

京都大学大学院経済学研究科  
再生可能エネルギー経済学講座  
ディスカッションペーパー

**Impacts of Green Finance Policy in China:  
Does the Recentralization Approach Work?**



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### Abstract:

“Collusions between local governments and firms” and its impacts on environmental governance have been paid a great of attention by the scholars in China. The center government carried out a series of re-centralization measurements to deter the collusions. By using the National Private Firm Survey datasets, we employ the Tobit model and Propensity Score Matching approach to investigate the relationship between political connections and corporate mitigation investments, from the perspective of the re-centralization trend. We find that political connections have significantly improved corporate mitigation investments. Furthermore, through establishing the mediation effect model, we find that private entrepreneurs mainly use political connections to obtain bank loans with lower interest rates, while formal financial institutions such as banks have higher requirements according to the green finance policies. Therefore, the positive effects of political connections on mitigation investments are mainly mediated through formal finance. Our research thus has important policy implications on the ongoing re-centralization trends in environmental governance in China.

**Keywords:** Political Connection; mitigation Investments; Green Finance Policy; Recentralization

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## 1. Introduction

In recent decades, public concerns on environmental degradations in China surge due to their serious detrimental impacts on residential health. It is found that ambient air pollution caused by coal combustion for winter heating reduce average life expectancy by 5.5 years (Yuyu Chen, Ebenstein, Greenstone, & Li, 2013). Moreover, air pollution reduce the perceived happiness of inhabitants by more than one-fifth (X. Zhang, Zhang, & Chen, 2017). The increasing public concerns on pollution have been motivating politicians and scholars to characterize corporate environmental behaviors and design policies to promote enforcement of environmental regulations as well as compliance of polluters.

Prior studies identify extensive factors affecting corporate pollution mitigations, among which the “Collusions between Local Governments and Firms”, or corporate political connections are recognized as a prominent institutional defect for local environmental degradations (Liang & Gao, 2014; Nie, 2017). As the collusion theory goes that, motivated by the growth-oriented cadre evaluation system, local governors overvalue tangible economic developments rather than environmental protections. In the absence of supervision from the Centre, local governments and entrepreneurs will easily form mutually beneficial coalitions, resulting in poor enforcement and low compliances of environmental regulations.

To deter the collisions, a re-centralization trend in environmental governance has been on its way, especially since President Xi Jinping’s regime in 2013. The Centre strengthens its vertical supervision on the enforcement of environmental regulations by the local governments, and introduces a series of centralized verification programs for environmental standards (Kostka & Nahm, 2017). This trend comprises of various institutional innovations in environmental governance, including the nationwide central enforcement campaigns, the establishment of the national environmental information disclosure program, as well as the green finance policy which provides binding environmental requirements for the polluters who apply for bank credits.

Prior theoretical research provides controversial predictions on the effectiveness of ongoing re-centralization trend. On one hand, most researchers believe that vertical supervision could prevent vested interests from capturing local government, which are always major local polluters (Xiong & Wang, 2011; Yin, 2011; Yin, Nie, & Lin, 2011). On the other hand, Nie and Zhang (2015) argue that re-centralization may not surely deter collusions. Moreover, despite the importance of institutional innovations, rare empirical research is devoted to assessing the impacts of the re-centralization.

Green finance policy, as a quasi-regulatory tool, is among a handful of re-centralization environmental measures. Drafted and enforced by the Central government, the Green Credit Policy in China directs both state-owned and joint-stock banks to help achieve its national environmental objectives as well as enforce its national emission standards through provision or withholding of credit provided or not.

In this study we investigate the impacts of the green finance policy on corporate mitigation investments, employing a large national survey of 17373 private firms. We start by exploring the relationship between corporate mitigation investments and their political connections, the latter is measured by the membership of owners in local congress, and can directly proxy their coalitions with local governors. Furthermore, we explore the possible impacts of green credit policy on the nexus of corporate mitigation efforts and their political connections through the mediating model.

We find that that corporate political connections and their pollution mitigation investments have a significant positive correlation, and by contrast, accrual pollution levies and pollution fines have not been affected by their political connections. The baseline results are stable even after we tackle the endogenous political connections. We further examine the mediating role of formal finance and found that political connections promoted firms to obtain loans from formal financial channels such as banks, while the environmental compliance requirements from formal financial institutes for lenders improve investments in corporate pollution control facilities.

Our study makes several contributions to the literature. First, to best of our knowledge, we are the first to empirically investigate the deterrence of the collusions by recentralization measure. We study the mediatory role of the formal financial institutes in promoting the pollution mitigation efforts of the politically connected firms. We find that the central government can indirectly influence the private firms’ mitigation investments behavior through formal financial channels by establishing national green financial standards (W. Li & Hu, 2014). Therefore, this study expands our knowledge of the political economy of environmental governance in China.

Second, previous findings mainly provide indirect evidence on the local government-firm collusions, and we use congress membership to directly measure collusions of individual firms. This would not only

help to deepen our understandings of political connections and corporate mitigation investments, but also provide a valid micro foundation for the collusion theory. For example, some studies use “personnel turnovers” as exogenous shocks for collusions(Liang & Gao, 2014). However, such identification methods neglect the eagerness of newly appointed local officials to promote the local economy(Eaton & Kostka, 2013). This study is the first to use the micro-level data of Chinese firms directly measure the corporate environmental governance behaviors and political connections of firms. Therefore, this study would hopefully supplement and extend the existing literature and would help us to gain a more detailed and comprehensive understanding of corporate environmental governance in China.

We proceed as follows: The next chapter provides a brief literature review on political connection and corporate mitigation efforts in China, followed by the development of the hypotheses in Chapter 3. Chapter 4 explains our sample and empirical strategies. Chapter 5 presents the baseline results. Chapter 6 discusses the mediating role of formal finance on baseline effects. Finally comes the conclusions with policy implications.

## 2. Literature review

### 2.1. Corporate Political Connection: The China Context

Former literature provides a natural point of departure for the analysis of corporate political activities that, firms will enhance their political connections until the marginal costs outweigh the corresponding benefits(Mara Faccio, 2007; M. Faccio & Hsu, 2017). The benefits and costs of political connections are diversified which hinges on institutional, social and even cultural backgrounds. For example, in democratic economies politically connected firms will employ excessively in exchange of treasury subsidies, for that high unemployment threatens the reelection of local politicians(Shleifer & Vishny, 1994).

