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

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Abstract

Using hand-collected data on violations of environmental regulations by heavily polluting firms in China, we examine the relationship between political connections and the probability of punishment for breach of such regulations. To this end, we exploit a regulatory reform, the enactment of Rule 18, a key component of China's anti-corruption campaign, which required politically connected independent directors to resign from their positions. Using difference-in-differences specifications, we find that firms from which politically connected directors resigned due to Rule 18 experience a significant increase in both the likelihood of ever being punished for environment-related violations and the frequency of punishment. The effect of Rule 18 is more pronounced among firms located in regions with less efficient judicial systems and higher levels of corruption, as well as firms that are not state-owned. Our evidence indicates that in the absence of effective regulation, political connections can be costly to the environment as they strongly affect the enforcement of environmental regulations.

Keywords: Political connections; independent directors; corporate environmental punishment; judicial efficiency; local corruption culture

JEL Classifications: G30, G38.

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1. Introduction

Political connections can be extremely valuable to firms (Fisman, 2001; Goldman et al., 2009; Amore and Bennedsen, 2013). A large body of research has focused on specific benefits associated with political connections, which include easier access to finance through commercial banks or the capital market (Claessens et al., 2008; Houston et al., 2014; Liu et al., 2013), as well as government bailout and favour in contract competition (Faccio et al., 2006; Goldman et al., 2013; Schoenherr, 2019). However, there has been little research on how political connections affect the enforcement of environmental regulations. In this paper, we investigate the relationship between political connections and the probability of punishment for the breach of such regulations.

China provides an ideal setting for this research for two reasons. First, while China has been one of the highest global carbon emitters and has experienced high levels of air pollution, the enforcement of environmental law has been relatively weak.[1] In order to address environmental degradation, China's environmental regulation system was established in the late 1970s.[2] Up to now, more than 20 environmental laws have been promulgated at a national level and over 140 executive regulations have been issued by the State Council. However, their enforcement has largely been weak, primarily due to conflicts of interest between local government and environmental protection bureaus (EPBs).

In the current hierarchy of environmental administration, EPBs are under the control of local governments, which have much discretion over environmental regulation. Since economic growth is the top criterion for political promotion, local officials who are career-minded often prioritize economic development over environmental concerns (Golding, 2011; Su et al., 2012; Tang and Tang, 2018). This creates a space for polluting firms to obtain exemptions for violations through personal connections and even corruption (e.g., bribes, patronage, etc.), as long as they can make a noticeable contribution to the local economy, employment or other provision of social goods (Wang et al., 2003; Maung et al., 2016). This is particularly common in heavily polluting industries, since most industrial pollution and greenhouse gas emissions come from large-scale manufacturing and production; indeed, most emissions come from large state-owned enterprises (SOEs) or capital-intensive private enterprises (Maung et al., 2016). Furthermore, there is clear evidence of collusion between local government and polluting firms, and this represents one of the biggest obstacles to the

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[1]   See   https://www.scmp.com/news/china/science/article/2166542/air-pollution-killing-1-million-people-and-costing-chinese. According to a report issued by 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 (annual average PM2.5 levels).

[2] See http://www.mee.gov.cn.

Electronic copy available at: https://ssrn.com/abstract=4195759

enforcement of environmental regulations.[3] For instance, in 2013, 19 large companies publicly named by the Ministry of Ecology and Environment (MEE) were penalized for repeatedly faking desulfurization figures, including China's five major electrical power companies, the largest state-owned coal producer, as well as the largest oil and gas producer.[4] Despite consistently manipulating environmental data, these large SOEs had received tens of millions of RMB in subsidies each year via local authorities. Thus, to investigate to what extent political connections hamper the enforcement of environmental regulations, we explore how the probability of corporate punishment changed following a specific regulatory change in 2013, the issuance of the 18th Decree (hereafter Rule 18), which is a key component of China's anti-corruption campaign.

Second, in China business success heavily relies on personal relationships and social networks (Lin et al., 2018), especially those of board members. According to Shi et al. (2018), as of 30 September 2013, government officials accounted for approximately 45% of all independent directors of companies in the Chinese A-share market. The effectiveness of such politically connected directors has been studied either by examining the relationship between government official directors and firm value (Wang, 2015; Sun et al., 2016; Chen et al., 2017; Shi et al., 2018) or by exploring how board membership affects firm behaviour (Wang, 2015; Lin et al., 2015; Lee and Wang, 2017; Lin et al., 2018).[5] Since politically connected directors have dominated corporate boards in China, exploring how these directors' resignations affect firm-level punishment for breaches of environmental regulations could help us better understand the political economy of environmental protection in a transition economy.

Identifying the causal effect of political connections on corporate punishment is an empirical challenge since the appointment of independent directors is endogenously determined. For example, heavily polluting firms may strategically select politicians as independent directors to meet their need to communicate with environmental agencies. Indeed, firms with politically connected directors differ from those without politically connected directors in many respects that might be confounded with corporate punishment (Correia, 2014).

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

[4] China's five major electrical power companies include China Huaneng, China Huadian, China Power Investment (CPI), China Guodian, and China Datang. The largest state-owned coal producer is China Shenhua. The largest oil and gas producer is PetroChina.
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.

[5] For brevity, we also use the terminology of "government official directors" in this paper, which has the same meaning as the term "politically connected (independent) directors".

To overcome this endogeneity issue, we 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 board positions. As an important part of China's anti-corruption campaign, Rule 18 was issued by the Chinese Communist Party (CCP) on 19 October 2013. It requires that government and Party officials above a certain rank, either currently in office or who have resigned or retired from office in the past three years, are prohibited from holding any part-time or full-time position in enterprises. Such tough restriction resulted in the resignation of many politically connected directors within a short period of time. The enactment of Rule 18 mitigates the endogeneity problem, since it was not widely discussed beforehand (and so was largely unexpected) and was imposed across all industries by the central government. We can therefore examine whether the consequent change in firms' degree of corporate political connection affected corporate punishment for the breach of environmental regulations. Specifically, we first employ the propensity score matching approach to match a group of firms from which directors resigned due to the issuance of Rule 18 (treated firms) with firms whose directors were unaffected (control firms) based on the similarity of firm characteristics. Using a difference-in-differences framework, our primary finding is that treated firms experienced a significant increase in both the likelihood of ever being punished and the frequency of punishment after the loss of political connection resulted from the issuance of Rule 18.

We then examine whether the effect of Rule 18 varies with the regional level of institutional development. First, we split the sample based on the efficiency of the regional judicial system in China, which captures the quality of the regional legal system, and find that the effect of Rule 18 on corporate environmental punishment is more pronounced among firms in regions with lower levels of judicial efficiency. Second, we examine whether the effect of Rule 18 on corporate environmental punishment varies across regions with various levels of public corruption and the subsample results confirm that the effect is more pronounced among firms located in regions with higher levels of corruption. In further tests, we examine whether the ownership structure matters. Since SOEs have inherent political connections (e.g., Hu et al., 2020b), intuitively, they may be less likely to rely on politically connected directors for preferential treatment than non-SOEs. Hence, we expect the effect of change in political connection resulted from the enactment of Rule 18 to be more pronounced among non-SOEs, and the empirical findings support this view.

To validate the findings, we carry out several robustness checks. Firstly, we examine the dynamic effects of Rule 18 and the validity of the parallel-trend assumption by comparing the coefficient estimates on a pre-reform indicator and post-reform indicators separately. We find

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that an increase in the likelihood and frequency of punishment for environmental violations occurs only after the issuance of Rule 18, which implies that this regulatory reform is more likely to be an external shock to firms rather than a response to changes in economic conditions. Secondly, to ensure the results are driven only by political connections, we conduct two sets of placebo tests. Specifically, we construct a pseudo-treated group by choosing firms with directors from universities, SOEs or publicly funded organizations (i.e., non-politically connected directors) who had resigned following the issuance of Rule 18 and then employing the same procedure used in the main regression. The results show that resignations of non-politically connected directors do not affect the change in corporate punishment. We also use other years as pseudo-event years and do not find significant differences in the probability and frequency of punishment between the treated firms and control firms around the pseudo-event years. Finally, to mitigate concerns that the inferences might be affected by confounding events that occurred around the same time as the issuance of Rule 18, we choose two other important events, namely the Eight-Point Regulation in 2012 and the Smart City Program launched in 2012 for the first batch of smart city pilot projects. The main results still hold when controlling for these two events.

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; Qian and Chen, 2021; Xiao and Shen, 2022). To the best of our knowledge, we are the first to examine how political connections affect corporate punishment for breaches of environmental regulations in China. Importantly, we exploit a regulatory change, the enactment of Rule 18 in October 2013, which forced many politically connected independent directors to resign from their positions. The use of this unforeseen event helps address the endogeneity issue. In a closely related study, Maung et al. (2016) find that SOEs are more likely to pay less in environmental levies than other firms. Rather than using an economic policy instrument (e.g., pollution levies used in Maung et al., 2016), our study focuses on a regulatory policy tool, punishment, which is more important in the low-trust countries, like China, where distrust often generates a public demand for stronger regulation (Aghion et al., 2010). We use the number of records of punishment for breaches of environmental regulations as this is likely to be a more accurate measure of the outcome of enforcement, given the likelihood of its long-term damage to corporate reputation and brand image.

Xiao and Shen's (2022) more recent study, which is related to ours, uses Rule 18 as a natural experimental setting and demonstrates that the absence of politically connected

independent directors (PCIDs) facilitates an improvement in corporate environmental performance. Our work differs from Xiao and Shen's in a number of ways. Firstly, our sample constructions differ from one another. By decomposing firms' environmental ratings into environmental strengths and environmental concerns, Xiao and Shen (2022) find that the loss of political connections results in a significant increase in firms' environmental strengths but a slight decline in firms' environmental concerns, which is consistent with the "tunnelling" mechanism rather than the "sheltering" mechanism.[6] However, such finding is drawn on a sample of privately controlled firms where the "tunnelling" activities by private controlling shareholders through related-party transactions are more prevalent, supporting the tunnelling channel. Our study mainly focuses on heavily polluting firms including both SOEs and non-SOEs. The motivations to hire government officials as independent directors might be different involving both rent-seeking (for SOEs) and expropriation (for non-SOEs) across firms (Wang, 2015). As a result, it is likely that the "sheltering channel" and the "tunnelling channel" will coexist, which may lead to a different conclusion. Secondly, we focus on different environmental outcome variables. While Xiao and Shen (2022) aim to explore the effect of political connections on firms' environmental performance which is measured as the total environmental strength score minus total environmental concern score (the net environmental rating), our paper emphasizes the enforcement issues on environmental protection, which enables us to highlight the threats of punishment stemming from the enforcement of law.

Second, we contribute by utilising a novel source to collect environmental performance data at the firm level in China. Because detailed information on corporate environmental performance is rarely included in annual reports, most measures related to environmental outcomes are at an aggregate level (at a provincial or national level). To address this issue, we manually collect high-quality information on firm-level environmental performance from the Institute of Public and Environmental Affairs (IPE). Relying on big data analytics, the IPE platform provides complete records of corporate environment-related violations and punishments that cover a wide range of enterprises including both publicly listed companies and their subsidiaries. This database integrates the information on environmental violation and enforcement from multiple credible sources in different formats, ranging from supervision

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[6] According to Xiao and Shen (2022), the "tunnelling" mechanism suggests that political connections may motivate controlling shareholders to tunnel, reducing available resources that could be used to improve firms' environmental performance. As a result, firms that lose political connections as a result of Rule 18 will voluntarily spend more on improving environmental strengths and concerns. According to the "sheltering" mechanism, political connections shield firms from being investigated and punished by regulatory agencies for environmental violations. Firms that lose political ties as a result of Rule 18 would be pushed to address environmental concerns in order to meet the minimum environmental standards and avoid punishment, but they would have no incentive to strengthen their environmental positions.

records on environmental quality, emissions and pollution published by local governments in 31 provinces and 338 cities, to those self-monitoring records mandatorily or voluntarily disclosed by enterprises. Given the absence of a secondary database containing data on environmental regulatory information, the IPE platform is a useful resource for retrieving the data required for measuring the effectiveness of enforcement.[7]

Finally, this paper also adds to the broader literature investigating the impact of China's far-reaching anti-corruption campaign on firm outcomes (Giannetti et al., 2021; Cao et al., 2018; Kong and Qin, 2021; Lin et al., 2016; Hao et al., 2020). In particular, Rule 18 has been utilized by other scholars, for example to examine the effect of its announcement on firms' stock returns (Shi et al., 2018) or its impact on corporate activities, such as the quality of financial reports (Hope et al., 2020), labour costs (Wei et al., 2020), corporate innovation (Qin and Zhang, 2019), corporate environmental disclosure and performance (Qian and Chen, 2021; Xiao and Shen, 2022), and corporate social responsibility performance (Li and Guo, 2022). This paper is the first to examine the impact of Rule 18 on corporate punishment for breaches of environmental regulations.

