects + \varepsilon_{i,t} \end{aligned}$$

The dependent variable, $Enforcement_{i,t}$, is either an indicator that equals 1 if there is an enforcement action involving environmental violations imposed on firm i in year t ($Probability$) or the total number of environmental enforcement records per year ($Records$). $Official_i$ is an indicator variable that takes the value of one if firm i has at least one resigned official independent director due to the enactment of Rule 18. $Post_{i,t}$ is one for firm-years in the post-pseudo-period (i.e., 2014 or 2015). The variable of interest is the interaction term, $Official_i \times Post_{i,t}$, whose coefficient captures the change in environmental enforcement for treated firms relative to the change for control firms subsequent to the political connections disruption.

Following the previous literature (e.g., Fan et al., 2007; Shi et al., 2018; Hu et al., 2020), I define politically connected independent directors as those serving as (a) current or former officials of the central governments, local governments or armies; (b) current or former delegates of the National People's Congress (NPC); or (c) current or former members of the Chinese People's Political Consultative Conference (CPCC).

Following the literature on independent director departures (Fahlenbrach et al., 2017; Hope et al., 2020; Wei et al., 2020), I consider standard firm characteristics that could be related to both the probability of official directors departures and the incidence of regulatory enforcement against corporate environmental violations as control variables, such as firm size ($FirmSize$), financial leverage ($Leverage$), firm profitability (ROA), firm age (Age), the level

of cash flow ($CashFlow$), capital intensity (PPE), sales growth ($Growth$), sales volatility ($SDSale$), market-to-book value (MB), and state ownership (SOE). I also control for corporate governance characteristics including ownership concentration (Top), the quality of internal control ($InternalControl$), analyst coverage ($Analyst$), the total number of directors ($BoardSize$), as well as audit opinion ($Auditor$). Industry and region fixed effects are included in subsequent regression specifications as well. In addition, I cluster standard errors by firm to account for possible within-firm serial correlation. All continuous variables are winsorized at the levels of 1% and 99% for reducing the influence of outliers. Appendix B presents definitions for all variables in detail.

4. Empirical Results

4.1 Descriptive statistics

Table 2 describes the distribution of firms in the sample across 19 heavily polluting industries. Obviously, two groups "Raw chemical materials and chemical products (C26)" and "Pharmaceutical manufacturing (C27)" jointly account for 37.77% of the sample. Apart from these two industries, the sample firms are widely dispersed among the rest of heavily polluting industries.

Summary statistics for the sample of the treated group and the control group are presented in Table 3. Comparing treated firms and control firms (No PSM) for the year prior to the event, I find important differences in firm characteristics (Panel A of Table 3). Relative to non-connected firms, firms with resigned official directors tend to operate with a higher degree of financial leverage, have a higher market-to-book ratio and be more likely to be SOEs. These differences in firm attributes between treated and control firms might affect official directors' willingness to serve on the board and thus drive their choices to remain in the position or not, which can spuriously drive the main results. In this case, I use the PSM approach to identify a group of control firms which are most similar to the treated firms. After adopting the PSM, the comparation between treated group and control group shows little difference in terms of all firm characteristics (the column of "Treated−Control (PSM)" in Panel A). In addition, as shown in Appendix A, I demonstrate that the PSM is effectively performed in adjusting for the balance of covariates across treated and control groups. The balancing test results show that the mean bias drops remarkably from 20.3 percent (before PSM) to 10.0 percent (after PSM).

Panel B of Table 3 summarizes statistics of main variables based on the entire sample of

48 matched treated firms and 49 matched control firms with 388 firm-year observations over the 4-year period from 2012 to 2015. I find that the mean of $Probability$ is 0.204 and the mean value of $Records$ is 0.299. With respect to key control variables, I find that the mean of $FirmSize$ is 22.462, the mean $Leverage$ is 0.098, the mean ROA is 0.097 and the average Age is 2.69 years. I also find that the average $BoardSize$ is 9.023 members, the mean percentage of shares held by the largest shareholder is 40.9% and 63.9% of firms in the sample are SOEs. These statistics are largely consistent with prior literature.

4.2 Identification checks

A critical identification assumption underlying the DID approach is the parallel-trend assumption, which requires average trends in the likelihood and magnitude of environmental punishment are parallel between firms with and without resigned official directors due to the issue of Rule 18 before the implementation of this policy. To ensure whether the parallel-trend assumption holds, I plot the average percentage of firms being punished for environmental-related violations per year based on the matched treated firms and control firms from 2012 to 2015 around the issue of Rule 18. As shown in Figure 2, I observe parallel trends for two groups of firms in years prior to the issue of Rule 18, which supports the common trend assumption. After the issue of Rule 18, though two lines both display obvious upward trends, the rate of increase in the likelihood of environmental punishment in treated group is significantly higher than that of control group.

4.3 Baseline regression results

Table 4 presents estimates of the main regression model regarding the impact of political connection disruption on corporate environmental punishment. I run two sets of regressions. In Columns (1)-(3), I use $Probability$ to measure the likelihood of regulatory environmental enforcement. In column (1), where $Official_i$ is the only explanatory variable, I find that it has a significant and negative effect on the probability of an environmental enforcement action. In column (2), after controlling for firm characteristics and including industry and region fixed effects, I find that the coefficient on $Official_i$ remains negative and significant. These findings indicate that firms are less likely to receive environmental oversight if they hire official directors to establish political connections, which is to some extent in line with findings in prior

research (e.g., Wang et al., 2003; Maung et al., 2016). In column (3), I regress $Probability$ on the interaction term of official directors and the post-policy indicator ($Official_i \times Post_{i,t}$) and a series of control variables. The estimated coefficient on $Official_i \times Post_{i,t}$ is 1.293, statistically significant at a 5% level. This result suggests that firms with resigned official directors tend to suffer from a higher probability of environmental enforcement after the issue of Rule 18. In columns (4)-(6), I replace $Probability$ with $Records$ and re-estimate the regression model. The results are similar to those in columns (1)-(3). Taken together, the empirical results from columns (1) to (6) are consistent with the first hypothesis, which suggests that treated firms experience an increase in the likelihood of receiving environmental punishment and severity of punishment conditioned on enforcement actions subsequent to political connections disruption due to the issue of Rule 18.

