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Abstract

We propose corruption can substitute for conventional collateral in enforcing financial commitments when institutions are poor. A theoretical framework with agency frictions is built, in which corruptive relations with government officials keep firms committed to loan payments. Based on this framework, we hypothesize the anti-corruption investigation destroys the commitment mechanism so that firms default and, most importantly, firms default strategically as long as they can substitute corruption with other collateral. We investigate regional data and firm-level data from China, and find powerful evidence supporting our hypotheses.

Keywords: Corruption, Relationship lending, Strategic defaults

JEL Classification: E44, O16

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1 Introduction

Conventional collateral often fails in unconventional economies. This is captured by a story titled "Ghost Collateral" published by Reuters On May 31st, 2017: bankers in China found some of the collateralized physical assets suddenly varnished, some never existed, and some others have been pledged repeatedly to multiple lenders.[1] On January 14, 2018, Financial Times reported a similar story: loans in Russia are often issued with fake collateral.[2] In these economies, financial contracts are hard to enforce due to various institutional flaws such as loose legal enforcement or hidden credit histories. Yet, the exchange of financial resources is known to be central for economic development (Buera et al., 2011; Moll, 2014). This raises the question how lending occurs where institutions are poor but substantial growth has been achieved.

We propose corruption, a widespread phenomenon in developing/emerging economies, to be an answer. The idea traces back to Leff (1964), Huntington (1968), and Liu (1985) who argue power and bribery can access firms to resources. In this paper, we posit corruptive relations with government officials are essential for firms to get loan resources when institutions are poor. Corruption cases of this kind have been reported as true stories. In 2015, one of the most powerful officials in China named Yongkang Zhou was arrested for corruption; the investigation uncovered he helped an entrepreneur to get a bank loan of 600 million RMB in 2013 as a reward for a bribery of over 14 million RMB.[3] In this true story of corruption, banks control the loan resources, the entrepreneur demands loans, and the official connects banks with the entrepreneur for bribes. Like in any corruption cases, bribes incentivize the official. Unlike in many corruption cases where the official offers subsidy or contracts with beneficial pricing to his connected entrepreneurs, here the corrupt official does not control or allocate resources directly, instead he serves the role of financial intermediation.

To sort out the elements of incentivization for banks, entrepreneurs, and officials, formally we build a model of limited commitment. In this model, the entrepreneur has an incentive to distract loan resources to low-quality projects, seize private returns, and avoid debt payment; the bank becomes held up in non-performing loans financing low-quality projects due to the soft-budget constraint; the

[1] See "Ghost collateral' haunts loans across China's debt-laden banking system" by Reuters.(link).

[2] See "How to fix Russia's broken banking system" by Financial Times (link).

[3] According to Pei (2016), the 14 million RMB bribery was paid by an entrepreneur named Liu Han to purchase a tourism project from Zhou's son, Zhou Bin, at a price of 20 million RMB while the fair market value of the project was under 6 million RMB.

official, however, possesses the power, the information, and the social connections to track credit histories and ban defaulting firms from future loans. Hereby, the entrepreneur and the bank facilitate unsecured lending by forming a corruptive relationship with the official, making the official the de facto intermediary between the two. The continuation value of this relationship for repeated loan issuance corrects the entrepreneur's distorted incentives, makes unsecured lending safe, and maintains the investment quality. As such, the bribe to the official is nothing but a reward for a much needed service in an environment with poor institutions.

To evaluate the importance of corruption for finance, ideally we would quantify our framework with data to estimate the total amount of corruption-backed loans in reality. Unfortunately, this would be an extremely challenging task, because corruptive activities are known to be secretive, to take various forms, and to be hard to measure properly. Hence, we follow an approach by Fisman (2001), estimating how financial variables respond when corruption is tackled down by the anti-corruption investigation or, in other words, when the corruption channel for finance is blocked. For this purpose, our model provides several testable predictions. It predicts the anti-corruption investigation destroys the corruptive relationship, breaks the commitment, and causes the soft-budget constraint problem to arise for bank-entrepreneur pairs connected with the official under investigation. Consequently, the entrepreneur defaults, leaving the bank with non-performing loans. Moreover, the blocked corruption channel drives the bank to search for yields and the entrepreneurs for alternative financing options. If the entrepreneur can substitute corruption with collateralized borrowing, the default would appear strategic: firm performance stays unaffected, financial status remains intact, but other financing tools are more actively utilized.