The remainder of the paper proceeds as follows. The next section provides background information on China's anti-corruption campaign and Rule 18 in particular, 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, related literature, and hypothesis development

2.1 Institutional background

In 2012, a far-reaching nationwide anti-corruption campaign took place in China.[8] Following the launch of the campaign, a series of regulations were issued to constrain the power of public servants and the behaviour of the Party and government officials. The most influential one, Rule 18, entitled "Opinion Regarding Further Regulating Party and Government Officials'

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[7] The information includes the name of enterprises being punished, the reason for punishment, the type of punishment, the size of the fine, the time for compliance with the order, the name of the institution(s) that announced the penalty, and the date on the enforcement document disclosed by the supervisor.

[8] President Xi launched the campaign in late 2012. He stressed that corruption had been the biggest threat to the ruling party and would 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.

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Part-Time (and Full-Time) Careers in Enterprises", was issued by the Organization Department of the Communist Party of China (CCCPC) on 19 October 2013.

Up until then, government officials commonly acted as independent directors on corporate boards. In China, business success heavily relied on the personal relationships and social networks of senior managers and board members (Lin et al., 2018). To gain competitive advantages in the market, firms sought to build a close relationship with government by hiring politicians as independent directors, who were often well-paid and enjoyed a range of perks.

Recognizing the potential risk of bribery and corruption in relations between firms and bureaucrats, the CCCPC promulgated Rule 18 to prevent possible rent-seeking behaviours. It prohibited all incumbent government and party officials above certain ranks from holding any independent directorship. Former politicians, those who had resigned or retired within the past three years, were also prohibited from holding such positions in firms whose business activities and fields fell within the scope of their prior area of responsibility.[9] Within eight months, around 300 government officials had resigned from the boards of publicly listed companies.[10] As shown in Figure 1, more than 60% among our firm-year observations have at least one politically connected independent director on the board in the pre-Rule period, compared with only 24.61% in 2015.[11] The observed significant decrease in the proportion of firms with politically connected directors from 2012 to 2015 provides supporting evidence that Rule 18 effectively cut the political connections of firms by forcing these government official directors to resign.

In this study, we use Rule 18 as a quasi-natural experiment which enables us to explore the effectiveness of the anti-corruption campaign in improving environmental regulatory enforcement. For one, the announcement of Rule 18 was a shock to the market: it was universally unforeseen by firms. More importantly, the departure of politically connected directors, as an exogenous shock, did not result from firms' environmental performance. Thus, the enactment of Rule 18 provides a useful setting to study the causal effect of political connections on corporate punishment for the breach of environmental regulations.

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[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] According to the Independent Director System established in 2001 in China, at least one-third of all directors of publicly listed firms must be independent. The unexpected resignation of politically connected directors caused by Rule 18 in a short period of time led to the number of independent directors falling below the mandatory limit. In this instance, firms are permitted to retain these independent board members until new directors are appointed. This is one possible explanation for why 24.61 % of our sample observations at the end of 2015 still included politically connected board members. See https://www.yicai.com/news/3991175.html (in Chinese).

2.2 Related literature on the effect of political connections

Following the pioneering work 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.[12] For example, using a sample of firms from 47 countries, Faccio (2006) shows a positive stock market reaction to 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 bailout (Faccio et al., 2006), lighter taxation (Kim and Zhang, 2016; 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 expenditure 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 – notably, those with ties to the government (Gordon and Hafer, 2005). Likewise, other government institutions, such as the US Internal Revenue Service (IRS) (Young et al., 2001; Hunter and Nelson, 1995), the US Federal Trade Commission (FTC) (Faith et al., 1982; Weingast and Moran, 1983) and the US Securities and Exchange Commission (SEC) (Correia, 2014; Fulmer et al., 2022; Heese, 2015), were also accused of selective enforcement.

Turning to the US Environmental Protection Agency (EPA), it has also discretion in deciding whether to investigate 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 excessive carbon emissions and less likely to receive a severe penalty when one is imposed. This evidence is consistent with the findings of Gulen and Myers (2022), who argue that the EPA's biased enforcement can be attributed to its lax oversight of state-level regulators in swing states. Heitz et al. (2021) provide further evidence that, while politically connected firms and non-politically connected firms are treated equally by the EPA in the investigation process, the former receive smaller fines if a violation is detected.

Distinguished from firms in the US, firms in China have different ways to build corporate

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[12] Another body of research demonstrates that political connections can destroy value. For instance, Schoenherr (2019) demonstrates that political connections reduce contract allocation efficiency. Sun et al. (2016) find that board political capital can have a negative aspect in that it permits block-holder rent appropriation. This literature, however, is irrelevant to our research question for this paper.

political connections, resulting in diversified definitions of political connections in the literature.[13] Empirical research in 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 having a politically connected CEO on post-IPO performance and find that firms with a politically connected CEO have worse post-IPO performance than other firms, which is consistent with the "grabbing hand" argument of Shleifer and Vishny (1998). Chen and Kung (2019) find that firms with connections to members of China's political elites enjoy a price discount in the primary land market and tend to purchase slightly more land as well. In return, local officials offering cheaper prices to politically connected firms are more likely to be promoted. Interestingly, the authors find that the anti-corruption campaign reduced the likelihood of such dealings. Lu et al. (2015) report that SOEs have an 8.6% higher win rate at trials involving the company than non-SOEs do, due to judicial bias.

Hiring former or incumbent politicians as independent directors was a common way for firms to cultivate a good relationship with the government in China (Zhang and Truong, 2019).[14] There is no doubt that independent directors play a pivotal role in shaping the Chinese system of corporate governance (Zhang and Truong, 2019). The resource dependency theory (see Pfeffer and Salancik, 1978) contends that preferential access to resources by directors and the board as a whole can be advantageous to firms. Independent directors with political ties are therefore expected to perform their duties and increase the value of the company by providing the company with access to scarce resources. This hypothesis is supported by Wang (2015), who finds that appointing independent directors with a political background can increase the value of privately held companies by facilitating access to external debt financing and increasing government subsidies. Additionally, Zhang and Truong (2019) find that politically connected directors are viewed as an important channel for reducing the information asymmetry between the firm and the government. This is especially useful for companies undertaking government-related business. When it comes to broader regulatory enforcement, politically connected firms generally seem to be less subject to scrutiny and encounter less regulatory burden. Indeed, as Berkman et al. (2010) suggest, minority shareholders in firms

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[13] Political connections can be defined in different ways. For example, Fan et al. (2007) and Liu et al. (2012) 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 proxies widely used in the literature include politically connected chairman (Wu et al., 2012a; Liu et al., 2012), political connected independent directors (Zhang and Truong, 2019), and state ownership of the firm (Lu et al., 2015).

[14] Hiring politicians as directors was pervasive across Chinese firms before Rule 18. Unlike many Western countries, which have strict rules and regulations for enforcing the post-employment restrictions on the civil servants once they leave the service, China had no specific post-employment policy for civil servants after leaving office (Lin et al., 2018).

with a state bureaucrat as the controlling shareholder are less likely to benefit from the enforcement of new regulations that improve the protection of minority shareholders. Lin et al. (2018) show that firms with a politically connected board are less likely to have infringements detected and to be fined by tax authorities if they are detected, which results in those authorities being less effective in constraining tax avoidance. Apart from tax agencies, courts can also be biased towards state-owned firms (Lu et al., 2015).

In summary, existing studies, particularly those on China, confirm a variety of benefits associated with political connections. However, there is limited evidence as to whether a company's political ties could influence the punishment for environmental violations. This study intends to investigate this important issue.

2.3 Hypotheses development

Based on the literature discussed above, it is possible that politically connected firms are more likely to evade environmental regulation, for example if news reports about corporate environmental violations are suppressed (Schweizer et al., 2020). The favourable regulatory outcome can also result from the politically connected directors' personal influence on environmental agencies based on their familiarity with enforcement procedures, their professional knowledge, or their long-term personal relationships and experiences in communicating with environmental agencies. However, in China, given that government official directors' ability to exercise discretion over decisions on investigating and imposing penalties has been limited since the launch of the anti-corruption campaign (with no change in other relevant factors), the value of those firms from which politically connected directors resigned due to Rule 18 may be diminished. We therefore expect that resignation of politically connected board members in response to the issuance of Rule 18 will increase the likelihood of firms receiving at least one environmental penalty and the frequency of punishments.

One plausible alternative explanation for the impact of firm-level political involvement on the enforcement of regulations is the career concerns of bureaucrats sitting on boards (Correia, 2014). As discussed by Zhang et al. (2019), the selective enforcement of environmental regulations stems from conflicts of interest between local governments and EPBs. In China, substantial power has been devolved from the central government to the local governments concerning how the central government's initiatives are to be implemented, including by appointing appropriate personnel and setting realistic agency budgets. The EPBs, which are critical government agencies at a provincial level, are under the leadership of the local government, but they have limited regulatory power. Additionally, the career promotion of

officials working in local government mainly depends on local economic performance, particularly in terms of GDP and revenue growth. Achievements in environmental improvement and poverty reduction are largely ignored (Tang and Tang, 2018). Anecdotal evidence suggests that politicians involved in the environmental branches of the local governments, compared with those in other branches, are less likely to be promoted in China, possibly because their efforts to improve the quality of the environment may not be immediately reflected in GDP or other performance metrics.[15] Hence, in the absence of adequate regulatory power and brighter promotion prospects, it is reasonable to expect EPBs to be more likely to fudge their enforcement responsibilities. On the other hand, it is plausible that firms with political connections, particularly those in the heavily polluting industries, will also be those that yield high profits and taxes. Given their major roles in local employment and providing local revenue, the local government is more likely to use its discretion in enforcing environmental regulations to provide such firms with concessions, such as requiring the local EPBs to accept lax enforcement of environmental standards and to impose lower environmental levies (Wang et al., 2003; Maung et al., 2016; Zhang et al., 2018). Since firms whose politically connected directors resigned as a result of Rule 18 would no longer be able to benefit from their local government connections, we conjecture that the possibility and the extent to which these firms benefit from lax regulatory enforcement decreased after the enactment of Rule 18.

In summary, our primary hypothesis is stated as follows:

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

While political connections can benefit firms through affecting regulatory decision making, the magnitude of this effect depends upon the level of institutional development. For example, the legal environment, including the system of legislation and enforcement, profoundly affects the extent to which individual firms can benefit from political affiliation (Allen et al., 2005). In a cross-country study, Faccio (2006) finds that the 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 in the economy. In the context of China, Lu et al. (2015) show that firms with links to the government are more

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likely to be satisfied with their court settlements if they are located in regions with less developed legal institutions and more business-unfriendly legal environments.

To a large extent, the effectiveness of China's anti-corruption campaign and the efficiency of its judiciary are inextricable. Judicial efficiency requires a reliable legal enforcement mechanism and that the courts should be capable of processing cases in a professional and fair manner without unreasonable delays (Voigt, 2016). In China, not all regions' judiciaries operate at the same level of efficiency, particularly in terms of environmental enforcement. In provinces with lower levels of judicial efficiency, the traditional court system plays a very limited role in environmental cases, which is often associated with delayed judicial decision-making. This can be partly attributed to the decentralization of judicial institutions. Under the current Chinese judicial system, a single environmental case (unlike common types of case) 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 in dispute resolution regarding environmental cases is possibly even worse than that of common types of case. Moreover, environmental cases often involve a broad scope of law, such as that governing land and resources, waste discharge and operations, and so on. Yet, it is difficult for judges, especially those in areas with fewer resources and more enforcement capacity constraints, to receive the specialized training required for them to deal well with environmental cases and hence provide efficient adjudication (Zhang et al., 2019). Therefore, owing to the court delay in these areas and correspondingly high costs of environmental litigation, firms involved in environmental cases are often unwilling to make a legal challenge even if they receive unfair treatment from environmental agencies. Firms then have strong incentives to establish political connections as a tool for resolving conflicts. Since the extent to which local environmental agencies can deter breaches of environmental regulations is subject to the strength of corporate political connections, we expect the effect of political connections on the probability of environmental punishment to be more pronounced in provinces with less efficient judicial systems. Thus, the effect of the enactment of Rule 18 in undermining the negative relationship between environmental enforcement and political connections should be more pronounced among firms located in these provinces. These suppositions lead to the second hypothesis:

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 less efficient judicial systems.