4.4 Cross-sectional results

In this subsection, I examine whether the effect of anti-corruption campaign on corporate environmental punishment varies with the strength of a province's institutional development. As discussed before, I expect that anti-corruption activities occurred in provinces with poor quality of judiciary system should provide stronger shocks on average. Thus, to test Hypothesis 2, I use the index of market intermediaries and legal environment, which is one aspect of Fan et al.'s (2017) marketization index, to capture a province's judiciary efficiency. I split the full sample into two based on the median of the province-level index. Results presented in Table 5 indicate that regardless of which dependent variable I use, the coefficient on the interaction term of $Official_i$ and $Post_{i,t}$ is significant at the 5 percent level in the group with lower judiciary efficiency (with coefficients of 2.230 and 1.108, respectively) and it is insignificant in the group with higher judicial efficiency (with coefficients of 0.322 and 0.238, respectively). The Chi-square statistic shows that the difference between two groups is close to marginally significant, suggesting that legal institutions play an important role in determining the effect of the anti-corruption. This is consistent with my conjecture that political connections serve as a substitute for a state's formal institutions, which is more salient in provinces with lower judiciary efficiency where connected firms are more heavily affected by Rule 18.

I next examine hypothesis 3 to see whether the other institutional factor, local corruption culture, affects the relation between political connections and environmental enforcement action. Following Liu and Li (2012), I construct a proxy for the public corruption at a province

level, $Amount_{i,t}$, which is defined as the amount of money involved in irregularities (including corruption, bribery, misappropriation of public funds, and etc.) detected by provincial government audit institutions divided by the nominal GDP of each province. Firms in the sample are thereby divided into two groups according to the median value of this partition variable. As shown in Table 6, across four specifications, the interaction term of $Official_i$ and $Post_{i,t}$ is significant at a 5% level in the group with greater degree of public corruption (with the coefficient of 2.170 and 1.050 when using $Probability$ and $Records$ as dependent variables, respectively) but insignificant in the group with lower level of public corruption (with the coefficient of −0.163 and 0.111, respectively). The Chi-square statistic shows that the difference between the two subsamples is significant at a 10 percent level. These findings are consistent with my expectation that the deterrent and rectification effect arising from Rule 18 on selective environmental enforcement behaviour is more pronounced when politically connected firms are located in more corrupt provinces.

5. Additional tests and results

5.1 The effect of firm-level characteristic

So far, I provide evidence that firms with resigned official directors due to Rule 18 are more likely to be punished with more severe punishment for environmental-related violations after the issue of Rule 18. However, the effect of Rule 18 on environmental punishment might vary among firms with different types of ownership. Existing literature highlights the fact that having politically connected directors is not equally important for all types of firms (Wu et al., 2012). Relative to other types of ownership, state ownership is often claimed as a natural form of political connections. SOEs, owing to its role in fulfilling social objectives rather than only pursing profit-driven goals, can benefit from government support and extra protection while operating in the business environment (Lu et al., 2015; Maung et al., 2016; Hope et al., 2020). Thus, SOEs may not need to rely on hiring official directors to establish political connections so that the effect of the resignation of official directors is expected to be less important for SOEs. Further evidence from Wang (2015) and Chen et al. (2017) also suggests that appointing politically connected directors are more valuable for non-SOEs. If this is the case, I would expect the effect of official directors' resignation caused by Rule 18 on environmental punishment is more pronounced among non-SOEs.

To further support the main results, I perform a firm-level heterogeneity analysis by

examining the role of ownership structure. I construct two groups of firms and separately conduct the PSM-DID method based on whether firms' ultimate controlling shareholder is the state or not over the sample period.[20] Table 7 presents results estimated for SOEs and non-SOEs respectively. I find that for SOEs, coefficients on the variable of interest, $Official_i \times Post_{i,t}$, are all statistically insignificant in both two specifications. In contrast, for non-SOEs, the estimated coefficients on the interaction term ($Official_i \times Post_{i,t}$) are significant at a 1% level in both specifications (with coefficients equal to 13.910 and 3.979, separately). The findings show that firms without state ownership are affected more by the sudden loss of politically connected directors. This is consistent with the argument in the existing literature that non-SOEs rely more on the political connection developed through hiring official directors.

5.2 Potential confounding events

I consider two potential confounding events that occurred around the issue of Rule 18. As the launch of China's anti-corruption reform, the Eight-Point Regulation was issued by the Politburo of the CCP in December 2012. This regulation aims to curb extravagance and bureaucracy by specifying detailed requirements on the working style of the Party and government officials, such as forbidding improper allocation and use of official vehicles, forbidding travelling at public expense, and cutting down on banquets at public expense and stamping out privilege. Following the Eight-Point Regulation, firms (especially SOEs) largely reduce their business entertainment and travel expenditure (ETC), a proxy for the firm-level corruption efforts (Cai et al., 2011; Lin et al., 2016). To control the effect of the Eight-Point Regulation, I add ETC, measured as the sum of firm's annual entertainment and travel costs under management expenses and sales expenses, as a control variable and rerun the main regression.[21] Columns (1) and (2) of Table 8 show that the inferences are not affected when controlling for ETC, indicating that the main results are not driven by the Eight-Point Regulation.