There are extensive studies on corporate political connections in China, for that the immature market mechanism allows politicians to exploit their power rent, and thereby such connections always lead to a social welfare loss. H. Li and Zhou (2005) find that low marketization encourages private entrepreneurs to pursue congress memberships in China, which in turn helps to obtain scarce resources such as financial credits allocated by local government in absent of “invisible hands”. Further, political connections can evade policy discrimination against private enterprises and secure property rights from “grabbing hands”(Kung & Ma, 2016). Notably, the alleviation of grabbing hands might improve the efficiency of the private sector (Frye & Shleifer, 1996).

### 2.2. From Political Connections to Collusions in Environmental Governance

The growth-oriented standards in evaluation framework for local leaders (Ye Chen, Li, & Zhou, 2005) combined with the “fragmented authority” design in environmental governance (Lieberthal, 1997) worsen the situation of pollution in China (Nie, 2017; Nie & Li, 2013). Since promotion-oriented local leaders are entitled to supervise the polluters, they usually overvalue economic growth and indulge the polluters in their polluting behaviors. For instance, local officials are more likely to support real estate projects to improve fiscal income, and promote economic development. By contrast, they usually neglect environmental projects considering their minor contributions to local growth (Wu, Deng, Huang, Morck, & Yeung, 2013). Moreover, local leaders even compete against their counterparts for pollution-intensive projects, and acquiesce to polluting industries in the promotion tournament (Jia, 2017).

The polluting firms can collude with the growth-oriented local leaders through establishing political connections, in order to get off punishments of their environmental violations. Prior studies provide a handful of evidence on how collusions lead to environmental degradations. On one hand, evidence shows that political connections provide shelters to polluters. Y. Wang (2015) finds that stock values of politically connected polluters are less susceptible to the haze policy launched in 2013, for that political connections will distort the implementation of the new policy. On one hand, even temporary breakups of the collusions will mitigate pollution. Liang and Gao (2014) find that cadre turnovers would significantly improve the local ambient air quality, for that such turnovers break up the stable collusions between the former local leaders and firms.

### 2.3. Deterring the “Collusions”: The Role of Central Government

Compared with growth-oriented local government, the Central government is more motivated to combat the pollution problems. On one hand, much of the literature deems that local governors are more easily captured by vested interests (Bardhan & Mookherjee, 2000). In contrast, the Central governments are more impartial and perspicacious because their decisions are made under more public inspections. On the other hand, the Central governments are more responsible for environmental quality, especially



when environmental degradations spread nationwide in China. The increasing public concerns on pollution thus lay more pressures on the Central governments than the local.

A great number of theoretical literature study the effectiveness and efficiency of re-centralization measures. For example, Xiong and Wang (2011) find that when the Centre strengthens their monitor of enforcement of environmental regulations by local cadres, the odds of local government-firm collusions will decrease. Yin (2011) further argues that the re-centralization measures only works when the regulatory task is difficult to measure. Nie and Zhang (2015) argue that re-centralization measures may not surely deter collusions.

The Central governments can exert its influences on local environmental governance through several mechanisms, including unifying and strengthening differentiated local environmental standards through national laws, directly supervising and monitoring the enforcement of environmental regulations (Van Rooij, Zhu, Na, & Qiliang, 2017). However, rare studies were conducted to empirically analyze the effectiveness of the re-centralization measures.

### 3. Theory and Hypotheses Development

#### 3.1. Political Connections and Access to Formal Finance

Prior research supports the idea that utilitarian firms benefit from their political connections (Mara Faccio, 2007). Formal finance is a typical reward for corporate political connections. In China local cadres frequently interfere with the credit decisions of banks in favor of firms in their coalition through their administrative power. H. Li, Meng, Wang, and Zhou (2008) find that the political connections of private enterprises facilitate their access to bank credits. Ayyagari, Demirgüç-Kunt, and Maksimovic (2010) also provide evidence that the helping hands of the governments do effectively promote banks to issue loans to politically connected firms. Yu and Pan (2008) further prove that these effects are more pronounced in cities with low efficiency of law, and severe government plundering. Thus, private entrepreneurs obtain scarce financial resources dominated by the local governors through establishing political connections. Therefore, we hypothesize that,

**Hypothesis 1:** *Ceteris paribus, political connections will significantly increase the opportunities for private firms to obtain loans from formal financial channels such as banks.*

#### 3.2. Impacts of Green Finance Policy on Corporate mitigation Investments

According to the local government-firm collusion theory, local leaders and firm owners will form a coalition, in which the leaders enforce lax environmental regulations on firms (Nie, 2017; Nie & Li, 2013; Nie & Zhang, 2015). Therefore, the collusion theory predicts that politically connected firms are more reluctant to improve their mitigation due to the shelter effects of local cadres (Y. Wang, 2015). Notably, this prediction holds upon the premise that the central governments allow for the coalitions but they need to make on efforts on monitoring (Nie & Zhang, 2015; Xiong & Wang, 2011; Yin, 2011). However, this premise loses its ground after the green finance policies are carried out.

As a recentralization measure, green finance policy unifies environmental requirements for bank credits nationwide, and are implemented directly through formal financial institutes. These requirements promote the green performance of firms having political connections. The green requirements of formal finance comprise of not only concrete measures reducing the environmental impacts, but also proactively promoting green programs and technologies (Bal, Faure, & Liu, 2014). Prior studies prove that green finance measurements in China significantly improve the corporate environmental performance. For instance, B. Zhang, Yang, and Bi (2011) find that credit applications of polluters in the blacklists of banks due to environmental violations were all rejected. Aizawa and Yang (2010) argue that though there are still challenges ahead, the Chinese green credit measurements gradually get repaid of their efforts. Therefore, we hypothesize that,

**Hypothesis 2:** *Ceteris paribus, private enterprises relying more on formal finance significantly increases their mitigation investments to meet the requirements of green finance policies.*

Following **Hypothesis 1** and **Hypothesis 2**, we hypothesize that:

**Hypothesis 3:** *Ceteris paribus, politically connected private firms invest more in pollution mitigation. In contrast, private firms without political connections have a lower investment in pollution control.*

In sum, as shown in Figure 1, access to formal finance mediates the impact of political connections on corporate mitigation investments in China (see in Figure 1).