Local corruption culture can also affect the implementation of anti-corruption measures. 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 higher levels of corruption, courts and regulators are more likely to be "captured" by political or interest groups, resulting in a failure of independent and impartial decision-making in environmental cases. Firms that violate environmental regulations have a motivation to establish relationships with government officials and even, in some cases, "grease" regulators through bribery. In turn, environmental officials in areas where the local culture tolerates corruption, may be less thoroughly monitored and have a better chance to maximize their opportunities to collect bribes by misusing their power to reduce regulatory oversight (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, 2022). Given that the anti-corruption campaign in China has targeted corruption at all levels, the environmental law enforcement officials are targeted as well. We therefore anticipate that the implementation of Rule 18 has a more pronounced impact on weakening the negative relationship between environmental enforcement and political connections for firms in more corrupt provinces. We accordingly state our third hypothesis as follows:

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. We obtain firm characteristics and financial information from the China Stock Market and Accounting Research (CSMAR), developed by GTA, one of leading data providers in China. We collect independent directors' personal biographical information mainly from the CSMAR. If the information in CSMAR is insufficient, supplement information is obtained from corporate annual reports, financial news websites and general internet searches with combined keywords (e.g., company name/stock code plus director's name).[16]

Data on corporate penalties for environmental infringements are manually collected from

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

a publicly available online environmental database established by the IPE, an influential non-profit environmental research organization in Beijing. [17] This database contains a comprehensive collection of supervision records on environmental quality, emissions and pollution published by local governments in 31 provinces and 338 cities, as well as information voluntarily disclosed by enterprises or required by legislation and under corporate social responsibility since 2006. Apart from records on corporate violations, the IPE also holds records specifically on corporate penalties for breaches of environmental regulations. This enables us to retrieve the name of those publicly listed companies and their affiliated enterprises (e.g., branches, subsidiaries and related parties) being punished, the reason for the punishment, the type of the punishment (e.g., warning, censure or fine), the size of the fine, the time for compliance with the order, the name of the institutions that announced the penalty, and the date on the enforcement document disclosed by the supervisor.

We start the data collection by searching for all corporate environmental punishment records via the IPE platform with the full name of each publicly listed company (or stock code) of interest during the period 2012 to 2015, which covers the year before, year of and two years after the enactment of Rule 18. The IPE records have the drawback that they do not all have the same format or record the same information. It is therefore difficult to aggregate them directly for further analysis. To address this issue, we focus on two most important categories of punishment: the "Decision of Administrative Punishment" and the "Publication of Information about Administrative Punishments".[18] For each firm-year, we calculate the total number of records falling into either of these categories for both the parent publicly listed company and its subsidiaries. Given that when an environmental violation occurs, it might take several days for the inspection to finish and a penalty order to be issued, we include those records whose enforcement date falls into the sample period, regardless of the date when the violation occurred. Depending on the specific category of the record, this is either the date of issue on the enforcement document or the date when the notice of punishment was made available to the public.[19] In this way, we find a total of 816 environmental punishment records over the period 2012 to 2015.

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[17] See http://www.ipe.org.cn.

[18] These two categories jointly account for the majority of total records of all firms in the sample period.

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

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 exchanges. To examine the outcome of the implementation of Rule 18 in 2013, we focus on a relatively short time span of 4 years from 2012 to 2015, with a two-year pre-event period and a two-year post-event period. We remove firms under financial distress or any other abnormal condition (ST stock) and those at risk of termination (*ST stock) during the sample period. Firms appearing in the year 2012 or later are also excluded, to ensure all firms have observations over a time span in which the regulatory change took place. We further restrict the sample of firms to heavily polluting industries because most environmental issues in China frequently occur in the heavily polluting industries where many firms are accused of committing serious environmental violations due to their continued involvement in the large-scale industrial production (Vennemo et al., 2009). Focusing on heavily polluting firms provides a genuine opportunity for exploring the effectiveness of the penalty function in regulating these violators in China. In addition, imposing this restriction can improve the validity of our research findings by reducing the potential impact of different environmental disclosure requirements imposed on firms among various industries. In China, it is mandatory for firms in heavily polluting industries to publish annual environmental reports and to disclose environmental information regarding pollutant discharge, environmental compliance, and environmental management on a regular basis, whereas it is voluntary for publicly listed firms beyond heavily polluting industries to disclose environmental information (Situ and Tilt, 2018). The stringent requirements on environmental disclosure for heavily polluting firms make it easier for the IPE to capture the environmental regulatory information of these firms because of its high transparency and accessibility.[20] This ensures, to some extent, that our hand-collected data on corporate penalties for environmental infringements are more complete and comparable across heavily polluting firms. As there is no widely accepted definition of a heavily polluting firm in the academic research literature, this study refers to a list of heavily polluting industries contained in the Decree on Environmental Information Disclosure issued by the Chinese Ministry of Environmental Protection in 2010, in line with previous research (Ren et al., 2019; Zhu and Tan, 2022; Qian and Chen, 2021).[21] For the purposes of data

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[20] Particularly, according to the "Environmental information disclosure guidance for Chinese listed companies" issued by the Ministry of Environmental Protection of China in 2010, major polluters are required to make a detailed provisional disclosure of any pollution incidents, environmental offenses and punishment within a day occurred. For more details, see https://www.cbex.com.cn/wm/rddt/xydt/201009/t20100915_9184.html (in Chinese).

[21] According to the Decree, there are 18 main industrial subsectors that are heavily polluting: thermal power; iron and steel; cement; electrolytic aluminium; coal; metallurgy; building materials; mining; chemicals;

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collection, it is necessary to bundle these industries into the broader industry codes used in the CSMAR database: B06, B07, B08, B09, C13, C14, C15, C17, C19, C20, C22, C25, C26, C27, C28, C30, C31, C32, and D44. This produces a primary sample of 556 individual firms in heavily polluting industries with 2,224 firm-year observations.

For firms within the primary sample, we hand collect all corporate announcements of the resignation of independent directors made between 19 October 2013, the date of enactment of Rule 18, to the fiscal year end of 2015. In total, 303 firms made such announcements, and there were 476 resignations of 434 independent directors. For each announcement, we retrieve the information on the name of directors who resigned, the date of resignation and, more importantly, the reason for departure. To ensure all departures are due to the enactment of Rule 18, we retain those resignation 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. In addition, where the announcement merely states that the resignation is "due to personal reasons", we check the work experience of the directors to identify whether Rule 18 nevertheless applies to them. This step allows us to augment the sample with 141 resigned directors, of whom 51 (36%) are identified as politically connected directors. In addition, in the case of 103 firms, the directors who resigned are non-politically connected, and these, too, are eliminated from the sample. This leaves a sample of 86 politically connected directors at 70 firms who resigned because of the passing of Rule 18.[22] Finally, we discard 61 firms which retain at least one director with political connections sitting on the board at the end of 2015. Thus, the final sample contains 386 firms between 2012 and 2015, among which 56 have politically connected directors and are assigned to the treated group. Table 1 summarizes the sample selection process.

3.3 Research design

We adopt a difference-in-differences method to analyse how political connections affect environmental enforcement. This approach allows us to address endogeneity issues (i.e., reverse causality and omitted variables) by investigating an exogenous shock to political connections (the forced resignation of politically connected independent directors resulted from the issuance of Rule 18). This is important because, as discussed previously, politically

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petrochemicals; pharmaceuticals; paper; fermentation; sugar; textiles; leather; brewing; vegetable oil processing.
[22] Although Rule 18 mainly applies to government officials, in practice it also affects other groups of independent directors without explicit political connections but holding civil-service rank, such as university professors, the managers of SOEs and publicly funded organizations.

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, before employing the difference-in-differences procedure, we use a propensity score matching approach to create a matched control sample conditional on the similarity of firm characteristics to those of treated firms. For each treated firm, we select a control firm by using the nearest-neighbour matching technique, with replacement based on the information in 2013. Specifically, we generate estimates of probabilities of being affected by Rule 18 from a logit model (whether the firm has at least one politically connected director who resigned due to the issuance of Rule 18) for all firms with available data for the variables listed in Appendix A.

To shed light on the effect of the official ban on firms having directors with political connections, we estimate the following difference-in-differences model:

$$
\begin{aligned}
Enforcement_{i,t} = {} & \beta_0 + \beta_1 PC_{i,t} + \beta_2 Post_{i,t} + \beta_3 PC_{i,t} \times Post_{i,t} + \beta_4 Firm\ Size_{i,t} \\
& + \beta_5 Leverage_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Firm\ Age_{i,t} + \beta_8 Cash\ Flow_{i,t} \\
& + \beta_9 Property, Plant\ and\ Equipment_{i,t} + \beta_{10} Sales\ Growth_{i,t} \\
& + \beta_{11} Sales\ Volatility_{i,t} + \beta_{12} Market\text{-}to\text{-}Book_{i,t} + \beta_{13} Top1_{i,t} \\
& + \beta_{14} Internal\ Control_{i,t} + \beta_{15} Auditor_{i,t} + \beta_{16} Board\ Size_{i,t} \\
& + \beta_{17} Analyst_{i,t} + \beta_{18} State\ Owned_{i,t} + Fixed\ Effects + \varepsilon_{i,t}
\end{aligned}
$$

The dependent variable, $Enforcement_{i,t}$, captures either the likelihood of being punished for violation of an environment-related regulation (*Punish Dummy*) or the frequency of punishment (*Punish Frequency*). *Punish Dummy* is an indicator that equals 1 if an enforcement action (i.e., the firm has received an environmental enforcement record from an environmental agency) is imposed on firm i in year t, and 0 otherwise. We also rank the frequency of punishment with *Punish Frequency*, a categorical variable, which is set to 2 if, for firm i in year t, the total number of enforcement records exceeds one, 1 if the total number of records equals one, and 0 if no enforcement action is imposed in that year.

$PC_{i,t}$ is an indicator variable that takes the value of 1 if firm i has at least one resigned politically connected independent director due to the enactment of Rule 18 (0 otherwise). In line with Fan et al. (2007) and Xiao and Shen (2022), we define politically connected independent directors as those serving as current or former government officials, Party

members or armed forces officers with a position equivalent to or above the county level of administration.[23] $Post_{i,t}$ is set to 1 for firm-years in the post-Rule period (i.e., 2014 or 2015) (0 otherwise). The key variable of interest is the interaction term, $PC_{i,t} \times Post_{i,t}$, whose coefficient captures the change in environmental enforcement for treated firms relative to the change for control firms subsequent to the change in political connections resulted from the event, the enactment of Rule 18.

Following the literature on the departure of independent directors (Fahlenbrach et al., 2017; Hope et al., 2020; Wei et al., 2020), we consider to control for standard firm characteristics that could be related to both the probability of government official directors departing and the incidence of regulatory enforcement in relation to corporate environmental violations, namely firm size ($Firm\ Size$), financial leverage ($Leverage$), firm profitability (ROA), firm age $(Firm\ Age)$, the level of cash flow $(CashFlow)$, capital intensity ($Property, Plant\ and\ Equipment$), sales growth ($Sales\ Growth$), sales volatility ($Sales\ Volatility$), market-to-book value ($Market\text{-}to\text{-}Book$), and state ownership ($State\ Owned$). We also control for corporate governance characteristics, namely ownership concentration ($Top1$), the quality of internal control ($Internal\ Control$), analyst coverage ($Analyst$), the total number of directors ($Board\ Size$), as well as audit opinion ($Auditor$).[24] Industry, region and year fixed effects are

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[23] Note that independent directors who only hold the National People's Congress (NPC) or the Chinese People's Political Consultative Conference (CPCC) membership are politically connected (Shi et al., 2018; Hu et al., 2020b), though they are not included into the treated group since they are not restricted by the Rule 18.