The second potential confounding event I consider is the China's Smart City Program,

[20] Specifically, by using the kernel matching method, I finally have 160 matched firms (33 treated firms and 127 control firms) in the SOE group while the total number of matched firms is 176 (19 treated firms and 157 control firms) in the non-SOE group. Apart from using the kernel matching technique, I also select the 1:2, 1:3 and 1:4 nearest neighbourhood techniques with replacement as alternatives in a robustness check and the results still hold. Corresponding results are available upon request.

[21] Firms' annual entertainment and travel costs are available from footnotes of income statements in the CSMAR database.

which aims to construct a city-level innovative governance system by integrating different sources of urban data on the basis of new technologies (e.g., artificial intelligence, big data and cloud computing).[22] The smart city initiative, as a new mode of urban development, was introduced by the Chinese central government since 2010 and further outlined in the "National New Urbanization Plan (2014-2020)". In 2012, the Chinese Ministry of Housing and Urban-Rural Development first selected 90 cities as pilot national smart cities, while by the end of 2015, a total number of 290 smart city pilots have been launched from the prefecture-level to the township level (Chu et al., 2021). Within this framework, traditional cities can be converted to smart cities with the help of digital information and communication technologies embedded into the environment. During this process, the pollution reduction can be realized by taking advantage of a wide range of urban innovation tools, such as energy-efficient Internet of Things (IoT) systems, real-time pollution monitoring platforms, and mobile robotic technologies, thereby achieving the improvement in the regional ecological environment (Chu et al., 2021). Thus, firms located in smart cities with the large-scale adoption of green technology are more likely to have a lower level of pollution footprint, which in turn are less likely to receive the environmental punishment from local EPB. To control the effect of Smart City Program, I include an indicator variable $Smart\ City$, which equals one if the firm operates in a city which is named as the "Smart City" in a calendar year, and zero otherwise. As shown in columns (3) and (4) of Table 8, the conclusions still hold.

5.3 Placebo tests

To validate that the probability and severity of environmental punishment caused by the disruption of political connections, I conduct two sets of placebo tests. First, I examine whether non-official director resignations following the issue of Rule 18 will induce similar effect. In comparison with official directors, non-official directors with little political power may not contribute to the firm value as much as official directors. In this case, if the results are indeed driven by political connections, I expect that the effect of non-official director resignations should have no or limited impacts on corporate environmental punishment. I use firms with resigned directors from universities, SOEs and publicly funded organizations as the pseudo-treated group and conduct the similar PSM-DID analysis. $PseudoOfficial_i$ is an indicator

[22] See https://www.forbes.com/sites/kensilverstein/2019/12/11/chinas-smart-cities-are-magnets-for-economic-growth-and-environmental-stewardship/?sh=7191ec933e93.

variable that takes the value of one if firm i has at least one resigned nonofficial independent director, and zero otherwise. Based on 85 matched pseudo-treated firms and 80 matched control firms with 660 observations, results in Panel A of Table 9 show that coefficients on the interaction term $PseudoOfficial_i \times Post_{i,t}$ are insignificant in both specifications.

Considering the possibility that the results might be driven by unobserved shocks which are unrelated to the issue of Rule 18, I next choose the year 2014 as the pre-pseudo-event period and 2015 as the post-pseudo-event period.[23] As presented in Panel B of Table 9, firms in the treated group and those in the control group do not differ much in terms of the likelihood and severity of environmental punishment around the pseudo-event years.

6. Conclusion

In this paper, I explore the impact of China's anti-corruption campaign on corporate environmental punishment. Based on a quasi-natural experiment that leads to mandatory resignation of many official directors and using a propensity-score matching approach, I document that the termination of firm-level political connections results in a higher probability of the firm being punished for illegal environmental behaviour as well as a more severe punishment. This finding is consistent with widespread criticisms of politically connected firms. I further examine how institutional development affects consequences of the anti-corruption campaign. The cross-sectional analyses show that such deterrent effect is more pronounced among firms located in provinces with lower judiciary efficiency or higher corruption culture, which implies that political connections can function as a substitute for formal institutions. Also, I investigate whether ownership structure matters and find that the effect of Rule 18 is more pronounced among non-SOEs. Collectively, I provide novel evidence about specific benefits accrue to the establishment of political connections, as well as how they are affected by the anti-corruption campaign in China.

As with other studies, this paper is subject to limitations. The sample size is relatively small with respect to the proportion of firms with resigned official directors in heavily polluting industries. Also, the environmental punishment sample captures only two categories of punishment, the "Decision of Administrative Punishment" and the "Publication of Information about Administrative Punishments", which jointly account for more than 55% of

[23] For robustness, I also rerun the main regression by choosing the year 2013 as the pre-pseudo-event period and 2015 as the post-pseudo-event period. The results remain unchanged. Corresponding results are available upon request.

total records of all firms in the sample period. A study on other types of punishment that emphasizes mechanism through which this policy affects environmental enforcement effectiveness might be an interesting avenue for future research.

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Appendix A. Procedure to construct the propensity-score-matched (PSM) sample

The propensity-score-matching (PSM) technique aims to pair treated units and control units to make two groups more alike conditional on certain observable characteristics (Dehejia and Wahba, 2002). The first step in this procedure is to obtain the estimation for the probability of being affected by the issue of Rule 18 (i.e., firms with resigned official directors) by running a logistic regression model based on a sample of firms in 2013. Next, I use the predicted probability from the first step to estimate each firm's propensity score. Then, I match each treated firm to the control firm by using the nearest neighbour matching technique without replacement. Panel A shows the estimation results from the logit regression model. Panel B reports the effectiveness of PSM approach. All variables are defined in Appendix B. *, **, and *** denote significance at the 0.1, 0.05, and 0.01 level, respectively.