#### 4. The Sample and Empirical Strategies

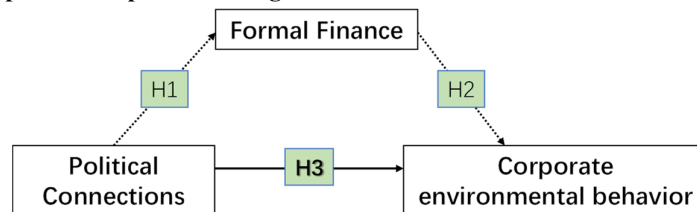


Figure 1 The Mediating Framework of Formal Finance on the Relationships between Corporate mitigation investments and Their Political Connections.

##### 4.1. Data and Sample

In this research we employ the Chinese Private Enterprise Survey (CPES) in 2006, 2008, 2010 and 2012. These surveys were jointly conducted by the United Front Work Department of CPC Central Committee, the All-China Federation of Industry and Commerce, the State Administration for Industry and Commerce and the Chinese National (Private) Economic Research Association (J. Chen, Lu, Lin, & Song, 2019). They randomly sampled and surveyed private firms across the country at a certain proportion (around 0.05%, slightly different across years) through multi-stage sampling. As many as 3,837, 4096, 4,613 and 5,073 private companies were sampled and interviewed in 2006, 2008, 2010 and 2012 respectively. Several studies on Chinese private enterprises were conducted using certain cross sections of the CPES dataset (Brandt & Li, 2003; Garnaut, Song, Yao, & Wang, 2012; Marquis & Qiao, 2018; Su & He, 2010).

We adopt these surveys mainly for the following reasons. On one hand, they are by far the most comprehensive survey in investigating the participation of entrepreneurs in political regimes such as The National People's Congress (NPC), the Chinese People's Political Consultative Conference (CPPCC), which makes it as the best dataset for analyzing the political connections for Chinese firms (H. Li, Liu, Zhang, & Ma, 2007; H. Li, Meng, & Zhang, 2006). On the other hand, these datasets provide information on corporate environmental governance such as pollution control investments, pollution levies and pollution fines, which facilitates our research to explicitly investigate the relationship between political connections and mitigation. Moreover, despite the slight difference of focus in each round of the survey, they collected diversified information on the characteristics of the firm owners, as well as the corporate operations, finance, management, which can be taken as candidates for controls in the model specifications.

For the feasibility of analysis, we pretreat the sample through the following steps: (1) Only observations that respond to questions on political features are retained; (2) we eliminate outliers with abnormal profit margins; (3) We eliminate observations with pollution mitigation investments greater than their annual turnover. The remaining sample size is 17366. The geographical distribution of the observations is shown in Appendix 1.

##### 4.2. Variables

###### 4.2.1. Measure of mitigation efforts

In this research, we measure the mitigation efforts of private firms by their annual investments in pollution abatement projects, including the facilities for waste water, waste gas, solid waste, noise and others. Mitigation investments are direct measurements of corporate pollution control efforts (Milliman & Prince, 1989), and has been widely used in the evaluation of mitigation incentives for polluters in China, for example, H. Wang and Chen (1999). Besides, for the robustness check, we also use the alternative measures such as the annual amount of pollution charges paid and the annual amount of pollution fines for the corporate mitigation efforts.

###### 4.2.2. Measure of political connections





Previous studies measure corporate political connections either by connections of firms with the governments, for example, the share of state-owned corporates, or the personal connections of the firm owners with the governments, for example, the owners are members of the legislatures or the ruling parties (M. Faccio, Masulis, & McConnell, 2006; H. Fan & Chen, 2017; J. Fan, 2016; Kung & Ma, 2016). Firms in this study are all private companies that do not have any state interests, thus we use the latter measurement of corporate political connections. To be specific, the corporate political features are identified based on firm owners' response to the following questions: "Are you an NPC or CPPCC member? If you are an NPC member, what level is it?", "If you are a CPPCC Member, then what level is it?". Simple statistics show that 50% of the interviewed entrepreneurs served as NPC or CPPCC members. Therefore, we develop a binary variable for political connections which takes the value of one if the owner is an NPC or CPPCC member at the county level and above, and zero otherwise. What's more, following H. Li et al. (2008) we also use the dummy variable of whether entrepreneurs are CCP members as a proxy of political connection.

#### 4.2.3. Measure of access to formal finance

In this study, we refer formal finance institutes to banks that controlled and supervised by the central governments. In *the 2012 Private Firm Survey*, the credit channels are classified into three categories: bank, small financial institution, and individuals. Firm owners were required to respond to the question that what's the loan balances for your firm in these three channels, only banks are regarded as formal finance institutes. Some previous studies employ directly the balance of bank loans as a measure of access to formal finance (H. Li et al., 2008). In this study, we use an alternative measurement, which is the proportion of bank loan balance in total loan balances. This alternative measurement allows us to control the impacts of the creditability on mitigation investments.

#### 4.3. Empirical strategy

In this research we establish the following model:

$$Mitigation_{ijkt} = \alpha PoliticalC_{ijkt} + \Gamma X_{ijkt} + \Phi Z_{ijkt} + \gamma_t + \eta_j + \mu_k + \varepsilon_{ijkt} \quad (1)$$

The subscript  $i$ ,  $j$  and  $k$  indicate the  $i$ th private firm in the  $j$ th province and the  $k$ th industry respectively, and the subscript  $t$  indicates the survey year.

The dependent variable  $Mitigation_{ijkt}$  is the corporate mitigation investments. We use pollution mitigation investments scaled by the corresponding operating income as the dependent variable. The ratio form is widely used in previous studies, which can help remove the influence of inflations and control the size effects (Klassen & Vachon, 2003). The explanatory variable  $PoliticalC_{ijkt}$  represents the binary proxy for corporate political connections defined above.

$X_{ijkt}$  are a set of firm attributes, including operating profit margin (%), tax burden rate (%) and firm age. Tax burden rate is defined as the proportion of tax accrual to turnover.  $Z_{ijkt}$  represents a vector of entrepreneurs' characteristics, including age, gender, education level.  $\gamma_t$  is the dummy for the year,  $\eta_j$  is the dummy variable for the province, and  $\mu_k$  is the industry dummy.  $\varepsilon_{ijkt}$  is the error term.

Sixty-two percentages of the observations have zero pollution control investments. Therefore, we perform Tobit regression on the model (1), which could help avoid negative predictions caused by OLS regression (Amemiya, 1984).



Corporate political connections may be the outcome of self-selection of private entrepreneurs. For instance, firm owners in heavy polluting industries may circumvent environmental regulations by establishing political connections with local governors (Y. Wang, 2015). Such self-selections may lead to estimation bias for our baseline regression (Wooldridge, 2010). PSM approach is always used to identify causality in the case of self-selection (Austin, 2011). It could help to control factors that influence the political connection behaviors through matching. We thus further employ propensity score matching approach to deal with this issue.