We are aware of related literature focusing on the role of CEOs' political connections or the average level of a firm's political connections including all board members (Fan et al., 2007; Xiao and Shen, 2022). Our study focuses exclusively on the political background of independent directors because the Rule 18 itself is less likely to affect the political status of CEOs and other board members. For Chinese SOEs, the appointment of top executives and the board composition are determined by the Organization Department of the CPC Central Committee or the State-owned Assets Supervision and Administration Commission of the State Council (SASAC). These appointees have the corresponding administrative ranks (e.g., vice-ministerial level) depending on the level of the firm's hierarchy which are similar to those political elites of the same administrative ranks' (e.g., vice provincial party secretaries or governors) in government. Though these appointees are not the so-called "politicians" (government officials), they are formally appointed by the government institutions, which will be unaffected by the Rule 18. For Chinese non-SOEs, the key positions (except independent directors) in practice are usually occupied by either professional mangers or family members (and relatives) who are also less likely to be the target of the Rule 18 due to the strict employment (and post-employment) restrictions imposed on civil servants (Cai et al., 2013; Gao and He, 2019).

We acknowledge that the effect of hiring PCIDs to the board may be diminished if the company already has insiders with political connections. However, there is evidence showing that PCIDs still matter even after controlling for the political background of other board members (see Wang, 2015). Motivated by Wang (2015), in order to rule out the potential impact of CEO political background on our primary results, we remove firms that experienced a CEO turnover during our sample period from the treated group (that is, we keep the CEO effect constant) and repeat the main analysis in Table 4. In an untabulated analysis, we find our main findings are still valid, as the coefficients on PC×Post are significant at the 1% level, with coefficients of 2.801 and 1.375 in models 3 and 6 of Table 4, respectively.

[24] The variable of audit opinion ($Auditor$) is automatically omitted due to collinearity when implementing the first step of PSM.

included in subsequent regression specifications as well.[25] In addition, we cluster standard errors by firm to account for possible within-firm serial correlation. All continuous variables are winsorized at the 1% and 99% levels in order to reduce the influence of outliers. Appendix A presents the definitions of all the variables.

4. Empirical results

4.1 Descriptive statistics

Table 2 describes the distribution of firms in the sample across the 19 heavily polluting industries. Two groups, "Raw chemical materials and chemical products (C26)" and "Pharmaceutical manufacturing (C27)", jointly account for 37.77% of the sample. Otherwise, the sample firms are fairly evenly dispersed across industries.

Summary statistics for the treated group and control group are presented in Table 3. Comparing treated firms and control firms in the year prior to the event, we find important differences in firm characteristics (Panel A of Table 3). For example, relative to non-connected firms, firms with resigned politically connected directors operate with a higher degree of financial leverage, have a higher market-to-book ratio and are more likely to be SOEs. These differences in firm attributes between treated and control firms might affect government official directors' willingness to serve on the board and thus drive their choices to remain in the position or not; if so, that in turn might spuriously drive the main results. Therefore, in these cases, we use a propensity score matching approach to identify a group of control firms which are most similar to the treated firms. After adopting this approach, the comparison between the treated group and the control group shows little difference in terms of all firm characteristics (the column "Treated−Control (PSM)" in Panel A). In addition, as shown in Appendix B, we demonstrate that the propensity score matching approach is effective in adjusting for the balance of covariates across treated and control groups.[26]

Panel B of Table 3 summarizes the statistics for the 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.[27] We find that the mean of

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[25] Due to the nature of our study, research question, and small sample size, we have decided not to control for the firm fixed effects, as doing so would essentially eliminate a large portion of our sample; that is, all firms for which there is no enforcement action involving environmental violations (no variation in the dependent variable). This would prevent us from identifying cross-sectional differences and, consequently, diminish the statistical power of our tests.

[26] The balancing test results show that the mean bias drops remarkably, from 20.3 percent (before PSM) to 10.0 percent (after PSM).

[27] The reason why the number of matched treated firms is different from the number of matched control firms is that one treated firm (stock code: 000920) in our sample has been matched to two control firms (stock code:

Punish Dummy is 0.204 and the mean value of *Punish Frequency* is 0.299. With respect to key control variables, we find that the mean of *Firm Size* is 22.462, the mean *Leverage* is 0.098, the mean *ROA* is 0.097 and the average *Firm Age* is 2.69 years. We also find that the average *Board Size* 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 (Hope et al., 2020; Wei et al., 2020; Li and Guo, 2022).

4.2 Baseline regression results

Table 4 presents estimates of the main regression model regarding the impact of Rule 18 on corporate punishment based on the sample with all non-treated firms as control firms in Panel A and the sample with PSM control firms in Panel B. For both panels, we run two sets of regressions, where the first dependent variable *Punish Dummy* captures the likelihood of regulatory environmental enforcement and the second dependent variable *Punish Frequency* measures the frequency of punishment for environmental violations. In column (1) of Panel A, where PC is the only explanatory variable, we find that it has a significant and negative effect on the probability of an environmental enforcement action. In column (2) of Panel A, after controlling for firm characteristics and including industry and region fixed effects, we find that the coefficient on PC remains negative and significant. These findings indicate that firms are less likely to receive an environmental penalty if they hire government official directors to establish political connections, which is in line with findings in prior research (e.g., Wang et al., 2003; Maung et al., 2016). In column (3) of Panel A, we regress *Punish Dummy* on the interaction term for government official directors and the post-Rule indicator ($PC \times Post$) and a series of control variables with the inclusion of industry, region and year fixed effects. The estimated coefficient on $PC \times Post$ is 0.898, which is statistically significant at the 5% level. This result suggests that firms with resigned politically connected directors tend to have a higher probability of environmental enforcement after the issuance of Rule 18. In columns (4)-(6) of Panel A, we replace *Punish Dummy* with *Punish Frequency* and estimate the ordered probit regression model. The results are consistent with those in columns (1)-(3).

Panel B of Table 4 shows the results based on a PSM sample, which are similar to those in the Panel A. We observe more negative and significant coefficients on PC in all columns. In columns (3) and (6), the estimated coefficients on $PC \times Post$ are 1.313 and 0.755, respectively,

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600019 and 002128) with (nearly) the same closest propensity scores (0.19843899 and 0.1989002). Our results are robust when only choosing the firm with the stock code of 600019 as a matched control firm. Corresponding results are available upon request.

which are both statistically significant at the 5% level. Importantly, this effect is also economically sizable. In untabulated analyses, we find that the probability of being punished for environment-related violations in the treated group is 27% higher after the enactment of Rule 18, while we do not find any significant change in the control group.[28] Taken together, the empirical results presented in Table 4 are consistent with the first hypothesis, which suggests that treated firms experience an increase in both the likelihood of receiving punishment and the frequency of punishment subsequent to the issuance of Rule 18.[29]

Our results are consistent with the argument that the connection between firms and government brought by the appointment of PCIDs reduces the cost of breaching environmental legislation since such affiliation can shelter firms from investigations and punishment against environmental violations (Fisman and Wang, 2015; Xiao and Shen, 2022). Plausibly, there are several channels that can explain how the resignation of PCIDs may affect environmental enforcement outcomes. For example, it is more difficult for firms losing PCIDs after Rule 18 to prepare for a surprise environmental inspection, thereby leading to a higher likelihood of being detected in environmental violations and thus getting punished. Since the enforcement of Rule 18, politically connected firms may suffer a higher incidence of being punished for their environmental violation behaviours because of the sudden departure of the PCIDs, who can be helpful in delaying the enforcement proceedings through their network ties to the authorities. Admittedly, it is possible that firms with a loss of PCIDs may adopt a series of positive strategies (e.g., increasing an investment in green innovation and sustainability) to reduce environmental pollution, which can lower the incidence of environmental violations and punishment (Xiao and Shen, 2022). However, these affirmative actions coupled with their consequences are less likely to be immediately observed as they are time-consuming; Instead, it is intuitive that the incidences of punishment are more likely to increase due to the lack of protection from the PCIDs after their sudden departure from the board.

4.3 Cross-sectional results

In this subsection, we examine whether the effect of the anti-corruption campaign on corporate punishment varies with the province's level of institutional development. As proposed in

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[28] To facilitate the interpretation of the logistic regression coefficient, we also calculate the odds ratio for the interaction term "$PC \times Post$", which equals 3.719. With respect to the marginal effect, while the value for PC is fixed at 1, the change in the coefficient of $PC \times Post$ equals 0.277, which is statistically significant at the 5% level (Z-statistic=2.04). By contrast, while the value for PC is fixed at 0, the change in the coefficient of $PC \times Post$ equals 0.305, which is statistically insignificant (Z-statistic=1.39).

[29] In the following analyses, we focus on the sample with PSM control firms and include region, industry and year fixed effects.

hypothesis 2, we expect that the anti-corruption measure provided a stronger shock on average in provinces with less efficient judicial systems. To test hypothesis 2, we use the index of market intermediaries and legal environment, which is one aspect of Fan et al.'s (2017) marketization index, to capture judicial efficiency. We split the full sample into two based on the median of the provincial-level index. The results presented in Table 5 indicate that regardless of which dependent variable we use, the coefficient on the interaction term of PC and $Post$ is significant at the 5 percent level in the group with less efficient judicial systems (with coefficients of 2.278 with a t-statistic of 2.43 and 1.183 with a t-statistic of 2.39, respectively) whereas it is insignificant in the group with more efficient systems (with coefficients of 0.342 with a t-statistic of 0.23 and 0.220 with a t-statistic of 0.27, respectively). This is consistent with our conjecture that political connections serve as a substitute for a province's formal institutions, and their effect is particularly pronounced in provinces where connected firms are more heavily affected by Rule 18.

We next examine hypothesis 3 by testing whether another institutional factor, local corruption culture, affects the relation between political connections and environmental enforcement. Following Liu and Li (2012), we construct a proxy for corruption at a provincial level, $Amount_{i,t}$, which is defined as the amount of money involved in irregularities (including corruption, bribery and misappropriation of public funds) detected by provincial government audit institutions divided by the nominal GDP of each province. Firms in the sample are then divided into two groups based on the median value of this partition variable. As shown in Table 6, across the four resulting specifications, the interaction term for PC and $Post$ is significant at the 5% level for firms in provinces with a greater degree of corruption (with coefficients of 2.205 with a t-statistic of 2.32 and 1.129 with a t-statistic of 2.25 when using *Punish Dummy* and *Punish Frequency* as dependent variables, respectively) but insignificant for those in provinces with a lower level (with coefficients of −0.182 with a t-statistic of −0.13 and 0.070 with a t-statistic of 0.09, respectively). These findings are consistent with our expectation that the effect of Rule 18 on environmental enforcement is more pronounced in more corrupt provinces.

5. Additional tests and results

5.1 The effect of firm-level characteristics

So far, we provide evidence that firms with resigned politically connected directors due to Rule 18 are more likely to be punished, and more frequently, for environment-related violations after Rule 18. However, the effect of Rule 18 might vary among firms with different types of

ownership. The literature highlights the fact that politically connected directors are not equally important for all different types of firms (Wu et al., 2012b). SOEs are often claimed to have inherent political connections, in that, owing to their role in fulfilling political or social objectives rather than pursuing only profit-driven goals, they can benefit from government support and extra protection while operating in the business environment (Lu et al., 2015; Maung et al., 2016; Guo et al., 2019; Hope et al., 2020; Kong et al., 2022). Thus, SOEs may not need to rely on hiring government official directors to establish political connections. If so, the effect of the resignation of politically connected 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 is more valuable for non-SOEs. If this is the case, we would expect the effect of politically connected directors' resignation caused by Rule 18 on punishment for breaches of environmental regulation is more pronounced among non-SOEs.

We therefore explore the role of firms' ownership structures. We construct two groups of firms based on whether firms' ultimate controlling shareholder is the state or not over the sample period and then separately repeat the procedures in the main regression.[30] Table 7 presents the results estimated for SOEs and non-SOEs. We find that for SOEs, coefficients on the variable of interest, $PC \times Post$, are statistically insignificant across both specifications. In contrast, for non-SOEs, the estimated coefficients on the interaction term ($PC \times Post$) are significant at the 1% level across both specifications. The findings show that non-state-owned firms are more significantly affected by the sudden loss of politically connected directors. This is consistent with the argument in the literature that non-SOEs rely more on the political connections of their government official directors.