Panel A: Results of the logit regression

Dependent variable = Resigned official directors		
Variables	Coefficient	Z-stat.
$FirmSize$	-0.065	-0.25
$Leverage$	3.071	1.64
ROA	6.360*	1.85
Age	-0.105	-0.22
$CashFlow$	2.671	1.51
PPE	0.107	0.09
$Growth$	-0.053	-0.30
$SDSale$	-0.092	-0.06
MB	0.129	0.66
Top	1.100	1.04
$InternalControl$	0.468	1.39
$Auditor$	0.000	(.)
$BoardSize$	-0.021	-0.23
$Analyst$	0.001	0.07
SOE	0.514	1.39

Panel B: Descriptive statistics of treated and control firms before and after matching

Variables		Mean value, treated firms (1)	Mean value, control firms (2)	Diff. (1)−(2)
$FirmSize$	Pre-match	22.424	22.088	0.336**
	Post-match	22.402	22.394	0.008
$Leverage$	Pre-match	0.110	0.075	0.035**
	Post-match	0.105	0.085	0.020
ROA	Pre-match	0.113	0.097	0.016**
	Post-match	0.112	0.108	0.004
Age	Pre-match	2.661	2.641	0.020
	Post-match	2.655	2.641	0.014
$CashFlow$	Pre-match	0.148	0.135	0.013
	Post-match	0.149	0.170	−0.021
PPE	Pre-match	0.336	0.305	0.031
	Post-match	0.329	0.304	0.025
$Growth$	Pre-match	−0.025	0.104	−0.129
	Post-match	−0.033	−0.202	0.169
$SDSale$	Pre-match	0.096	0.096	0.000
	Post-match	0.096	0.096	0.000

MB	Pre-match	1.469	1.144	0.325*
	Post-match	1.415	1.315	0.100
Top	Pre-match	0.406	0.369	0.037*
	Post-match	0.404	0.444	-0.040
$InternalControl$	Pre-match	0.364	0.244	0.120*
	Post-match	0.352	0.296	0.056
$Auditor$	Pre-match	1.000	1.000	0.000
	Post-match	1.000	1.000	0.000
$BoardSize$	Pre-match	9.109	8.953	0.156
	Post-match	9.111	9.074	0.037
$Analyst$	Pre-match	9.855	8.193	1.662
	Post-match	9.907	10.074	−0.167
SOE	Pre-match	0.618	0.453	0.165**
	Post-match	0.611	0.630	−0.019

Appendix B: Variable Definitions

This table provides definitions for the key variables used in the analysis.

Variable	Definition
Probability	Indicator variable that equals one if there is enforcement action involving environmental violations imposed on firm i in year t
Records	Number of annual environmental enforcement records firms received from environmental agencies.
Official	Indicator variable that equals one if the firm has at least one resigned official director due to the enactment of Rule 18, zero otherwise.
Post	Indicator variable that equals one for post-policy period (the year of 2014 or 2015), zero otherwise.
FirmSize	Book value of total assets.
Leverage	Long-term debt divided by total assets.
ROA	Return on assets, calculated as EBITDA divided by the firm's average total assets.
Age	Firm age, calculated as the natural logarithm of years that the firm has established.
CashFlow	Cash and cash equivalent divided by total assets.
PPE	Fixed assets, calculated as property, plant and equity divided by total assets.
Growth	Annual sales growth rate, calculated as sales in year t minus sales in year t-1, divided by sales in year t-1.
SDSale	The standard deviation of sales, calculated as the standard deviation of sales (deflated by total assets) in the previous three years.
MB	Market value of assets divided over book value of assets. Market value of assets is book value of total assets minus book value of equity plus market value of equity.
Top	Percentage of shares owned by the largest shareholder.
InternalControl	Indicator variable that equals one for the firms with internal control weaknesses.
Auditor	Indicator variable that equals one for unmodified audit opinions, zero otherwise.
BoardSize	Number of directors on the board.
Analyst	Number of analyst teams following, calculated as the natural logarithm of one plus the number of analyst teams following the firm.
SOE	Indicator variable that equals one if the firm is ultimately controlled by the government, zero otherwise.

Figure 1
The proportions of official directors and nonofficial directors on the board
(Firm-year level)

This figure displays how the proportions of firms with official directors and nonofficial directors change across the years. The $Official\ independent\ directors$ is defined as the firms with at least one politically connected independent director in a calendar year. Politically connected independent directors are those serving as (a) current or former officials of the central governments, local governments or armies; (b) current or former delegates of the National People's Congress (NPC); or (c) current or former members of the Chinese People's Political Consultative Conference (CPCC). The $Nonofficial\ independent\ directors$ is defined as the firms without any politically connected independent director during the sample period.

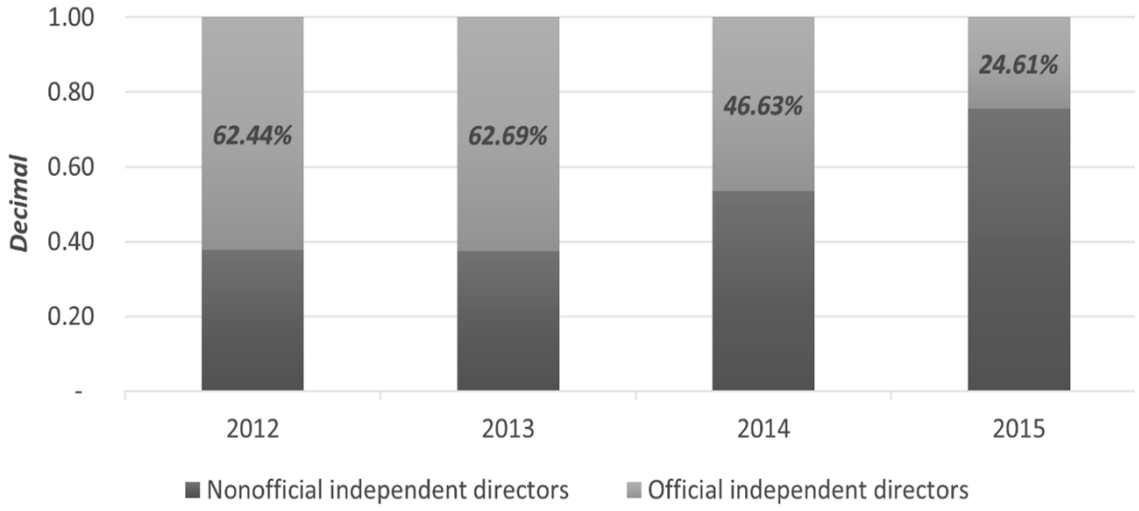

Figure 2
The probability of environmental punishment between treated firms and control firms surrounding the issue of Rule 18 in 2013

This figure shows the probability of environmental punishment of 48 matched treated firms (dashed line) and 49 matched control firms (solid line) on average from 1 year before to 2 years after the issue of Rule 18. The event year is 2013. The plot output is based on the average percentage of firms being punished for environmental-related violations per year.