One important procedure for the PSM approach is to select proper matching variables. The principle of selection is to include variable not only determines political connections but also mitigation investments (Austin, 2011). In this study, we include pollution charges, profit margin, tax burden rate, age of firm, as well as age, gender, and education of entrepreneurs as matching variables.

#### 4.4. The mediating model

According to Baron and Kenny (1986), we identify the mediation effects through the following three steps: first, regress the dependent variable  $Mitigation_{ijkt}$  on the explanatory variables  $PoliticalC_{ijkt}$  as well as the control variables in order to get the main effect, see in regression equation (2). This step is completed in the baseline regression; second, the mediator  $FormalFinance_{ijkt}$  is subjected to Tobit regression on the explanatory variable  $PoliticalC_{ijkt}$  and the control variables, see in regression equation (3); third, the explanatory variables  $PoliticalC_{ijkt}$ , the mediator  $FormalFinance_{ijkt}$ , as well as the control variables are simultaneously included in the regression equation, see in regression equation (4).

$$Mitigation_{ijkt} = \beta_1 PoliticalC_{ijkt} + \Gamma X_{ijkt} + \Phi Z_{ijkt} + \gamma_t + \eta_j + \mu_k + \varepsilon_{ijkt} \quad (2)$$

$$\begin{aligned} FormalFinance_{ijkt} = & \beta_2 PoliticalC_{ijkt} + \Gamma X_{ijkt} \\ & + \Phi Z_{ijkt} + \gamma_t + \eta_j + \mu_k + \varepsilon_{ijkt} \end{aligned} \quad (3)$$

$$\begin{aligned} Mitigation_{ijkt} = & \beta_{31} PoliticalC_{ijkt} + \beta_{32} FormalFinance_{ijkt} \\ & + \Gamma X_{ijkt} + \Phi Z_{ijkt} + \gamma_t + \eta_j + \mu_k + \varepsilon_{ijkt} \end{aligned} \quad (4)$$

According to Hypothesis 3, after adding the mediation variable  $FormalFinance_{ijkt}$  in Equation(4), it is predicted that the magnitude of the main effect  $\beta_1$  is reduced, and the mediation effect  $\beta_{32}$  is positively significant.

## 5. Empirical Results

### 5.1. Descriptive statistics

**Table 1** tabulates features of private companies with and without political connections, and reports the t-statistics on differences between these two groups. We can find that for owners' attributes, politically connected entrepreneurs are older and more likely to have received a college education, and they are more likely to be male. For firms' attributes, firms with political connections have higher operating income and less tax burden, however, their profit margins are lower. For credit channels, politically connected firms are more likely to borrow from banks, while those without political connections are



more dependent on private financing. On the aspects of environmental governance, politically connected companies invest more in pollution mitigation and by contrast, have lower pollution fines. No significant difference found in the pollution levy.

Table 1 Summary Statistics: Firms with Political Connections versus Firms without Political Connections.

|                                 | Without Political<br>Connections | With Political<br>Connections | Difference           |
|---------------------------------|----------------------------------|-------------------------------|----------------------|
|                                 | Mean (S.D.)                      | Mean (S.D.)                   | Mean (S.D.)          |
|                                 | (1)                              | (2)                           | (1) - (2)            |
| <b>Environmental Governance</b> |                                  |                               |                      |
| Pollution Mitigation (%)        | 0.365<br>(2.436)                 | 0.548<br>(3.142)              | -0.183***<br>(0.048) |
| Pollution Levy (%)              | 0.125<br>(0.584)                 | 0.134<br>(0.548)              | -0.008<br>(0.010)    |
| Environmental Fine (%)          | 0.005<br>(0.158)                 | 0.002<br>(0.027)              | 0.004*<br>(0.002)    |
| <b>Firm Attributes</b>          |                                  |                               |                      |
| Turnover (Log)                  | 14.829<br>(3.231)                | 16.565<br>(2.576)             | -1.737***<br>(0.047) |
| Profit Margin (%)               | 9.854<br>(20.494)                | 8.889<br>(15.880)             | 0.965***<br>(0.305)  |
| Tax Burden Rate (%)             | 6.849<br>(9.481)                 | 6.496<br>(8.088)              | 0.353**<br>(0.145)   |
| Informal Finance (%)            | 0.277<br>(0.410)                 | 0.164<br>(0.324)              | 0.113***<br>(0.009)  |
| Firm Age (year)                 | 6.235<br>(4.661)                 | 8.621<br>(4.896)              | -2.385***<br>(0.074) |
| <b>Owners Attributes</b>        |                                  |                               |                      |
| Entrepreneurs Age (year)        | 43.594<br>(9.246)                | 46.067<br>(7.838)             | -2.473***<br>(0.130) |
| College Education (1=Y)         | 0.875<br>(0.331)                 | 0.921<br>(0.270)              | -0.047***<br>(0.005) |
| Gender (1=F)                    | 0.179<br>(0.383)                 | 0.127<br>(0.333)              | 0.052***<br>(0.005)  |
| Observations                    | 9319                             | 8049                          | 17368                |

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

## 5.2. Baseline Results

Table 2 represents the regression results of the model (1). The dependent variable in Column (1) is the ratio of corporate pollution control investments to revenue. In order to compare with the existing literature, we also reported the regression results of pollution levy in Column 2 and pollution fines in Column 3.

Table 2 Impacts of Political Connections on Environmental Governance.