5.2 Dynamic effects of Rule 18 and placebo tests

To assess the dynamic effects of Rule 18 and the plausibility of the parallel-trend assumption underlying the difference-in-differences approach, we follow Hu et al. (2020a) and replace $Post_{i,t}$ with four indicator variables. Specifically, we construct the indicators $Year-1$, $Year0$, $Year1$ and $Year2$, which equal 1 for the year before Rule 18 was implemented, the

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[30] The small sample size does not allow us to perform a strict sub-sample test based on the full-sample regression as we do not have sufficient observations to estimate in one sub-group. Alternatively, we separately run each sub-sample regression based on whether included firms are state-owned or non-state-owned and then compare the corresponding coefficients across two sub-samples. Specifically, we employ different matching techniques to construct an artificial control group within each sub-sample. By using the kernel matching method, we 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, we also select the 1:2, 1:3 and 1:4 nearest-neighbour techniques with replacement as alternatives in a robustness check and the results still hold. Corresponding results are available upon request.

event year itself (2013, when Rule 18 was implemented), the year after its implementation and the second year after its implementation, respectively.[31] If the issuance of Rule 18 is an exogenous shock to firms rather than a response to changes in economic conditions, a positive and significant effect on the likelihood and magnitude of punishment for breaching environmental regulations should be observed only after the enactment of Rule 18. As presented in Panel A of Table 8, the coefficients on the post-event indicators ($Year1$ and $Year2$) are significantly positive across both specifications, but the coefficients on the pre-event indicator ($Year-1$) are insignificant in column (1) or significantly negative in in column (2). Accordingly, this analysis shows that a higher probability of environmental enforcement is evident only after the issuance of Rule 18.

To validate that the probability and frequency of punishment both increased with the ban on political connections, we conduct two sets of placebo tests. First, we examine whether the resignation of non-politically connected directors following the issuance of Rule 18 induces a similar effect to the resignation of politically connected directors. Non-connected directors (those with little political power) may not contribute to the firm's value as much as connected directors do. In this case, if the results are indeed driven by political connections, we expect that the resignations of non-connected directors should have no or rather little impact on corporate punishment. We use firms with directors from universities, SOEs and publicly funded organizations who have resigned as the pseudo-treated group and conduct a similar empirical analysis to that above. $PseudoPC_{i,t}$ is an indicator variable that takes the value of 1 if firm i has at least one resigned non-politically connected independent director, and 0 otherwise. Based on 85 matched pseudo-treated firms and 80 matched control firms with 660 observations, the results in Panel B of Table 8 show that coefficients on the interaction term $PseudoPC \times Post$ are insignificant across both specifications.

Considering the possibility that the results might be driven by unobserved shocks which are unrelated to the issuance of Rule 18, we choose the year 2014 as the pre-pseudo-event period and 2015 as the post-pseudo-event period.[32] As presented in Panel C, firms in the treated group and those in the control group do not differ much in terms of the likelihood and frequency of punishment around the pseudo-event years. Overall, these tests imply that the change of environmental enforcement is caused by the loss of political connections as a result of Rule 18.

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[31] Since we use the observations in the year 2013 as the baseline group, $Year0$ is thus excluded from this analysis.
[32] For robustness, we 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.

5.3 Potential confounding events

In this section, we consider two potential confounding events that occurred around the same time as the issuance of Rule 18. The first is the Eight-Point Regulation, issued by the Politburo of the CCP in December 2012, which aims to curb extravagance and bureaucracy by specifying detailed requirements on the work arrangements for the Party and government officials, such as forbidding improper allocation and use of official vehicles, forbidding travel at public expense, and cutting down on banquets at public expense and stamping out other privileges. Following the Eight-Point Regulation, firms, especially SOEs, largely reduced their business entertainment and travel expenditure (ETC), which is widely used as a proxy for firm-level corruption efforts (Cai et al., 2011; Lin et al., 2016; Cumming and Ge, 2022). To control the effect of the Eight-Point Regulation, we add ETC, measured as the sum of the firm's annual entertainment and travel costs under management expenses and sales expenses, as an additional control variable and rerun the main regression.[33] Columns (1) and (2) of Table 9 show that the inferences are not affected after controlling for ETC, indicating that the main results are not driven by the Eight-Point Regulation.

The second potential confounding event we consider is the launch of China's Smart City Program, 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).[34] The smart city initiative, as a new mode of urban development, was introduced by the Chinese central government in 2010 and was 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, and by the end of 2015 a total of 290 smart city pilots had 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 in the environment. This process supports pollution reduction 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 (Chu et al., 2021). Firms located in smart cities with such large-scale adoption of green technology are more likely to have a smaller pollution footprint, and so be less likely to receive a penalty from the local EPBs. To control the effect of the Smart City Program, we include an indicator variable, *Smart City*,

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

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

which equals 1 if the firm operates in a city which is named as a "Smart City" in a calendar year, and 0 otherwise. As shown in columns (3) and (4) of Table 9, our main findings still hold, suggesting that the main results are not driven by potential confounding events.

6. Conclusion

In this paper, we explore the impact of China's anti-corruption campaign on corporate environmental punishment. More specifically, using a quasi-natural experiment based on Rule 18 involving the mandatory resignation of independent directors with political connections, we document that the termination of firm-level political connections results both in a higher probability and in a higher frequency of the firm being punished for breaches of environmental regulations. This finding is consistent with widespread criticisms of politically connected firms. We also examine how the level of institutional development affects the consequences of the anti-corruption campaign. The cross-sectional analyses show that the effect of the campaign is more pronounced among firms located in provinces with less efficient judicial systems or a higher corruption culture, which implies that political connections can function as a substitute for formal institutions. In further cross-sectional analysis, we investigate whether the ownership structure matters and find that the effect of Rule 18 is more pronounced among non-SOEs. Collectively, we provide novel evidence regarding the benefits and costs of political connections, as well as how they are affected by the anti-corruption campaign in China.

As with all studies, ours does not come without limitations. First, the sample size is relatively small, given that we focus on firms operating in heavily polluting industries. Further studies might consider firms from other industries. As we previously discussed, once all publicly listed firms are required to mandatorily disclose environmental information, it would be interesting to further explore the role of political connections in affecting firms' environmental outcomes across various industries. Second, this paper focuses on the two most common categories of environmental punishment, and other types of punishment might be an interesting avenue for future research. Thirdly, the current study examines how the loss of political connections affects the likelihood and frequency of receiving a punishment for environmental violations by focusing on the future short-term horizon. The long-term effects of firms' environmental outcomes could be further explored in future research. A thorough analysis of the mechanisms by which the resignation of PCIDs (due to Rule 18) affects the cost of environmental violations is outside the purview of this paper due to data limitations, but it could also be a fruitful area for future research.

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References

Adhikari, A., Derashid, C., Zhang, H., 2006. Public policy, political connections, and effective tax rates: Longitudinal evidence from Malaysia. Journal of Accounting and Public Policy. 25, 574–595.

Aghion, P., Algan, Y., Cahuc, P., Shleifer, A., 2010. Regulation and distrust. The Quarterly Journal of Economics. 125, 1015–1049.

Allen, F., Qian, J., Qian, M., 2005. Law, finance, and economic growth in China. Journal of Financial Economics. 77, 57–116.

Amore, M.D., Bennedsen, M., 2013. The value of local political connections in a low-corruption environment. Journal of Financial Economics. 110, 387–402.

Berkman, H., Cole, R.A., Fu, L.J., 2010. Political connections and minority-shareholder protection: Evidence from securities-market regulation in China. Journal of Financial and Quantitative Analysis. 45, 1391–1417.

Cai, H., Fang, H., Xu, L.C., 2011. Eat, drink, firms, government: An Investigation of corruption from the entertainment and travel costs of Chinese firms. The Journal of law and Economics. 54, 55–78.

Cai, H., Li, H., Park, A., Zhou, L., 2013. Family ties and organizational design: Evidence from Chinese private firms. The Review of Economics and Statistics. 95, 850–867.

Cao, X., Wang, Y., Zhou, S., 2018. Anti-corruption campaigns and corporate information release in China. Journal of Corporate Finance. 49, 186–203.

Chang, L., Li, W., Lu, X., 2015. Government engagement, environmental policy, and environmental performance: Evidence from the most polluting Chinese listed firms. Business Strategy and the Environment. 24, 1–19.

Chen, C.R., Li, Y., Luo, D., Zhang, T., 2017. Helping hands or grabbing hands? An analysis of political connections and firm value. Journal of Banking and Finance. 80, 71–89.

Chen, T., Kung, J.K.S., 2019. Bursting the "Princelings": The campaign against corruption in China's primary land market. The Quarterly Journal of Economics. 134, 185–226.

Chu, Z., Cheng, M., Yu, N.N., 2021. A smart city is less polluted city. Technological Forecasting & Social Change. 172, 121037.

Claessens, S., Feijen, E., Laeven, L., 2008. Political connections and preferential access to finance: The role of campaign contributions. Journal of Financial Economics. 88, 554–580.

Correia, M.M., 2014. Political connections and SEC enforcement. Journal of Accounting and Economics. 57, 241–262.

Cumming, D., Ge, Y., 2022. Trade facilitation costs and corruption: Evidence from China. Journal of International Financial Markets, Institutions & Money. 78, 101564.

Dehejia, R.H., Wahba, S., 2002. Propensity score-matching methods for nonexperimental causal studies. The Review of Economics and Statistics. 84, 151–161.

Emery, L.P., Faccio, M., 2022. Exposing the revolving door in executive branch agencies. Available at SSRN: https://ssrn.com/abstract=3732484.

Faccio, M., 2006. Politically connected firms. The American Economic Review. 96, 369–386.

Faccio, M., Masulis, R.W., McConnell, J.J., 2006. Political connections and corporate bailouts. The Journal of Finance. 61, 2597–2635.

Fahlenbrach, R., Low, A., Stulz, R.M., 2017. Do independent director departures predict future bad events? The Review of Financial Studies. 30, 2313–2358.

Faith, R.L., Leavens, D.R., Tollison, R.D., 1982. Antitrust pork barrel. The Journal of Law and Economics. 25, 329–342.

Fan, G., Wang, X., Yu, J., 2017. NERI Index of Marketization of China's Provinces: 2016 Report. Social Science Academic Press: Beijing, China.

Fan, J.P.H., Wong, T.J., Zhang, T., 2007. Politically connected CEOs, corporate governance, and post-IPO performance of China's newly partially privatized firms. Journal of Financial

Economics. 84, 330–357.

Fisman, R., 2001. Estimating the value of political connections. The American Economic Review. 91, 1095–1102.

Fisman, R., Wang, Y., 2015. The mortality cost of political connections. The Review of Economic Studies. 82, 1346–1382.

Fulmer, S., Knill, A., Yu, X., 2022. Negation of sanctions: The personal effect of political contributions. Journal of Financial and Quantitative Analysis. Forthcoming.

Gao, H., He, Z., 2019. Board structure and role of outside directors in private firms. European Financial Management. 25, 861–907.

Giannetti, M., Liao, G., You, J., Yu, X., 2021. The externalities of corruption: Evidence from entrepreneurial firms in China. Review of Finance. 25, 629–667.

Golding, W.F., 2011. Incentives for change: China's cadre system applied to water quality. The Washington International Law Journal. 20, 399–428.

Goldman, E., Rocholl, J., So, J., 2009. Do politically connected boards affect firm value? The Review of Financial Studies. 22, 2331–2360.

Goldman, E., Rocholl, J., So, J., 2013. Politically connected boards of directors and the allocation of procurement contracts. Review of Finance. 17, 1617–1648.

Gordon, S., Hafer, C., 2005. Flexing muscle: Corporate political expenditures as signals to the bureaucracy. American Political Science Review. 99, 245–261.

Gulen, H., Myers, B.W., 2022. The selective enforcement of government regulation: Battleground states, state regulators, and the EPA', Available at SSRN: https://ssrn.com/abstract=2826741.

Guo, H., Li, W., Zhong, Y., 2019. Political involvement and firm performance-Chinese setting and cross-country evidence. Journal of International Financial Markets, Institutions & Money. 59, 218–231.

Hao, Z., Liu, Y., Zhang, J., Zhao, X., 2020. Political connection, corporate philanthropy and efficiency: Evidence from China's anti-corruption campaign. Journal of Comparative Economics. 48, 688–708.