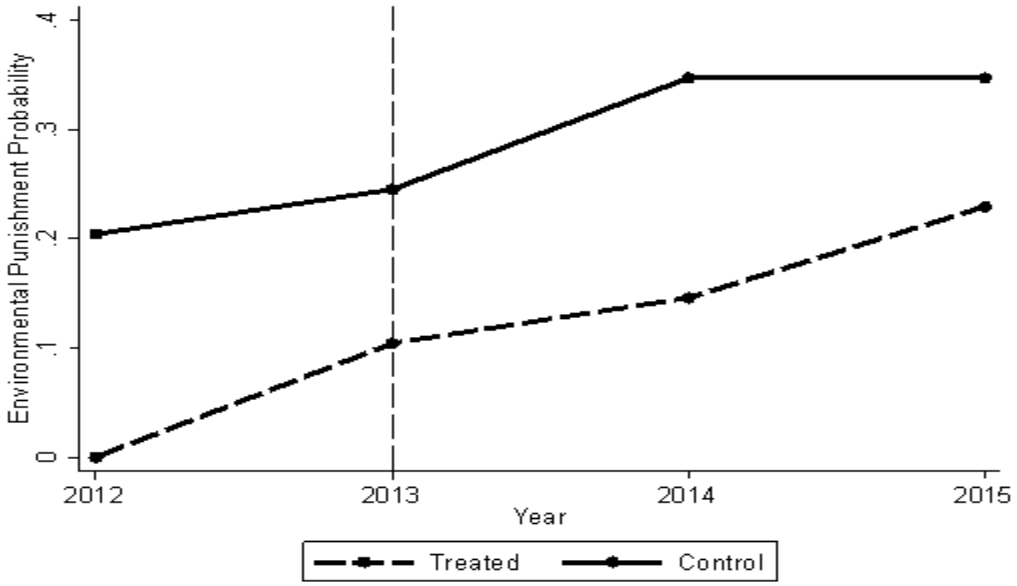

Table 1
Sample selection process

This table describes the selection procedure for treated firms and control firms over the sample period.

	Number of firms
All heavily polluting firms listed on the Main and SME Boards of Shanghai and Shenzhen A-share stock exchanges	556
Heavily polluting firms with resigned directors	303
Including: heavily polluting firms with resigned directors due to the issue of Rule 18 (announcements with the reason containing the phrases or keywords "according to Rule 18", "according to the new requirements", "adopting the new rule", or any other similar expressions in Chinese)	173
Less: heavily polluting firms with resigned directors from universities, SOEs and publicly funded organizations due to the issue of Rule 18 (announcements with the reason containing the phrases or keywords "according to Rule 18", "according to the new requirements", "adopting the new rule", or any other similar expressions in Chinese)	(103)
Heavily polluting firms with resigned official directors due to the issue of Rule 18 (announcements with the reason containing the phrases or keywords "according to Rule 18", "according to the new requirements", "adopting the new rule", or any other similar expressions in Chinese)	70
Plus: heavily polluting firms with resigned official directors due to the issue of Rule 18 (announcements with the reason containing the phrases or keywords "due to personal reasons" in Chinese)	47
Less: heavily polluting firms without completely losing political connections after the issue of Rule 18	(61)
Treated firms in the sample	56
Control firms in the sample	330
Including: heavily polluting firms with resigned directors from universities, SOEs and publicly funded organizations due to the issue of Rule 18 (announcements with the reason containing the phrases or keywords "according to Rule 18", "according to the new requirements", "adopting the new rule", or any other similar expressions in Chinese)	103
Including: heavily polluting firms without any resigned directors over the sample period	227
Total firms in treated group and control group	386

Table 2
Sample distribution by industry group

This table reports the distribution of the sample firms by industries based on the CSRC (China Securities Regulatory Commission) classification.

Industry	CSRC Code	Number of firms	Percentage (%)
Chemical fibre manufacturing	C28	32	5.76
Coal mining and processing	B06	22	3.96
Farm products processing	C13	19	3.42
Ferrous metal mining	B08	2	0.36
Food manufacturing	C14	26	4.68
Leather, fur, feathers, and related products and shoemaking	C19	2	0.36
Mining and dressing of nonferrous metals	B09	19	3.42
Non-metallic mineral products	C30	36	6.47
Paper making and paper products	C22	18	3.24
Petroleum and gas extraction	B07	4	0.72
Petroleum processing, coking and nuclear fuel processing	C25	7	1.26
Pharmaceutical manufacturing	C27	101	18.17
Production and supply of electric power and thermal power	D44	33	5.94
Raw chemical materials and chemical products	C26	109	19.60
Smelting and pressing of ferrous metals	C31	24	4.32
Smelting and pressing of nonferrous metal	C32	51	9.17
Textile	C17	24	4.32
Timber processing, timber, bamboo, cane, palm fiber and straw products	C20	5	0.90
Wine, drinks and refined tea manufacturing	C15	22	3.96
Total		556	100

Table 3
Descriptive statistics

This table reports the descriptive statistics for the sample of treated firms and control firms. Panel A shows the summary statistics of firm characteristics for treated firms and control firms before and after employing the PSM, in the last year prior to being shocked (the year of 2013). Panel B displays the summary statistics of main variables used in the empirical estimations for 48 matched treated firms and 49 matched control firms over the period of 2012-2015.