Notes: For all Tobit regressions, we report the marginal effects, and standard errors in

| dF/dx                        | (1)<br>Pollution<br>Mitigation<br>(% of Turnover) | (2)<br>Pollution Levy<br>(% of Turnover) | Pollution Fine<br>(% of Turnover) |
|------------------------------|---|--|-----------------------------------|
| Political<br>Connection(1=Y) | 1.129***<br>(0.268)                               | 0.145***<br>(0.041)                      | 0.037<br>(0.092)                  |
| Firm Attributes              |   |  |                                   |
| Profit Margin (%)            | 0.015**<br>(0.006)                                | 0.006***<br>(0.001)                      | 0.000<br>(0.003)                  |
| Tax Burden Rate (%)          | 0.044***<br>(0.014)                               | 0.009***<br>(0.002)                      | 0.014<br>(0.011)                  |
| Firm Age (year)              | 0.021<br>(0.013)                                  | 0.008***<br>(0.003)                      | 0.010<br>(0.007)                  |
| Owners Attributes            |   |  |                                   |
| Entrepreneurs Age<br>(year)  | 0.007<br>(0.008)                                  | 0.005**<br>(0.002)                       | -0.005<br>(0.006)                 |
| College Education<br>(1=Y)   | 0.434*<br>(0.251)                                 | -0.025<br>(0.029)                        | 0.127<br>(0.142)                  |
| Gender(1=M)                  | 0.607***<br>(0.215)                               | -0.026<br>(0.032)                        | 0.163<br>(0.176)                  |
| Constant                     | -5.143***<br>(0.769)                              | -0.687***<br>(0.122)                     | -2.026**<br>(0.893)               |
| Year Dummy                   | Y   | Y  | Y                                 |
| Province Dummy               | Y   | Y  | Y                                 |
| Industry Dummy               | Y   | Y  | Y                                 |
| Left-censored                | 7781  | 7046                                     | 7804                              |
| Observations                 | 11740   | 11737                                    | 7941                              |
| Log-likelihood               | -14939.8  | -9414.0                                  | -633.1                            |
| R-squared                    | 0.045   | 0.059                                    | 0.080                             |

parentheses, clustered at the provincial level. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

The results show that political connections have a significant association with corporate environmental governance. Firstly, we can find in Column (1) that politically connected firms invest more in pollution control investments. To be specific, the ratio of pollution control investments to turnover in politically connected companies is 0.275 percentage higher than those without political connections. Secondly, politically connected firms pay higher pollution charges according to Column (2). Finally, no significant relationship is found between political connections and corporate pollution fines in Column (3).

Our results challenge the predictions of the theory of "collusion between local government and firms".



According to the collusion theory, the local governors and firms could reach a conspiracy, under which the pollution from the firms would be indulged, resulting in environmental degradation. This indulgent is manifested in reducing the burden of corporate sewage charges and pollution fines. However, our study did not find significant evidence supporting the collusion hypothesis.

We report the robustness check in **Table 3**. In the robustness check, we use NPC membership, CPPCC memberships, as well as CCP membership of the owners as proxies for political connections for in model (1) respectively. Furthermore, we include the ratio of sewage charges to turnover in **Table 3**, in order to control the intensity of environmental regulations confronted by polluters.

**Table 3** shows that all four proxies are significantly related to corporate pollution control investments. The NPC membership and the CPPCC membership have impacts of similar magnitude as the constructed explanatory variable, while CCP memberships are less influential. This may be because CCP member is a universal identity in China, its relevance to political connections is low. What's more, CCP membership may be acquired before entrepreneurs started their firms. On the contrary, the NPC membership and the CPPCC membership are more direct and realistic approached for entrepreneurs to establish political connections.

Table 3 Impacts of Political Connections on Mitigation Investments with Multiple Measurements of Political Connections.

| dF/dx                     | (1)<br>Mitigation<br>Investments | (2)<br>Mitigation<br>Investments | (3)<br>Mitigation<br>Investments | (4)<br>Mitigation<br>Investments |
|---------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Political Connection(1=Y) | 1.165***<br>(0.261)              |                                  |                                  |                                  |
| CPC Member(1=Y)           |                                  | 1.210***<br>(0.317)              |                                  |                                  |
| CPPCC Member(1=Y)         |                                  |                                  | 1.067***<br>(0.265)              |                                  |
| CCP member (1=Y)          |                                  |                                  |                                  | 0.546***<br>(0.168)              |
| Firm Attributes           |                                  |                                  |                                  |                                  |
| Pollution Levy (%)        | 2.310***<br>(0.283)              | 2.321***<br>(0.340)              | 2.370***<br>(0.265)              | 2.301***<br>(0.279)              |
| Profit Margin (%)         | 0.002<br>(0.005)                 | 0.004<br>(0.006)                 | -0.000<br>(0.004)                | 0.002<br>(0.005)                 |
| Tax Burden Rate (%)       | 0.027*<br>(0.015)                | 0.026<br>(0.017)                 | 0.025*<br>(0.015)                | 0.025*<br>(0.014)                |
| Firm Age (year)           | 0.025***<br>(0.013)              | 0.034**<br>(0.017)               | 0.032***<br>(0.012)              | 0.050***<br>(0.016)              |
| Owners Attributes         |                                  |                                  |                                  |                                  |
| Entrepreneurs Age (year)  | 0.004<br>(0.006)                 | 0.007<br>(0.007)                 | 0.001<br>(0.007)                 | 0.002<br>(0.007)                 |
| College Education (1=Y)   | 0.518*<br>(0.269)                | 0.558*<br>(0.287)                | 0.456*<br>(0.269)                | 0.608**<br>(0.281)               |
| Gender(1=M)               | 0.758***<br>(0.223)              | 0.774***<br>(0.266)              | 0.735***<br>(0.227)              | 0.754***<br>(0.224)              |
| Constant                  | -5.301***<br>(0.820)             | -5.481***<br>(0.998)             | -5.081***<br>(0.908)             | -5.330***<br>(0.842)             |
| sigma                     | 4.774***<br>(0.558)              | 4.765***<br>(0.658)              | 4.847***<br>(0.593)              | 4.790***<br>(0.561)              |
| Year Dummy                | Y                                | Y                                | Y                                | Y                                |

| Province Dummy | Y        | Y        | Y        | Y        |
|----------------|----------|----------|----------|----------|
| Industry Dummy | Y        | Y        | Y        | Y        |
| Left-censored  | 7718     | 6336     | 7011     | 7667     |
| Observations   | 11552    | 9247     | 10144    | 11480    |
| Log-likelihood | -14177.1 | -10830.1 | -11789.1 | -14136.0 |
| R-squared      | 0.067    | 0.075    | 0.068    | 0.065    |

Notes: For all Tobit regressions, we report the marginal effects, and standard errors in parentheses, clustered at provincial level. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .\*

From column (4), we can also find the impacts of various features on corporate pollution mitigation investments. For example, the pollution charge is the most important factor among all these variates. 1% increase in corporate sewage charges would improve their pollution control investments by around 2.3%. This indicates that, after several rounds of reform, the pollution charge policy has become the most important promotion for firms to conduct pollution control(H. Wang & Jin, 2002; H. Wang & Wheeler, 2000, 2005).