We take these predictions to data. Although we believe corruption-backed finance is present everywhere, we choose to examine data from China because in recent years the Chinese government implemented extensive financial reforms to activate more financing tools, providing an ideal institutional background for identifying the substitution between corruption and other collateral. Moreover, in 2013 the Chinese president launched an intensive national anti-corruption campaign with an enormous amount of investigations and arrests, generating large data variations for testing our theory. Figure 1 plots the time series of the total number of investigated ("Shuang Gui") corrupt officials against the ratio of non-performing loans before and after 2013: from 2012 to 2013, the arrests rose by 23% and, from 2013 to 2014, by a further 42.1%; interestingly, the ratio of non-performing loans increased

simultaneously. This is consistent with our theory.

We turn to more detailed panel data to test the true empirical success of our theory. At the regional level, we study the correlation between the amount of non-performing loans and the number of arrested corruption officials. At the firm level, we compile a unique data set on firm defaults and on firm implications by the anti-corruption investigations, combining information publicized by the government and disclosed by news media. With this firm panel, we employ a staggered difference-in-difference approach to estimate a firm's responses in default probability and in other financial indicators following the arrest of a corrupt official connected with this firm. Our purpose is to identify the true causal relationship stemming from the anti-corruption investigation.

We find robust and powerful evidence supporting our predictions. At the regional level, non-performing loans rise when the anti-corruption campaign intensifies. At the firm level, default probability increases once a firm becomes implicated by the anti-corruption investigation, but the firm's performance or financial status does not at all deteriorate. We interpret this evidence as a sign of weaker incentives to repay the unsecured debt as implied by our theory, rather than the tightening of their loan-payment capacity as suggested by alternative theories on corruption. Moreover, we find firms turn to share-pledge financing or corporate bonds, and firm value drops accordingly. All these findings point to corruption as an essential financing channel for firms connected with corrupt officials.

Our paper is related to several bodies of literature. It joins a recent empirical literature on how the anti-corruption investigation impacts the Chinese economy (Chen and Kung, 2018; Fang et al., 2018, Li et al., 2018). On a broader sense, it belongs to the literature studying the relationship between corruption and growth (Shleifer and Vishny, 1993; Wei, 1999; Olken and Pande, 2012). While this literature often links corruption with slower growth, some scholars have proposed corruption and bribes can work as "grease" to speed up wheels of commerce when regulations are bad (Leff, 1964; Huntington, 1968; Liu, 1985). Empirically, Mauro (1995) and Svensson (2005) both examine cross-country aggregate data and find evidence suggesting the relationship between corruption and growth is in fact mixed and ambiguous. Our proposed corruption for finance reconciles some of these views.

We also build on the literature on soft-budget constraints faced by financial intermediaries when borrowers' commitment is limited and the enforcement mechanism is insufficient (Dewatripont and Maskin, 1995, and Maskin and Xu, 2001). We join Boot (2000) to propose relationship lending and specify corruption in particular as a solution for the SBC problem. Our work echos the literature on

contract enforceability and economic institutions (Greif, 1993).

The rest of the paper proceeds as follows. Section 2 builds a model to provide testable predictions. Section 3 discusses the data. Section 4 presents the key evidence. Section 5 explains our evidence is unique to corruption for finance. We conclude in Section 6.

2 Model

We model an environment where monitoring credit is costly and extending credit is risky due to poor institutions. The credit history of an entrepreneur is opaque, either because there lacks a well enforced credit-recording system economy-wide, or because competition among banks and informal creditors fragments credit histories. Therefore, entrepreneurs who defaulted in the past can easily borrow again from new creditors. Pledging conventional physical collateral cannot guarantee the credit safety, as physical assets' ownerships can be hard to verify. Government officials are powerful: they can track credit histories and influence credit allocations through their extensive connections with entrepreneurs, banks, and other officials.[4]

This model serves two purposes: to illustrate how corruption supplements poor institutions by enforcing financial commitments and to provide a tractable framework for deriving testable predictions. To achieve these purposes, several elements are required: 1) limited commitment arising from moral hazard that can be overcome by corruption; 2) observable financial instruments that will respond when anti-corruption investigations destroy corruption; 3) testable predictions that can distinguish corruption for financial intermediation from corruption for other economic uses.

2.1 Basic Setups

Time is discrete and lasts forever. The economy is populated by banks, entrepreneurs, and government officials. There are one measure of banks, one measure of entrepreneurs, and N^G measure of government officials who participates in lending. All agents have linear utility over consumption. They discount future utility at rate $\beta \in (0, 1)$. The utility from consuming one consumption good is one.

Entrepreneurs use intermediate goods to produce consumption goods. They cannot self finance.

[4]Corrupt officials are different from mafia. Gangsters in mafia could punish the defaulting entrepreneur by killing him and his family for example. The punishment that a corrupt official imposes on a defaulting entrepreneur is to terminate an ongoing lending relationship, so that he/she can no longer obtain credit.