Panel A: Comparison between treated firms and control firms

	Treated group		Control group (No PSM)		Treated – Control (No PSM)	Control group (PSM)		Treated – Control (PSM)
	N	Mean	N	Mean	Difference	N	Mean	Difference
$FirmSize$	48	22.34	330	22.10	0.13	49	22.49	−0.14
$Leverage$	48	0.11	330	0.08	0.03**	49	0.09	0.01
ROA	48	0.10	330	0.10	0.28	49	0.10	0.00
Age	48	2.65	330	2.64	0.92	49	2.66	-0.01
$CashFlow$	48	0.14	330	0.13	0.64	49	0.15	−0.01
PPE	48	0.34	330	0.31	0.20	49	0.32	0.02
$Growth$	48	0.03	330	0.11	0.57	49	−0.27	0.30
$SDSale$	48	0.10	330	0.10	0.98	49	0.10	0.00
MB	48	1.49	330	1.17	0.08*	49	1.40	0.08
Top	48	0.40	330	0.37	0.21	49	0.43	−0.04
$InternalControl$	48	0.35	330	0.25	0.12	49	0.31	0.05
$Auditor$	48	1.00	330	0.96	0.16	49	1.00	0.00
$BoardSize$	48	9.13	330	8.97	0.56	49	9.24	−0.12
$Analyst$	48	8.40	330	8.06	0.83	49	9.84	−1.44
SOE	48	0.63	330	0.45	0.02**	49	0.65	−0.03

Panel B: Treated firms with propensity-score-matched (PSM) firms as control firms

	N	Mean	SD	P25	P50	P75
$Probability$	388	0.204	0.403	0.000	0.000	0.000
$Records$	388	0.299	0.634	0.000	0.000	0.000
$FirmSize$	388	22.462	1.116	21.606	22.355	23.116
$Leverage$	388	0.098	0.110	0.000	0.054	0.172
ROA	388	0.097	0.052	0.064	0.089	0.124
Age	388	2.690	0.361	2.565	2.708	2.944
$CashFlow$	388	0.145	0.111	0.055	0.117	0.198
PPE	388	0.331	0.164	0.198	0.317	0.434
$Growth$	388	−0.125	1.299	−0.144	0.244	0.369

Table Continued Overleaf

Table 3 (Continued)

Panel B: Treated firms with propensity-score-matched (PSM) firms as control firms

	N	Mean	SD	P25	P50	P75
$SDSale$	388	0.099	0.098	0.038	0.068	0.125
MB	388	1.173	1.039	0.495	0.819	1.513
Top	388	0.409	0.154	0.298	0.396	0.510
$InternalControl$	388	0.387	0.488	0.000	0.000	1.000
$Auditor$	388	1.000	0.000	1.000	1.000	1.000
$BoardSize$	388	9.023	1.917	8.000	9.000	9.000
$Analyst$	388	7.912	8.260	1.000	5.000	12.000
SOE	388	0.639	0.481	0.000	1.000	1.000

Table 4

Political connection disruption and corporate environmental punishment

This table illustrates the impact of political connection disruption on corporate environmental punishment based on a reduced sample of firms with 48 matched treated firms and 49 matched control firms over the period of 2012-2015. The columns (1)-(3) present results from logistic regressions of likelihood of environmental enforcement on political connections disruption, while the columns (4)-(6) present results of the ordered probit model examining the relation between the magnitude of environmental punishment and political connections disruption. The first dependent variable ($Probability$) is an indicator variable that equals one if there is enforcement action involving environmental violations imposed on firm i in year t. The second dependent variable ($Records$) is defined as the number of annual environmental enforcement records firms received from environmental agencies. Official is an indicator variable that equals one if the firm has at least one resigned official director due to the enactment of Rule 18. Post is an indicator variable that equals one for post-policy period (the year of 2014 or 2015). The interaction term Official × Post captures both the difference between treated firms and control firms as well as the difference before and after the enactment of Rule 18. Columns (2), (3), (5) and (6) control for industry and region fixed effects. All continuous variables are winsorized at the levels of 1% and 99%. P-values are computed using firm-clustered standard errors. *, **, and *** denote significance at 10%, 5% and 1% levels, respectively. All variables are defined in Appendix B.

	Probability			*Records*		
	(1)	(2)	(3)	(4)	(5)	(6)
$Official \times Post$			**1.293****			**0.704****
			(2.04)			(2.38)
$Official$	**−1.078*****	**−1.348*****	**−2.315*****	**−0.562*****	**−0.768*****	**−1.300*****
	(−2.85)	(−3.62)	(−3.96)	(−2.64)	(−3.63)	(−4.64)
$Post$			**0.883*****			**0.508*****
			(2.65)			(2.69)
$FirmSize$		**0.610**	**0.294**		**0.362****	**0.185**
		(2.13)	(0.95)		(2.12)	(1.00)
$Leverage$		**2.141**	**2.743**		**1.164**	**1.528**
		(1.17)	(1.43)		(1.13)	(1.41)
ROA		**−0.017**	**1.738**		**−0.634**	**0.394**
		(−0.00)	(0.40)		(−0.26)	(0.15)
Age		**0.990**	**0.573**		**0.580**	**0.329**
		(1.38)	(0.86)		(1.61)	(0.94)
$CashFlow$		**2.940**	**3.071**		**1.295**	**1.450**
		(1.55)	(1.62)		(1.33)	(1.50)
PPE		**2.485***	**1.960**		**1.549***	**1.323**
		(1.71)	(1.29)		(1.87)	(1.57)
$Growth$		**−0.073**	**−0.076**		**−0.022**	**−0.022**
		(−0.60)	(−0.66)		(−0.34)	(−0.35)