Heese, J., 2015. Government preferences and SEC enforcement. Harvard Business School Working Paper, No. 15-054.

Heitz, A., Wang, Y., Wang, Z., 2021. Corporate political connections and favourable environmental regulatory enforcement. Management Science. Forthcoming.

Hope, O.K., Yue, H., Zhong, Q., 2020. China's anti-corruption campaign and financial reporting quality. Contemporary Accounting Research. 37, 1015–1043.

Houston, J.F., Jiang, L., Lin, C., Ma, Y., 2014. Political connections and the cost of bank loans. Journal of Accounting Research. 52, 193–243.

Hu, J., Li, S., Taboada, A.G., Zhang, F., 2020a. Corporate board reforms around the world and stock price crash risk. Journal of Corporate Finance. 62, 101557.

Hu, R., Karim, K., Lin, K.J., Tan, J., 2020b. Do investors want politically connected independent directors? Evidence from their forced resignations in China. Journal of Corporate Finance. 61, 101421.

Hunter, W.J., Nelson, M.A., 1995. Tax enforcement: A public choice perspective. Public Choice. 82, 53–67.

Khwaja, A.I., Mian, A., 2005. Do lenders favor politically connected firms? Rent provision in an emerging financial market. The Quarterly Journal of Economics. 120, 1371–1411.

Kim, C., Zhang, L., 2016. Corporate political connections and tax aggressiveness. Contemporary Accounting Research. 33, 78–114.

Kong, D., Qin, N., 2021. China's anticorruption campaign and entrepreneurship. The Journal of Law and Economics. 64, 153–180.

Kong, D., Xiong, M., Qin, N., 2022. Business Tax reform and CSR engagement: Evidence from China. International Review of Financial Analysis. 82, 102178.

Lee, W., Wang, L., 2017. Do political connections affect stock price crash risk? Firm-level evidence from China. Review of Quantitative Finance and Accounting. 48, 643–676.

Li, H.B., Meng, L., Wang, Q., Zhou, L., 2008. Political connections, financing and firm performance: Evidence from Chinese private firms. Journal of Development Economics. 87, 283–299.

Li, Q., Guo, M., 2022. Do the resignations of politically connected independent directors affect corporate social responsibility? Evidence from China. Journal of Corporate Finance. 73, 102174.

Lin, C., Morck, R., Yeung, B., Zhao, X., 2016. Anti-corruption reforms and shareholder valuations: Event study evidence from China. NBER Working Paper. No. 22001.

Lin, H., Zeng, S., Ma, H., Chen, H., 2015. How political connections affect corporate environmental performance: The mediating role of green subsidies. Human and Ecological Risk Assessment: An International Journal. 21, 2192–2212.

Lin, K.Z., Mills, L.F., Zhang, F., Li, Y., 2018. Do political connections weaken tax enforcement effectiveness? Contemporary Accounting Research. 35, 1941–1972.

Liu, J., Li, B., 2012. Government auditing and corruption control: Evidence from China's provincial panel data. China Journal of Accounting Research. 5, 163–186.

Liu, J., Uchida, K., Gao, R., 2012. Political connections and the long-term stock performance of Chinese IPOs. Journal of International Financial Markets, Institutions & Money. 22, 814–833.

Liu, Q., Tang, J., Tian, G.G., 2013. Does political capital create value in the IPO market? Evidence from China. Journal of Corporate Finance. 23, 395–413.

Lu, H., Pan, H., Zhang, C., 2015. Political connectedness and court outcomes: Evidence from Chinese corporate lawsuits. Journal of Law and Economics. 58, 829–861.

Maung, M., Wilson, C., Tang, X., 2016. Political connections and industrial pollution: Evidence based on state ownership and environmental levies in China. Journal of Business Ethics. 138, 649–659.

Mixon, F.G.JR., 1995. Public choice and the EPA: Empirical evidence on carbon emissions violations. Public Choice. 83, 172–137.

Pfeffer, J., Salancik, G.R., 1978. The external control of organizations: A resource dependence perspective. Harper & Row: New York.

Qian, W., Chen, X., 2021. Corporate environmental disclosure and political connection in regulatory and leadership changes: The case of China. The British Accounting Review. 53, 100935.

Qin, X., Zhang, X., 2019. De-politicization and innovation: Evidence from China. Journal of Accounting and Public Policy. 38, 106668.

Ren, S., He, D., Zhang, T., Chen, X., 2019. Symbolic reactions or substantive pro-environmental behaviour? An empirical study of corporate environmental performance under the government's environmental subsidy scheme. Business Strategy and the Environment. 28, 1148–1165.

Schoenherr, D., 2019. Political connections and allocative distortions. The Journal of Finance, 74, 543–586.

Schweizer, D., Wang, X., Wu, G., Zhang, A., 2020. Political connections and media bias: Evidence from China. Available at SSRN: https://ssrn.com/abstract=3709127.

Shi, H., Xu, H., Zhang, X., 2018. Do politically connected independent directors create or destroy value? Journal of Business Research. 83, 82–96.

Shleifer, A., Vishny, R.W., 1998. The grabbing hand: Government pathologies and their cures. Harvard University Press: Cambridge, Massachusetts.

Situ, H., Tilt, C., 2018. Mandatory? Voluntary? A discussion of corporate environmental disclosure requirements in China. Social and Environmental Accountability Journal. 38, 131–144.

Su, F., Tao, R., Xi, L., Li, M., 2012. Local officials' incentives and China's economic growth: tournament thesis reexamined and alternative explanatory framework. China & World Economy. 20, 1–18.

Sun, P., Hu, H.W., Hillman, A.J., 2016. The dark side of board political capital: Enabling blockholder rent appropriation. Academy of Management Journal. 59, 1801–1822.

Tang, Z., Tang, J., 2018. Stakeholder corporate social responsibility orientation congruence, entrepreneurial orientation and environmental performance of Chinese small and medium-sized enterprises. British Journal of Management. 29, 634–651.

Vennemo, H., Aunan, K., Lindhjem, H., Seip, H.M., 2009. Environmental pollution in China: Status and trends. Review of Environmental Economics and Policy. 3, 209–230.

Voigt, S., 2016. Determinants of judicial efficiency: a survey. European Journal of Law and Economics. 42, 183–208.

Wang, H., Mamingi, N., Laplante, B., Dasgupta, S., 2003. Incomplete enforcement of pollution regulation: Bargaining power of Chinese factories. Environmental and Resource Economics. 24, 245–262.

Wang, L., 2015. Protection or expropriation: Politically connected independent directors in China. Journal of Banking and Finance. 55, 92–106.

Wei, C., Hu, S., Chen, F., 2020. Do political connection disruptions increase labor costs in a government-dominated market? Evidence from publicly listed companies in China. Journal of Corporate Finance. 62, 101554.

Weingast, B.R., Moran, M.J., 1983. Bureaucratic discretion or congressional control? Regulatory policymaking by the Federal Trade Commission. Journal of Political Economy. 91, 765–800.

Wu, W., Wu, C., Zhou, C., Wu, J., 2012a. Political connections, tax benefits and firm performance: Evidence from China. Journal of Accounting and Public Policy. 31, 277–300.

Wu, W., Wu, C., Rui, O.M., 2012b. Ownership and the value of political connections: Evidence from China. European Financial Management. 18, 695–729.

Xiao, G., Shen, S., 2022. To pollute or not to pollute: Political connections and corporate environmental performance. Journal of Corporate Finance, 74, 102214.

Young, M., Reksulak, M., Shughart, W.F., 2001. The political economy of the IRS. Economics and Politics, 13, 201–220.

Yu, F., Yu, X., 2011. Corporate lobbying and fraud detection. Journal of Financial and Quantitative Analysis. 46, 1865–1891.

Zhang, B., Chen, X., Guo, H., 2018. Does central supervision enhance local environmental enforcement? Quasi-experimental evidence from China. Journal of Public Economics. 164, 70–90.

Zhang, K., Truong, C., 2019. What's the value of politically connected directors? Journal of Contemporary Accounting and Economics. 15, 100161.

Zhang, Q., Yu, Z., Kong, D., 2019. The real effect of legal institutions: Environmental courts and firm environmental protection expenditure. Journal of Environmental Economics and Management. 98, 102254.

Zhu, Z., Tan, Y., 2022. Can green industrial policy promote green innovation in heavily polluting enterprises? Evidence from China. Economic Analysis and Policy. 74, 59–75.

Appendix A: Variable Definitions

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

Variable	Definition
Analyst	Number of analyst teams following the firm, calculated as the natural logarithm of one plus the number of analyst teams.
Auditor	Indicator variable that equals 1 for unmodified audit opinions, and 0 otherwise.
Board Size	Number of directors on the board.
Cash Flow	Cash and cash equivalent divided by total assets.
ETC	The sum of the firm's annual entertainment and travel costs under two accounting categories: management expenses and sales expenses.
Firm Age	The natural logarithm of the number of years since the firm was established.
Firm Size	The natural logarithm of the book value of total assets.
Internal Control	Indicator variable that equals 1 for firms with internal control weaknesses, and 0 otherwise.
Leverage	Long-term debt divided by total assets.
Market-to-Book	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.
Post	Indicator variable that equals 1 for post-Rule period (2014 or 2015), and 0 otherwise.
Property, Plant and Equipment	Net property, plant and equipment scaled by total assets.
PC	Indicator variable that equals 1 if the firm has at least one resigned politically connected director due to the enactment of Rule 18, and 0 otherwise. Politically connected independent directors are those serving as current or former government officials, Party members or armed forces officers with a position equivalent to or above the county level of administration.
Punish Dummy	Indicator variable that equals 1 if there is enforcement action involving environmental violations imposed on firm i in year t, and 0 otherwise.
Punish Frequency	Categorical variable that equals 2 if, for firm i in year t, the number of enforcement actions (i.e., environmental enforcement records from environmental agencies) exceeds one, 1 if the total number of records equals one, and 0 if no enforcement action is imposed in year t.
ROA	Return on assets, calculated as EBITDA divided by the firm's average total assets.
Sales Growth	Annual sales growth, calculated as sales in year t minus sales in year t-1, divided by sales in year t-1.
Sales Volatility	The standard deviation of sales, calculated as the standard deviation of sales (deflated by total assets) in the previous three years.
Smart City	Indicator variable that equals 1 if the firm operates in a city which is named as a "Smart City" in year t, and 0 otherwise.
State Owned	Indicator variable that equals 1 if the firm is ultimately controlled by the government, and 0 otherwise.
Top1	Percentage of shares owned by the largest shareholder.

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

The propensity score matching (PSM) technique aims to pair treated firms and control firms to make two groups more alike conditional on certain observable characteristics (Dehejia and Wahba, 2002). The first step in this procedure is to estimate the probability of being affected by the issuance of Rule 18 (i.e., whether a particular firm has affected politically connected directors) by running a logistic regression model based on a sample of firms in 2013. Next, we use the predicted probability from the first step to estimate each firm's propensity score. Then, we match each treated firm to a control firm by using the nearest-neighbour matching technique with replacement. Panel A shows the estimation results from the logit regression model. Panel B reports the effectiveness of the PSM approach. All variables are defined in Appendix A. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Panel A: Results of the logit regression

Dependent variable = The presence of resigned politically connected directors

Variables	Coefficient	Z-stat.
Firm Size	-0.065	-0.25
Leverage	3.071	1.64
ROA	6.360*	1.85
Firm Age	-0.105	-0.22
Cash Flow	2.671	1.51
Property, Plant and Equipment	0.107	0.09
Sales Growth	-0.053	-0.30
Sales Volatility	-0.092	-0.06
Market-to-Book	0.129	0.66
*Top*1	1.100	1.04
Internal Control	0.468	1.39
Board Size	-0.021	-0.23
Analyst	0.001	0.07
State Owned	0.514	1.39

Appendix B Continued Overleaf

Panel B: Mean value of treated and control firms before and after matching

Variables		Treated firms (1)	Control firms (2)	Diff. (1)−(2)
Firm Size	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
Firm Age	Pre-match	2.661	2.641	0.020
	Post-match	2.655	2.641	0.014
Cash Flow	Pre-match	0.148	0.135	0.013
	Post-match	0.149	0.170	−0.021
Property, Plant and Equipment	Pre-match	0.336	0.305	0.031
	Post-match	0.329	0.304	0.025
Sales Growth	Pre-match	−0.025	0.104	−0.129
	Post-match	−0.033	−0.202	0.169
Sales Volatility	Pre-match	0.096	0.096	0.000
	Post-match	0.096	0.096	0.000
Market-to-Book	Pre-match	1.469	1.144	0.325*
	Post-match	1.415	1.315	0.100
*Top*1	Pre-match	0.406	0.369	0.037*
	Post-match	0.404	0.444	-0.040
Internal Control	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
Board Size	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
State Owned	Pre-match	0.618	0.453	0.165**
	Post-match	0.611	0.630	−0.019