### 5.3. Tackle the Endogeneity: The PSM Approach

To deal with the endogeneity caused by self-selections, we use the Propensity Score Matching Approach to estimate the treatment effects of corporate political connections. The matching variates comprise of pollution charges, profit margin, tax burden rate, age of firm, as well as age, gender, and education of entrepreneurs. **Table 4** reports the results of the balance test after matching. The variances of most matching variates are significantly reduced through matching, and the distinctions of means between the treatment group and the control group lose their significances, which indicates that the comparability of these two groups is greatly enhanced.

Table 4 Propensity Score Matching and Balance Tests.

|                          | Mean after Matching |                 | S. D. after Matching |                 | S.D. ratios     |                |
|--------------------------|---------------------|-----------------|----------------------|-----------------|-----------------|----------------|
|                          | Control Group       | Treatment Group | Control Group        | Treatment Group | Before Matching | After Matching |
| Pollution Levy (%)       | 0.123               | 0.121           | 0.323                | 0.251           | 78%             | 63%            |
| Turnover (Log)           | 15.227              | 16.798          | 4.816                | 4.092           | 85%             | 89%            |
| Profit Margin (%)        | 9.484               | 8.843           | 392.277              | 232.215         | 59%             | 88%            |
| Tax Burden Rate (%)      | 6.727               | 6.293           | 83.961               | 58.965          | 70%             | 99%            |
| Firm Age (year)          | 6.433               | 8.847           | 21.363               | 23.355          | 109%            | 94%            |
| Entrepreneurs Age (year) | 43.806              | 46.239          | 83.245               | 58.916          | 71%             | 71%            |
| College Education (1=Y)  | 0.874               | 0.925           | 0.110                | 0.070           | 63%             | 105%           |
| Gender (1=M)             | 0.831               | 0.882           | 0.140                | 0.104           | 75%             | 100%           |

**Table 5** reports the average treatment effect of the treatment group ("ATET"). The PSM approach confirms that our baseline results are valid. Compared with the baseline results, the propensity score matching method yields smaller effects. In the baseline conclusions, pollution abatement investments of private firms with political connections are 0.28 percentage higher. In the results of the propensity score matching method, this effect was reduced to 0.13 percentage. This shows that there is a small selection bias in the benchmark results.



Table 5 Impacts of Political Connections on Environmental Governance: Propensity Score Matching

| Treatment             | ATET     | S.D.  | Z    | P Value |
|-----------------------|----------|-------|------|---------|
| Political Connections | 0.132**  | 0.063 | 2.09 | 0.037   |
| CPC member            | 0.185*** | 0.064 | 2.87 | 0.004   |
| CPPCC member          | 0.151*** | 0.053 | 2.86 | 0.004   |

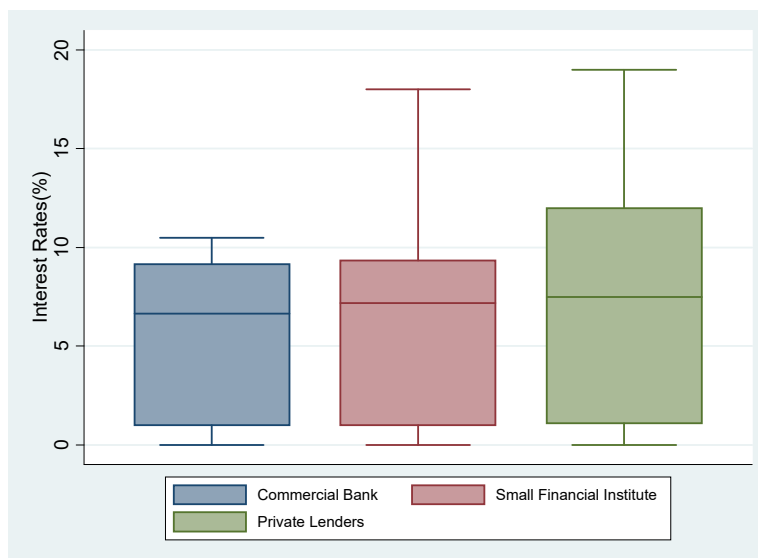
Notes: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

#### 6. Mechanism: The Intermediary Role of Formal Finance

The baseline findings of this study are that political connections are positively associated with mitigation investments. In this section, we construct a mediating model by employing access to formal finance as a mediator variable to examine the possible mechanism.

Figure 2 depicts the comparisons of interest rates from three channels, namely commercial banks, small financial institutes, and private lenders. As is shown, the median interest rate of commercial bank loans is the lowest, while the private loan rate the highest. What's more, the volatility of interest rates of bank loans is also the smallest, far less than that of private loan interest rates.

Figure 2 Loan interests for different credit channels



### 6.1. Impacts of political connections on access to formal finance

Table 6 tabulates the regression results of Step 2 for the mediating model. The dependent variable is the ratio of bank loans to total loan balances. Column (1) only includes political connections as a major explanatory variable. Furthermore, in order to make our results more comparable, we include the marketization index of each province in the column (2) following the work of H. Li et al. (2008). The marketization index is evaluated by X. Wang, Yu, and Fan (2016) to measure the maturity of market institutions. In column (3), the interaction term of political connections and the marketization index is included.

The empirical results show that bank loan ratios of politically connected private enterprises are 0.1 percentage higher than the non-politically connected firms. From the regression results in column (3), political connections in provinces with higher degrees of marketization have a significant negative impact on private firms' access to loans from banks. After including the interaction term, the impact of political connections on bank loans is greatly reduced. This result is in line with former studies (H. Li et al., 2008; Yu & Pan, 2008).





Table 6 Impacts of Political Connections on Access to Formal Finances.