Table Continued Overleaf

Table 4 (Continued)

	Probability			*Records*		
	(1)	(2)	(3)	(4)	(5)	(6)
SDSale		**2.446**	**3.231****		**1.352***	**1.739****
		(1.62)	(1.98)		(1.65)	(2.02)
MB		**0.075**	**0.483****		**0.023**	**0.259****
		(0.39)	(2.27)		(0.21)	(2.06)
Top		**−2.328***	**−2.290***		**−1.077**	**−1.036**
		(−1.87)	(−1.92)		(−1.53)	(−1.54)
InternalControl		**0.037**	**0.027**		**0.049**	**0.052**
		(0.14)	(0.09)		(0.34)	(0.34)
Auditor		**0.000**	**0.000**		**0.000**	**0.000**
		(.)	(.)		(.)	(.)
BoardSize		**−0.108**	**−0.080**		**−0.053**	**−0.033**
		(−1.16)	(−0.87)		(−0.96)	(−0.59)
Analyst		**−0.013**	**0.009**		**−0.011**	**0.000**
		(−0.64)	(0.39)		(−0.97)	(0.01)
SOE		**0.677**	**0.633**		**0.310**	**0.289**
		(1.34)	(1.31)		(1.13)	(1.08)
Constant	**−0.916*****	**−17.481*****	**−10.796***			
	(−4.36)	(−2.95)	(−1.74)			
Industry FE	NO	YES	YES	NO	YES	YES
Region FE	NO	YES	YES	NO	YES	YES
Observations	388	388	388	388	388	388
Adj.R^2	0.0431	0.2086	0.2459	0.0301	0.1757	0.2071

Table 5
The influence of institutional development

This table shows the results of the influence of province-level judiciary efficiency on anti-corruption effects based on a reduced sample of firms with 48 matched treated firms and 49 matched control firms over the period of 2012-2015. The sample is split into two subsamples based on the median values of one certain field index of marketization−development of market intermediaries and legal environment in the year prior to the event, which is obtained from Fan et al. (2017). The first dependent variable ($Probability$) is an indicator variable that equals one if there is enforcement action involving environmental violations imposed on firm i in year t. The second dependent variable ($Records$) is defined as the number of annual environmental enforcement records firms received from environmental agencies. Official is an indicator variable that equals one if the firm has at least one resigned official director due to the enactment of Rule 18. Post is an indicator variable that equals one for post-policy period (the year of 2014 or 2015). The interaction term Official × Post captures both the difference between treated firms and control firms as well as the difference before and after the enactment of Rule 18. Each model includes industry and region fixed effects. All continuous variables are winsorized at the levels of 1% and 99%. P-values are computed using firm-clustered standard errors. *, **, and *** denote significance at 10%, 5% and 1% levels, respectively. All variables are defined in Appendix B.

	Judiciary efficiency			
	Low	High	Low	High
	$Probability$		$Records$	
$Official \times Post$	**2.230****	**0.322**	**1.108****	**0.238**
	(2.40)	(0.22)	(2.29)	(0.30)
Difference:	**1.908**		**0.870**	
Low – High	***χ²(1) = 1.44***		***χ²(1) = 1.59***	
$Official$	**−3.263*****	**−2.626****	**−1.731*****	**−1.559****
	(−3.70)	(−1.99)	(−3.87)	(−2.10)
$Post$	**0.308**	**1.484***	**0.278**	**0.736***
	(0.55)	(1.91)	(0.92)	(1.83)
Other controls	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Region FE	YES	YES	YES	YES
Observations	212	176	212	176
Adj.R^2	0.2868	0.3692	0.2279	0.3077

Table 6
The influence of institutional development

This table reports the results of the influence of province-level public corruption on anti-corruption effects based on a reduced sample of firms with 48 matched treated firms and 49 matched control firms over the period of 2012-2015. The sample is divided into two subgroups based on the median value of the partition variable Amount. This variable is calculated as the amount of money involved in irregularities (including corruption, bribery, misappropriation of public funds, etc.) detected by province-level government audit institutions, adjusted by the nominal GDP of each province in the year prior to the event. The first dependent variable ($Probability$) is an indicator variable that equals one if there is enforcement action involving environmental violations imposed on firm i in year t. The second dependent variable ($Records$) is defined as the number of annual environmental enforcement records firms received from environmental agencies. Official is an indicator variable that equals one if the firm has at least one resigned official director due to the enactment of Rule 18. Post is an indicator variable that equals one for post-policy period (the year of 2014 or 2015). The interaction term Official × Post captures both the difference between treated firms and control firms as well as the difference before and after the enactment of Rule 18. Each model includes industry and region fixed effects. All continuous variables are winsorized at the levels of 1% and 99%. P-values are computed using firm-clustered standard errors. *, **, and *** denote significance at 10%, 5% and 1% levels, respectively. All variables are defined in Appendix B.