Figure 1
Proportion of firms with politically connected and non-politically connected directors on the board (Firm-year level)

This figure shows how the proportion of firms with politically connected directors and non-politically connected directors changed across the years. Firms with *Politically connected directors* are defined as those with at least one politically connected independent director in a calendar year. Firms with *Non-Politically connected directors* are defined as those without any politically connected independent director during a particular calendar year.
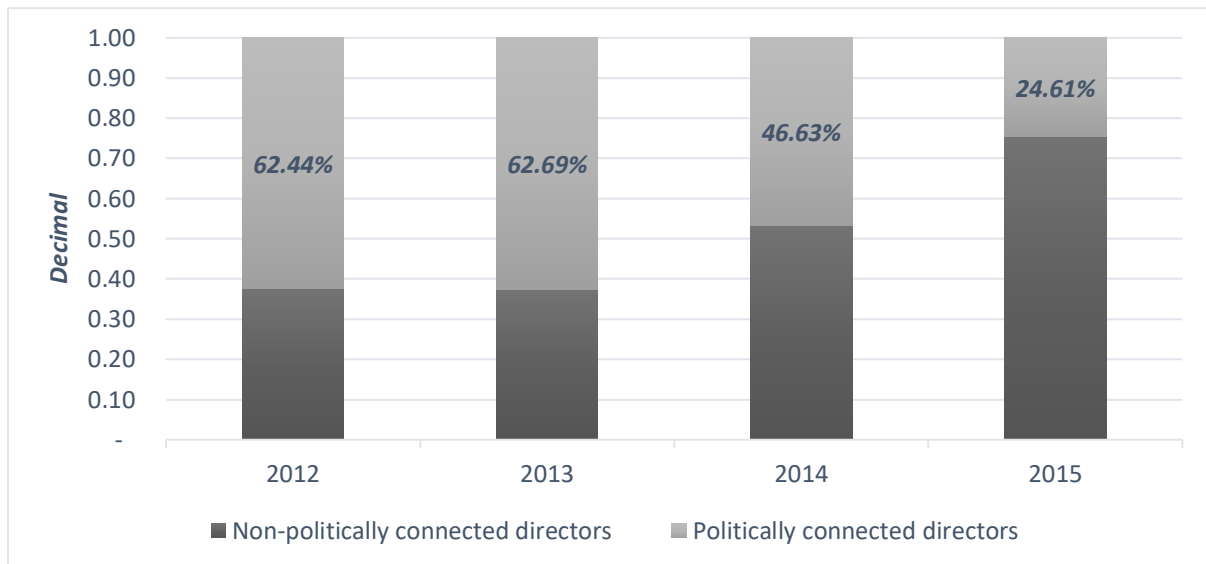
Table 1
Sample selection process
This table describes the selection procedure for treated and control firms over the sample period.

	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 issuance 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 similar expressions in Chinese)	173
Less: heavily polluting firms with resigned directors from universities, SOEs and publicly funded organizations due to the issuance 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 similar expressions in Chinese)	(103)
Heavily polluting firms with resigned politically connected directors due to the issuance 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 similar expressions in Chinese)	70
Plus: heavily polluting firms with resigned politically connected directors due to the issuance 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 issuance of Rule 18	(61)
Treated firms in the sample	<u>56</u>
Control firms in the sample	<u>330</u>
Including: heavily polluting firms with resigned directors from universities, SOEs and publicly funded organizations due to the issuance 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 similar expressions in Chinese)	103
Including: heavily polluting firms without any resigned directors over the sample period	227
Total firms in treated and control groups	386

Table 2
Sample distribution by industry group

This table reports the distribution of the sample firms across 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 non-ferrous 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 non-ferrous metals	C32	51	9.17
Textiles	C17	24	4.32
Timber processing, timber, bamboo, cane, palm fibre 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 the event (the year 2013). Panel B displays the summary statistics of the main variables used in the empirical estimations for matched treated firms and matched control firms over the period 2012-2015. Treated-Control denotes the mean difference for each variable between the treated and control samples. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

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)
	Mean	Mean	Difference	Mean	Difference
Firm Size	22.34	22.10	0.13	22.49	−0.14
Leverage	0.11	0.08	0.03**	0.09	0.01
ROA	0.10	0.10	0.28	0.10	0.00
Firm Age	2.65	2.64	0.92	2.66	-0.01
Cash Flow	0.14	0.13	0.64	0.15	−0.01
Property, Plant and Equipment	0.34	0.31	0.20	0.32	0.02
Sales Growth	0.03	0.11	0.57	−0.27	0.30
Sales Volatility	0.10	0.10	0.98	0.10	0.00
Market-to-Book	1.49	1.17	0.08*	1.40	0.08
*Top*1	0.40	0.37	0.21	0.43	−0.04
Internal Control	0.35	0.25	0.12	0.31	0.05
Auditor	1.00	0.96	0.16	1.00	0.00
Board Size	9.13	8.97	0.56	9.24	−0.12
Analyst	8.40	8.06	0.83	9.84	−1.44
State Owned	0.63	0.45	0.02**	0.65	−0.03

Table Continued Overleaf

Table 3 (Continued)

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

	Mean	SD	P25	P50	P75
Punish Dummy	0.204	0.403	0.000	0.000	0.000
Punish Frequency	0.299	0.634	0.000	0.000	0.000
Firm Size	22.462	1.116	21.606	22.355	23.116
Leverage	0.098	0.110	0.000	0.054	0.172
ROA	0.097	0.052	0.064	0.089	0.124
Firm Age	2.690	0.361	2.565	2.708	2.944
Cash Flow	0.145	0.111	0.055	0.117	0.198
Property, Plant and Equipment	0.331	0.164	0.198	0.317	0.434
Sales Growth	−0.125	1.299	−0.144	0.244	0.369
Sales Volatility	0.099	0.098	0.038	0.068	0.125
Market-to-Book	1.173	1.039	0.495	0.819	1.513
Top1	0.409	0.154	0.298	0.396	0.510
Internal Control	0.387	0.488	0.000	0.000	1.000
Auditor	1.000	0.000	1.000	1.000	1.000
Board Size	9.023	1.917	8.000	9.000	9.000
Analyst	7.912	8.260	1.000	5.000	12.000
State Owned	0.639	0.481	0.000	1.000	1.000

Table 4

Loss of politically connected directors and corporate punishment

This table presents results on the impact of the loss (through resignation because of Rule 18) of politically connected directors on corporate punishment for breaches of environmental regulations over the period 2012-2015. Panel A shows the results using all non-treated firms as control firms. Panel B shows the results using PSM firms as control firms. In both panels, columns (1)-(3) present results from logistic regressions of likelihood of environmental enforcement on resignation, while columns (4)-(6) present results of the ordered probit model examining the relation between the frequency of environmental punishment and resignation. The first dependent variable (*Punish Dummy*) is an indicator variable that equals 1 if there is enforcement action involving environmental violations imposed on firm i in year t, and 0 otherwise. The second dependent variable (*Punish Frequency*) is a categorical variable that equals 2 if, for firm i in year t, the total number of environmental enforcement records from environmental agencies exceeds one, 1 if the total number of records equals one, and 0 if no enforcement action is imposed. PC is an indicator variable that equals 1 if the firm has at least one resigned politically connected director due to the enactment of Rule 18. $Post$ is an indicator variable that equals 1 for post-Rule period (the year 2014 or 2015). The interaction term $PC \times Post$ captures both the difference between treated firms and control firms as well as the difference before and after the enactment of Rule 18. All continuous variables are winsorized at the levels of 1% and 99%. Standard errors are clustered at the firm level and *t*-statistics are reported in parentheses. *, **, and *** denote significance at 10%, 5% and 1% levels, respectively. All variables are defined in Appendix A.

Panel A: All non-treated firms as control firms

	Punish Dummy			Punish Frequency		
	(1)	(2)	(3)	(4)	(5)	(6)
$PC \times Post$	-	0.881**	0.898**	-	0.438**	0.469**
		(2.19)	(2.24)		(2.31)	(2.46)
PC	−0.859***	−1.822***	−1.845***	−0.438**	−0.996***	−1.032***
	(−2.66)	(−4.32)	(−4.38)	(−2.47)	(−4.86)	(−5.01)
$Post$	-	0.775***	-	-	0.495***	-
		(5.21)			(6.26)	
$Firm\ Size$	-	0.494***	0.467***	-	0.279***	0.260***
		(3.96)	(3.67)		(3.94)	(3.62)
$Leverage$	-	0.391	0.536	-	0.292	0.385
		(0.42)	(0.56)		(0.54)	(0.70)
ROA	-	1.108	1.119	-	0.266	0.269
		(0.64)	(0.64)		(0.26)	(0.26)
$Firm\ Age$	-	−0.011	−0.052	-	0.026	−0.008
		(−0.04)	(−0.20)		(0.19)	(−0.06)
$Cash\ Flow$	-	−1.041	−1.011	-	−0.529	−0.509
		(−1.07)	(−1.03)		(−1.03)	(−0.97)
$Property, Plant\ and$ $Equipment$	-	2.354***	2.324***	-	1.453***	1.420***
		(3.78)	(3.69)		(4.27)	(4.14)

Table Continued Overleaf

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Table 4 (Continued)

	Punish Dummy			Punish Frequency		
	(1)	(2)	(3)	(4)	(5)	(6)
Sales Growth	-	−0.024	−0.035	-	−0.022	−0.028
		(−0.29)	(−0.41)		(−0.48)	(−0.61)
Sales Volatility	-	2.615***	2.624***	-	1.591***	1.591***
		(3.78)	(3.81)		(4.26)	(4.25)
Market-to-Book	-	0.061	0.067	-	0.028	0.036
		(0.58)	(0.62)		(0.47)	(0.59)
Top1	-	−1.056*	−1.041*	-	−0.565*	−0.565*
		(−1.88)	(−1.85)		(−1.82)	(−1.81)
Internal Control	-	0.202	0.203	-	0.085	0.081
		(1.42)	(1.40)		(1.04)	(0.97)
Auditor	-	−0.277	−0.199	-	−0.192	−0.153
		(−0.69)	(−0.48)		(−0.75)	(−0.60)
Board Size	-	−0.056	−0.054	-	−0.035	−0.035
		(−1.20)	(−1.15)		(−1.28)	(−1.27)
Analyst	-	−0.007	−0.004	-	−0.003	−0.002
		(−0.62)	(−0.40)		(−0.51)	(−0.27)
State Owned	-	0.278	0.296	-	0.182*	0.202*
		(1.40)	(1.49)		(1.65)	(1.82)
Constant	−1.131***	−12.530***	−12.279***	-	-	-
	(−13.51)	(−4.72)	(−4.51)			
Industry FE	NO	YES	YES	NO	YES	YES
Region FE	NO	YES	YES	NO	YES	YES
Year FE	NO	NO	YES	NO	NO	YES
Observations	1,524	1,524	1,524	1,524	1,524	1,524
Pseudo.R^2	0.0108	0.1535	0.1576	0.0073	0.1355	0.1404

Panel B: Propensity-score-matched firms as control firms

	Punish Dummy			Punish Frequency		
	(1)	(2)	(3)	(4)	(5)	(6)
PC × Post	-	1.293**	1.313**	-	0.704**	0.755**
		(2.04)	(2.08)		(2.38)	(2.51)
PC	−1.078***	−2.315***	−2.335***	−0.562***	−1.300***	−1.359***
	(−2.85)	(−3.96)	(−4.02)	(−2.64)	(−4.64)	(−4.76)
Post	-	0.883***	-	-	0.508***	-
		(2.65)			(2.69)	
Firm Size	-	0.294	0.279	-	0.185	0.167
		(0.95)	(0.88)		(1.00)	(0.88)

Table Continued Overleaf

Table 4 (Continued)