|  | (1)<br>Formal Finance<br>(%) | (2)<br>Formal Finance<br>(%) | (3)<br>Formal Finance<br>(%) |
|--|------------------------------|------------------------------|------------------------------|
| Political Connection(1=Y)              | 0.123***<br>(0.025)          | 0.123***<br>(0.025)          | 0.284***<br>(0.061)          |
| Marketization                          |                              | 0.046***<br>(0.002)          | 0.054***<br>(0.004)          |
| Political Connection×<br>Marketization |                              |                              | -0.018**<br>(0.007)          |
| Firm Attributes                        |                              |                              |                              |
| Profit Margin (%)                      | 0.001*<br>(0.000)            | 0.001*<br>(0.000)            | 0.001*<br>(0.000)            |
| Tax Burden Rate (%)                    | -0.001<br>(0.001)            | -0.001<br>(0.001)            | -0.001<br>(0.001)            |
| Firm Age (year)                        | 0.006***<br>(0.001)          | 0.006***<br>(0.001)          | 0.006***<br>(0.001)          |
| Owners Attributes                      |                              |                              |                              |
| Entrepreneurs Age (year)               | -0.000<br>(0.001)            | -0.000<br>(0.001)            | -0.000<br>(0.001)            |
| College Education (1=Y)                | 0.082***<br>(0.023)          | 0.082***<br>(0.023)          | 0.081***<br>(0.023)          |
| Gender(1=M)                            | 0.001<br>(0.025)             | 0.001<br>(0.025)             | 0.001<br>(0.025)             |
| Constant                               | 0.669***<br>(0.042)          | 0.124***<br>(0.041)          | 0.048<br>(0.054)             |
| Province Dummy                         | Y                            | Y                            | Y                            |
| Industry Dummy                         | Y                            | Y                            | Y                            |
| Left-censored                          | 699                          | 699                          | 699                          |
| Observations                           | 5012                         | 5012                         | 5012                         |
| Log-likelihood                         | -2925.3                      | -2925.3                      | -2919.8                      |
| R-squared                              | 0.104                        | 0.104                        | 0.106                        |

Notes: For all Tobit regressions, we report the marginal effects, and standard errors in parentheses, clustered at the provincial level. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

### 6.2. Complete test of the mediating effects

Table 7 reports the complete mediation effect test. To facilitate the analysis, column (1) replicates the baseline regression, which serves as a basis of comparison. Column (2) is a test of the factors affecting the ability of access to bank loans, and the results are the same as those in Table 3. Column (3) political connections and the proportion of bank loans are simultaneously included. Notably, we use the proportion of bank loans in total loan balances other than the total balance of bank loans as a mediating variable to avoid the inverse causality between credit capability and mitigation investments.

From the regression results in Column (3), the estimated coefficient of the median variable itself is significantly positive, indicating that the higher the proportion of loans from banks, the higher pollution control investments, which is consistent with our expectation. In addition, we also find that, compared with the basic regression results in column (1), after we add the proportion of bank loans as a mediator, the impact of political connections on the proportion of investments in corporate pollution control is reduced. This shows that the mediating effect of formal finance surely exists.

Table 7 Impacts of Political Connections on Environmental Governance: The Mediating Effects of Former Finance.

|                             | (1)<br>Mitigation<br>Investments | (2)<br>Formal Finance | (3)<br>Mitigation<br>Investments |
|-----------------------------|----------------------------------|-----------------------|----------------------------------|
| Political Connection(1=Y)   | 1.165***<br>(0.261)              | 0.119***<br>(0.025)   | 0.915***<br>(0.297)              |
| Formal Finance (%)          |                                  |                       | 0.558*<br>(0.326)                |
| Firm Attributes             |                                  |                       |                                  |
| Pollution Levy (%)          | 2.310***<br>(0.283)              | 0.007<br>(0.012)      | 2.908***<br>(0.600)              |
| Profit Margin (%)           | 0.002<br>(0.005)                 | 0.001*<br>(0.000)     | -0.002<br>(0.010)                |
| Tax Burden Rate (%)         | 0.027*<br>(0.015)                | -0.001<br>(0.001)     | 0.036**<br>(0.018)               |
| Firm Age (year)             | 0.025**<br>(0.013)               | 0.006***<br>(0.001)   | 0.006<br>(0.014)                 |
| Owners Attributes           |                                  |                       |                                  |
| Entrepreneurs Age<br>(year) | 0.004<br>(0.006)                 | -0.001<br>(0.001)     | -0.000<br>(0.009)                |
| College Education<br>(1=Y)  | 0.518*<br>(0.269)                | 0.082***<br>(0.025)   | 0.624**<br>(0.300)               |
| Gender(1=M)                 | 0.758***<br>(0.223)              | 0.005<br>(0.027)      | 0.523<br>(0.416)                 |
| Constant                    | -5.301***<br>(0.820)             | 0.681***<br>(0.041)   | -5.215***<br>(1.318)             |
| Industry Dummy              | Y                                | Y                     | Y                                |
| Province Dummy              | Y                                | Y                     | Y                                |
| Left-censored               | 7718                             | 666                   | 2687                             |
| Observations                | 11552                            | 4713                  | 4629                             |
| Log-likelihood              | -14177.1                         | -2783.1               | -6920.3                          |
| R-squared                   | 0.067                            | 0.101                 | 0.060                            |

Notes: For all Tobit regressions, we report the marginal effects, and standard errors in parentheses, clustered at provincial level. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

## 7. Conclusions and Policy Implications

In this research by employing datasets from *the National Private Firm Surveys*, we provide robust evidence that corporate political connections can increase their corporate mitigation investments. One of the possible pathways is that the central government increases the environmental requirements for polluters who apply for bank loans and thereby improves the mitigation investments of the politically connected firms.

Former literature argues that “collusions between local governments and firms” in China could result in a lack of incentives for polluters to improve their mitigation efforts. However, we challenge the results of former studies that, corporate political connections do not always damage the enthusiasm of their environmental governance. The Centre can deter the coalition through re-centralization measurements. In our case, the green credit policy is a successful re-centralization policy. Thus, our results remind us



that, the stakeholders involved in the Chinese pollution governance comprise the central government, the local government and the polluting firms.

Notably, our conclusions do not necessarily mean to encourage corporate mitigation through political connections. Political connections are not wonder-drugs for pollution. As mentioned above, under certain circumstances, political connections could even swift to protective umbrellas for polluters.

However, our study still has significant policy implications. In recent years, the central government increased its efforts in pollution mitigations and has repeatedly dispatched its commissioners to directly supervise local cadres on pollution. This measurement will help break the coalitions between local governments and polluting firms. However, these costly central supervisions could only function well in the short-term. By contrast, the green finance policy can solve the incentive issues more efficiently through the well-established formal financial system. Therefore, this study shows that the key to the best practice of environmental governance is to establish the modern market mechanisms and to strengthen the standardization, institutionalization, legalization of environmental regulations.

There is still room for improvement in this study. On the one hand, although this study validates the mediating role of formal finance in benchmarking effects, corporate political connections and their impacts on environmental governance are relatively complex, and future research still needs to identify other motivations for corporate pollution mitigation investments. On the other hand, in this study, we document the impact of political connections on pollution mitigation investments. High pollution control investments alone could not secure better corporate environmental performance. High investments in environmental governance do not mean that the pollution mitigation facilities equipped can guarantee normal operations. As reported, lots of pollution control facilities don't run timely due to their high operation cost. Therefore, the relationship between political connections and corporate environmental performance is a possible direction for future research.