	Local corruption culture			
	Low	High	Low	High
	$Probability$		$Records$	
$Official \times Post$	**−0.163**	**2.170****	**0.111**	**1.050****
	(−0.11)	(2.31)	(0.14)	(2.15)
Difference:	**−2.333***		**−0.939**	
Low – High	***$\chi^2(1) = 3.20$***		***$\chi^2(1) = 2.45$***	
$Official$	**−1.148**	**−3.367*****	**−0.841**	**−1.780*****
	(−0.89)	(−3.83)	(−1.19)	(−4.01)
$Post$	**0.672**	**0.581**	**0.261**	**0.450**
	(0.99)	(0.98)	(0.72)	(1.41)
Other controls	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Region FE	YES	YES	YES	YES
Observations	176	212	176	212
Adj.R^2	0.3054	0.2954	0.2510	0.2454

Table 7
The influence of ownership structure

This table presents the results of the influence of ownership structure on anti-corruption effects. The regressions are limited to the firms with state ownership and non-state ownership separately over the period of 2012-2015. Based on whether the ultimate controlling shareholder is the state or not, I have two separate groups: SOEs and non-SOEs. The first dependent variable ($Probability$) is an indicator variable that equals one if there is enforcement action involving environmental violations imposed on firm i in year t. The second dependent variable ($Records$) is defined as the number of annual environmental enforcement records firms received from environmental agencies. Official is an indicator variable that equals one if the firm has at least one resigned official director due to the enactment of Rule 18. Post is an indicator variable that equals one for post-policy period (the year of 2014 or 2015). The interaction term Official × Post captures both the difference between treated firms and control firms as well as the difference before and after the enactment of Rule 18. Each model includes industry and region fixed effects. All continuous variables are winsorized at the levels of 1% and 99%. P-values are computed using firm-clustered standard errors. *, **, and *** denote significance at 10%, 5% and 1% levels, respectively. All variables are defined in Appendix B.

	Ownership structure			
	SOE	Non-SOE	SOE	Non-SOE
	$Probability$		$Records$	
$Official \times Post$	**0.104**	**13.910*****	**−0.021**	**3.979*****
	(0.23)	(16.05)	(−0.09)	(8.71)
$Official$	**−0.909***	**−15.599*****	**−0.487****	**−4.910*****
	(−1.95)	(−30.90)	(−2.03)	(−18.72)
$Post$	**1.010*****	**0.952*****	**0.677*****	**0.608*****
	(4.71)	(4.23)	(5.76)	(5.20)
Other controls	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Region FE	YES	YES	YES	YES
Observations	636	701	638	701
Adj.R^2	0.1245	0.1586	0.1128	0.1413

Table 8
Potential confounding events

This table reports results controlling for two potential confounding events. The first two columns show results controlling for the Eight-Point Regulation and the next two columns present results controlling for the Smart City Program. In columns (1) and (2), I include ETC, which is measured as the sum of firm's annual entertainment and travel costs under two accounting categories: management expenses and sales expenses. In columns (3) and (4), I add an indicator variable $Smart\ City$, which takes the value of one if the firm operates in a city which is named as the "Smart City" in a calendar year. The first dependent variable ($Probability$) is an indicator variable that equals one if there is enforcement action involving environmental violations imposed on firm i in year t. The second dependent variable ($Records$) is defined as the number of annual environmental enforcement records firms received from environmental agencies. Official is an indicator variable that equals one if the firm has at least one resigned official director due to the enactment of Rule 18. Post is an indicator variable that equals one for post-policy period (the year of 2014 or 2015). The interaction term Official × Post captures both the difference between treated firms and control firms as well as the difference before and after the enactment of Rule 18. Each model includes industry and region fixed effects. All continuous variables are winsorized at the levels of 1% and 99%. P-values are computed using firm-clustered standard errors. *, **, and *** denote at 10%, 5% and 1% levels, respectively. All variables are defined in Appendix B.

	Eight-Point Regulation		Smart City Program	
	$Probability$	$Records$	$Probability$	$Records$
	(1)	(2)	(3)	(4)
$Official \times Post$	**1.727****	**0.969*****	**1.285****	**0.700****
	(2.23)	(2.75)	(2.04)	(2.38)
ETC	**−0.126**	**−0.060**		
	(−0.62)	(−0.54)		
$Smart\ City$			**0.076**	**0.035**
			(0.18)	(0.15)
$Official$	**−2.613*****	**−1.518*****	**−2.305*****	**−1.295*****
	(−3.85)	(−5.26)	(−3.93)	(−4.61)
$Post$	**0.893*****	**0.521*****	**0.861****	**0.499****
	(2.58)	(2.70)	(2.37)	(2.51)
Other controls	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Region FE	YES	YES	YES	YES
Observations	348	348	388	388
Adj.R^2	0.2569	0.2180	0.2460	0.2071

Table 9
Placebo analyses

This table presents two sets of placebo analyses. Panel A shows regression results based on 85 matched pseudo-treated firms and 80 matched control firms during the sample period. The pseudo-treated group includes firms with resigned directors from universities, SOEs, and publicly funded organizations ($PseudoOfficial$). Panel B shows regression results using the pseudo-event years. I select the year 2014 as the pre-pseudo-event period and 2015 as the post-pseudo-event period. The first dependent variable ($Probability$) is an indicator variable that equals one if there is enforcement action involving environmental violations imposed on firm i in year t. The second dependent variable ($Records$) is defined as the number of annual environmental enforcement records firms received from environmental agencies. Each model includes industry and region fixed effects. All continuous variables are winsorized at the levels of 1% and 99%. P-values are computed using firm-clustered standard errors. *, **, and *** denote significance at 10%, 5% and 1% levels, respectively. All variables are defined in Appendix B.

Panel A: Tests using the pseudo-treated group

	$Probability$	$Records$
$PseudoOfficial \times Post$	**0.061**	**−0.000**
	(0.17)	(−0.00)
$PseudoOfficial$	**0.400**	**0.252**
	(1.19)	(1.49)
$Post$	**1.065*****	**0.708*****
	(3.84)	(4.75)
Other controls	YES	YES
Industry FE	YES	YES
Region FE	YES	YES
Observations	660	660
Adj.R^2	0.1475	0.1303

Panel B: Tests using the pseudo-event years

	$Probability$	$Records$
$Official \times Post$	**0.703**	**0.379**
	(1.15)	(1.28)
$Official$	**−1.419****	**−0.811****
	(−2.23)	(−2.42)
$Post$	**−0.110**	**0.021**
	(−0.23)	(0.09)
Other controls	YES	YES
Industry FE	YES	YES
Region FE	YES	YES
Observations	194	194
Adj.R^2	0.2671	0.2248