	Punish Dummy			Punish Frequency		
	(1)	(2)	(3)	(4)	(5)	(6)
Leverage	-	**2.743**	**2.915**	-	**1.528**	**1.659**
		(1.43)	(1.49)		(1.41)	(1.50)
ROA	-	**1.738**	**1.815**	-	**0.394**	**0.537**
		(0.40)	(0.41)		(0.15)	(0.21)
Firm Age	-	**0.573**	**0.497**	-	**0.329**	**0.242**
		(0.86)	(0.75)		(0.94)	(0.69)
Cash Flow	-	**3.071**	**3.167***	-	**1.450**	**1.547**
		(1.62)	(1.66)		(1.50)	(1.57)
Property, Plant and Equipment	-	**1.960**	**2.034**	-	**1.323**	**1.337**
		(1.29)	(1.29)		(1.57)	(1.56)
Sales Growth	-	**−0.076**	**−0.087**	-	**−0.022**	**−0.029**
		(−0.66)	(−0.73)		(−0.35)	(−0.45)
Sales Volatility	-	**3.231****	**3.269****	-	**1.739****	**1.856****
		(1.98)	(1.98)		(2.02)	(2.13)
Market-to-Book	-	**0.483****	**0.474****	-	**0.259****	**0.272****
		(2.27)	(2.10)		(2.06)	(2.03)
Top1	-	**−2.290***	**−2.305***	-	**−1.036**	**−1.080**
		(−1.92)	(−1.92)		(−1.54)	(−1.59)
Internal Control	-	**0.027**	**0.022**	-	**0.052**	**0.037**
		(0.09)	(0.07)		(0.34)	(0.23)
Board Size	-	**−0.080**	**−0.082**	-	**−0.033**	**−0.035**
		(−0.87)	(−0.88)		(−0.59)	(−0.63)
Analyst	-	**0.009**	**0.011**	-	**0.000**	**0.002**
		(0.39)	(0.51)		(0.01)	(0.17)
State Owned	-	**0.633**	**0.639**	-	**0.289**	**0.307**
		(1.31)	(1.32)		(1.08)	(1.15)
Constant	**−0.916*****	**−10.796***	**−10.679***	-	-	-
	(−4.36)	(−1.74)	(−1.67)			
Industry FE	NO	YES	YES	NO	YES	YES
Region FE	NO	YES	YES	NO	YES	YES
Year FE	NO	NO	YES	NO	NO	YES
Observations	388	388	388	388	388	388
Pseudo.R^2	0.0431	0.2459	0.2517	0.0301	0.2071	0.2160

Table 5
The influence of regional judicial efficiency

This table shows the results of the influence of the level of efficiency of the provincial judicial systems on the effectiveness of the anti-corruption measure based on a PSM sample over the period 2012-2015. The sample is split into two subsamples based on the median values of the index 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 (*Punish Dummy*) is an indicator variable that equals 1 if there is enforcement action involving environmental violations imposed on firm i in year t, and 0 otherwise. The second dependent variable (*Punish Frequency*) is a categorical variable that equals 2 if, for firm i in year t, the total number of environmental enforcement records from environmental agencies exceeds one, 1 if the total number of records equals one, and 0 if no enforcement action is imposed. PC is an indicator variable that equals 1 if the firm has at least one resigned politically connected director due to the enactment of Rule 18. The interaction term $PC \times Post$ captures both the difference between treated firms and control firms as well as the difference before and after the enactment of Rule 18. All continuous variables are winsorized at the levels of 1% and 99%. Standard errors are clustered at the firm level and *t*-statistics are reported in parentheses. *, **, and *** denote significance at 10%, 5% and 1% levels, respectively. All variables are defined in Appendix A.

	Regional judicial efficiency			
	Low	High	Low	High
	Punish Dummy		*Punish Frequency*	
$PC \times Post$	2.278**	0.342	1.183**	0.220
	(2.43)	(0.23)	(2.39)	(0.27)
PC	−3.326***	−2.773**	−1.810***	−1.641**
	(−3.72)	(−2.04)	(−3.91)	(−2.12)
Other controls	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Region FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	212	176	212	176
Pseudo.R^2	0.2955	0.3854	0.2392	0.3232

Table 6
The influence of local corruption culture

This table reports the results of the influence of provincial-level public corruption on the effectiveness of the anti-corruption measure based on a PSM sample over the period 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 and misappropriation of public funds) detected by provincial government audit institutions, adjusted by the nominal GDP of each province in the year prior to the event. The first dependent variable (*Punish Dummy*) is an indicator variable that equals 1 if there is enforcement action involving environmental violations imposed on firm i in year t, and 0 otherwise. The second dependent variable (*Punish Frequency*) is a categorical variable that equals 2 if, for firm i in year t, the total number of environmental enforcement records from environmental agencies exceeds one, 1 if the total number of records equals one, and 0 if no enforcement action is imposed. PC is an indicator variable that equals 1 if the firm has at least one resigned politically connected director due to the enactment of Rule 18. The interaction term $PC \times Post$ captures both the difference between treated firms and control firms as well as the difference before and after the enactment of Rule 18. All continuous variables are winsorized at the levels of 1% and 99%. Standard errors are clustered at the firm level and t-statistics are reported in parentheses. *, **, and *** denote significance at 10%, 5% and 1% levels, respectively. All variables are defined in Appendix A.

	Local corruption culture			
	Low	High	Low	High
	Punish Dummy		*Punish Frequency*	
$PC \times Post$	−0.182	2.205**	0.070	1.129**
	(−0.13)	(2.32)	(0.09)	(2.25)
PC	−1.105	−3.380***	−0.805	−1.850***
	(−0.86)	(−3.80)	(−1.14)	(−4.01)
Other controls	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Region FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	176	212	176	212
Pseudo.R^2	0.3069	0.3059	0.2537	0.2615

Table 7
The influence of ownership structure (SOEs vs Non-SOEs)

This table presents the results of the influence of ownership structure on the effectiveness of the anti-corruption measure. The regressions are limited to state-owned firms and non-state-owned firms over the period 2012-2015. Based on whether the ultimate controlling shareholder is the state or not, we have two separate groups: SOEs and non-SOEs. The first dependent variable (*Punish Dummy*) is an indicator variable that equals 1 if there is enforcement action involving environmental violations imposed on firm i in year t, and 0 otherwise. The second dependent variable (*Punish Frequency*) is a categorical variable that equals 2 if, for firm i in year t, the total number of environmental enforcement records from environmental agencies exceeds one, 1 if the total number of records equals one, and 0 if no enforcement action is imposed. PC is an indicator variable that equals 1 if the firm has at least one resigned politically connected director due to the enactment of Rule 18. The interaction term $PC \times Post$ captures both the difference between treated firms and control firms as well as the difference before and after the enactment of Rule 18. All continuous variables are winsorized at the levels of 1% and 99%. Standard errors are clustered at the firm level and t-statistics are reported in parentheses. *, **, and *** denote significance at 10%, 5% and 1% levels, respectively. All variables are defined in Appendix A.

	Ownership structure			
	SOEs	Non-SOEs	SOEs	Non-SOEs
	Punish Dummy		*Punish Frequency*	
$PC \times Post$	**0.099**	**12.914*****	**−0.021**	**4.088*****
	(0.22)	(15.03)	(−0.09)	(8.77)
PC	**−0.909****	**−14.604*****	**−0.492****	**−5.023*****
	(−1.96)	(−29.58)	(−2.03)	(−17.80)
Other controls	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Region FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	636	701	638	701
Pseudo.R^2	0.1276	0.1748	0.1165	0.1533

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Table 8
Dynamic effects of Rule 18 and placebo analyses

This table presents the dynamic effects of Rule 18 in Panel A and two sets of placebo tests in Panel B and Panel C. Panel A shows regression results based on a PSM sample over the period 2012-2015. Four indicators, namely $Year-1$, $Year0$, $Year1$ and $Year2$ take the value of one for the year before the issuance of Rule 18, the event year itself, the year after the issuance of Rule 18 and the second year after the issuance of Rule 18, respectively. Panel B shows regression results based on a group of matched pseudo-treated firms and pseudo-control firms during the sample period. The pseudo-treated group includes firms with directors from universities, SOEs, and publicly funded organizations who resigned ($PseudoPC$). Panel C shows regression results using the pseudo-event years. We select the year 2014 as the pre-pseudo-event period and 2015 as the post-pseudo-event period. The first dependent variable ($Punish\ Dummy$) is an indicator variable that equals 1 if there is enforcement action involving environmental violations imposed on firm i in year t, and 0 otherwise. The second dependent variable ($Punish\ Frequency$) is a categorical variable that equals 2 if, for firm i in year t, the total number of environmental enforcement records from environmental agencies exceeds one, 1 if the total number of records equals one, and 0 if no enforcement action is imposed. All continuous variables are winsorized at the levels of 1% and 99%. Standard errors are clustered at the firm level and t-statistics are reported in parentheses. *, **, and *** denote significance at 10%, 5% and 1% levels, respectively. All variables are defined in Appendix A.

Panel A: Dynamic effects of Rule 18

	Punish Dummy	Punish Frequency
PC	−1.414***	−0.832***
	(−3.70)	(−3.84)
$Year-1$	−0.663	−0.435*
	(−1.23)	(−1.65)
$Year1$	0.813**	0.412**
	(2.07)	(2.17)
$Year2$	1.028**	0.649***
	(2.27)	(2.78)
Other controls	YES	YES
Industry FE	YES	YES
Region FE	YES	YES
Year FE	YES	YES
Observations	388	388
Pseudo.R^2	0.2426	0.2080

Table Continued Overleaf

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Table 8 (Continued)

Panel B: Placebo tests using the pseudo-treated group

	Punish Dummy	*Punish Frequency*
PseudoPC × Post	**0.061**	**0.016**
	(0.17)	(0.08)
PseudoPC	**0.399**	**0.236**
	(1.17)	(1.37)
Other controls	YES	YES
Industry FE	YES	YES
Region FE	YES	YES
Year FE	YES	YES
Observations	660	660
Pseudo.R^2	0.1557	0.1401

Panel C: Placebo tests using the pseudo-event years

	Punish Dummy	*Punish Frequency*
PC × Post	**0.703**	**0.379**
	(1.15)	(1.28)
PC	**−1.419**[**]	**−0.811**[**]
	(−2.23)	(−2.42)
Other controls	YES	YES
Industry FE	YES	YES
Region FE	YES	YES
Year FE	YES	YES
Observations	194	194
Pseudo.R^2	0.2671	0.2248

Table 9
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), we include ETC, which is measured as the sum of the firm's annual entertainment and travel costs under two accounting categories: management expenses and sales expenses. In columns (3) and (4), we add an indicator variable $Smart\ City$, which takes the value of 1 if the firm operates in a city which is named as a "Smart City" in a calendar year, and 0 otherwise. The first dependent variable ($Punish\ Dummy$) is an indicator variable that equals 1 if there is enforcement action involving environmental violations imposed on firm i in year t, and 0 otherwise. The second dependent variable ($Punish\ Frequency$) is a categorical variable that equals 2 if, for firm i in year t, the total number of environmental enforcement records from environmental agencies exceeds one, 1 if the total number of records equals one, and 0 if no enforcement action is imposed. PC is an indicator variable that equals 1 if the firm has at least one resigned politically connected director due to the enactment of Rule 18. The interaction term $PC \times Post$ captures both the difference between treated firms and control firms as well as the difference before and after the enactment of Rule 18. All continuous variables are winsorized at the levels of 1% and 99%. Standard errors are clustered at the firm level and t-statistics are reported in parentheses. *, **, and *** denote at 10%, 5% and 1% levels, respectively. All variables are defined in Appendix A.

	Eight-Point Regulation		Smart City Program	
	Punish Dummy	*Punish Frequency*	*Punish Dummy*	*Punish Frequency*
	(1)	(2)	(3)	(4)
$PC \times Post$	1.744**	1.022***	1.311**	0.757**
	(2.25)	(2.86)	(2.09)	(2.54)
ETC	−0.123	−0.061	-	-
	(−0.60)	(−0.55)		
$Smart\ City$	-	-	0.019	−0.015
			(0.05)	(−0.06)
PC	−2.627***	−1.580***	−2.332***	−1.362***
	(−3.87)	(−5.33)	(−4.01)	(−4.76)
Other controls	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Region FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	348	348	388	388
Pseudo.R^2	0.2625	0.2268	0.2517	0.2160