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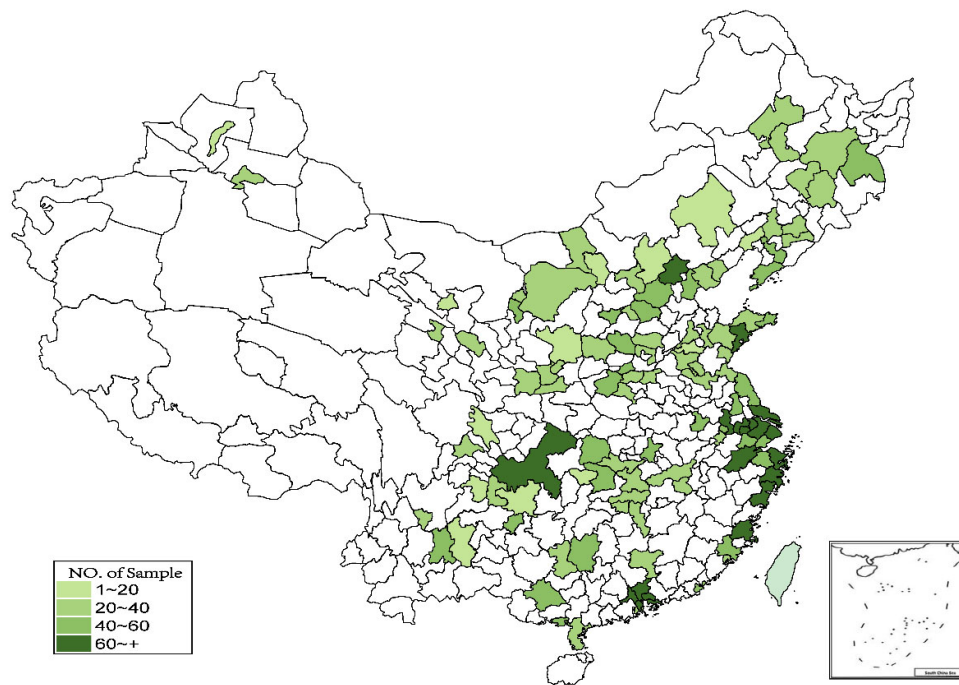
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### Appendix A Geographic Distribution of Samples





## Appendix B Proportions of Firm Owners as CPC and CCPCC members

| Levels   | CPC Member | CCPCC member | Total | %    |
|----------|------------|--------------|-------|------|
| None     | 12,191     | 10,948       | 7,559 | 48%  |
| Town     | 440        | n.a.         | 440   | 3%   |
| County   | 1,593      | 3,080        | 4,673 | 30%  |
| City     | 1,055      | 1,496        | 2,551 | 16%  |
| Province | 232        | 212          | 444   | 3%   |
| State    | 69         | 30           | 99    | 1%   |
| Total    | 15,580     | 15,766       | 8,207 | 100% |

## Appendix C Industrial Characteristics of Samples

| Industry   | Samples | %     |
|--|---------|-------|
| Manufacturing  | 4,661   | 29.37 |
| Wholesale and Retail Trade   | 2,352   | 14.82 |
| Mining   | 2,031   | 12.8  |
| Information Service  | 1,412   | 8.9   |
| Farming, Forestry, Animal Husbandry and Fishery                          | 1,107   | 6.98  |
| Construction   | 998     | 6.29  |
| Accommodation and Food Industry  | 642     | 4.05  |
| Transportation   | 503     | 3.17  |
| Real Estate  | 467     | 2.94  |
| Neighborhood Services and Other Service Industry                         | 298     | 1.88  |
| Leasehold and Business Service Industry                                  | 257     | 1.62  |
| Scientific Research, Technical Service and Geologic Examination Industry | 185     | 1.17  |
| Production And Supply Of Electric Power, Gas And Water                   | 172     | 1.08  |
| Cultural, Physical and Entertainment Industry                            | 151     | 0.95  |
| Sanitation, Social Security and Social Welfare Industry                  | 89      | 0.56  |
| Education  | 72      | 0.45  |
| Finance  | 68      | 0.43  |
| Sanitation, Social Security and Social Welfare Industry                  | 45      | 0.28  |
| Public Administration and Social Organization                            | 10      | 0.06  |
| Others   | 348     | 2.19  |
| Total  | 15,868  | 100   |



Appendix D Correlation matrix of variables.

|                       | Mitigation Investment | Pollution Charge | Pollution Fine | Turnover  | Profit Margin | Tax Burdon | Informal Finance | Firm Age   | Owner Age | College Education | Gender |
|-----------------------|-----------------------|------------------|----------------|-----------|---------------|------------|------------------|------------|-----------|-------------------|--------|
| Mitigation Investment | 1                     |                  |                |           |               |            |                  |            |           |                   |        |
| Pollution Charge      | 0.299***              | 1                |                |           |               |            |                  |            |           |                   |        |
| Pollution Fine        | 0.0202*               | 0.0443***        | 1              |           |               |            |                  |            |           |                   |        |
| Turnover              | -0.0238**             | -0.130***        | -0.0255*       | 1         |               |            |                  |            |           |                   |        |
| Profit Margin         | 0.0532***             | 0.144***         | 0.0223*        | -0.222*** | 1             |            |                  |            |           |                   |        |
| Tax Burdon            | 0.0996***             | 0.164***         | 0.0898***      | -0.217*** | 0.303***      | 1          |                  |            |           |                   |        |
| Informal Finance      | -0.0110               | 0.00210          | 0.0248         | -0.334*** | -0.0238       | 0.000830   | 1                |            |           |                   |        |
| Firm Age              | -0.0213*              | -0.00379         | -0.0140        | 0.288***  | -0.0103       | -0.0163    | -0.174***        | 1          |           |                   |        |
| Owner Age             | -0.00147              | 0.00710          | -0.00368       | 0.164***  | -0.0573***    | -0.0184*   | -0.0585***       | 0.292***   | 1         |                   |        |
| College Education     | 0.00596               | -0.0205*         | 0.00468        | 0.0690*** | -0.0179*      | 0.00613    | -0.0580***       | -0.00624   | -0.131*** | 1                 |        |
| Gender                | -0.0126               | 0.0127           | -0.0105        | -0.120*** | 0.0289***     | 0.00853    | 0.0297*          | -0.0673*** | -0.114*** | 0.0238**          | 1      |

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$