In each period, banks are endowed with K units of intermediate goods. Banks can either lend the intermediate goods to entrepreneurs, or invest in a safe storage technology $G(K)$, G being a smooth and concave function with $G''(\cdot) < 0 < G'(\cdot) < R_H$. Individual banks take r_0, the return to the safe-storage technology, as given.[5] Denote the amount of intermediate goods banks allocate to safe-storage technology as K^S, then:

$$r_0 = G'(K^S). \tag{1}$$

An entrepreneurs owns s fraction of her firm's equity. The measure of entrepreneurs with s share or less is denoted $N^E(s)$, for $s \in [0, 1]$ and $N^E(1) = 1$. We simplify the entry and exit by assuming an entrepreneur faces an exogenous probability δ of exit at the beginning of every period. An exiting entrepreneur will be replaced by an identical entrepreneur.

Entrepreneurs can form corruptive relationships with government officials for loan issuance. Developing such an relationship is a privilege accessible only to a limited number of entrepreneurs. We simplify the entry into corruption by assuming entrepreneurs form such relationships through random matching, under which the probability of meeting an official is evenly distributed among entrepreneurs. Here we abstract away from a potential selection effect of entrepreneurs into corruption (Liu, 1985), because we do not focus on corruption's allocative impact. In some way, random matching reflects an inefficient allocation of corruptive government connections among entrepreneurs, which is probability true in reality due to corruption's hidden and secretive nature.

In particular, let the measure of entrepreneurs with share s or less who are connected with officials to be $C_t^E(s)$. The rest of entrepreneurs with share s or less, $N^E(s) - C_t^E(s)$, can form relationships with officials at a probability $\alpha \in [0, 1]$. We assume an official meets at least two entrepreneurs of the same type at the same time when considering a new relationship. Entrepreneurs compete by offering a lump-sum payment upfront to the official. The Bertrand competition implies zero expected value of creating a new relationship for an entrepreneur. After the relationship is established, an entrepreneur will pay an additional flow fee of bribery every period as long as the official stays in power. The amount of the bribe will be determined by Nash bargaining.

[5] Even though the banking sector has market power, we assume bankers in each bank compete with each other so that they take as given the bank's marginal return of lending.

2.2 Soft-budget Constraints

There are of course many ways to model limited commitment arising from moral hazard. In this paper, we follow Dewatripont and Maskin (1995) and Maskin and Xu (2001) to illustrate, without additional enforcement mechanisms, entrepreneurs shirk in maintaining investment quality, which subjects banks to soft-budget constraints.

Each period consists of three sub-periods. At the beginning of sub-period one, an entrepreneur is endowed with a production opportunity that requires one unit of intermediate good. If the opportunity is funded, the entrepreneur makes a choice at sub-period two on the quality of the project to be high or to be low. A high-quality project generates output R_H at the end of sub-period three. R_H is fully pledgeable, and will be seized by the bank in case the entrepreneur defaults. A low-quality project, however, requires one unit of additional funding at sub-period two; it generates θR_L units of pledgeable output and $(1-\theta)R_L$ units of unpledgeable private return at sub-period three. $\theta \in (0,1)$ represents its pledgeability. The private return cannot be observed by banks, shareholders, or government officials, and therefore will be fully taken by defaulting entrepreneurs.

Assumption 1. $R_L - r_0 < R_H$, $r_0 < \theta R_L < 2r_0$, $R_H - r_0 < (1-\theta)R_L$

$R_L - r_0 < R_H$ ensures the choice of high-quality project to be socially optimal. $r_0 < \theta R_L$ makes sure that banks find it suboptimal to terminate a low-quality project at sub-period two, because the pledgeable part of the output from a low-quality project is higher than its opportunity cost as one additional unit of input.[6] $\theta R_L < 2r_0$ implies funding low-quality projects generates a loss for banks, because its pledgeable output is lower than the total amount of funding it requires. Thus, banks keep funding a low-quality project only because the first unit of input is already sunk, and terminating it will generate an even bigger loss. The limited commitment thus generates the classic problem of soft budget constraint (SBC) raised by Dewatripont and Maskin (1995).

$R_H - r_0 < (1-\theta)R_L$ concerns the incentive of entrepreneurs with $s = 1$. Denote the interest rate at which banks lend to entrepreneurs to be r. Its spread with banks' opportunity cost r_0, $r - r_0$, reflects the risk premium associated with lending to entrepreneurs. Due to lax institutions, an entrepreneur can default without being punished by continuing to borrow from new creditors, so that she makes her decision based on one-period payoffs only. If she chooses a low-quality project, defaults on the debt,

[6] Assumption 1 takes r_0 as given. For the general equilibrium analysis, we assume it holds for all possible value of r_0, $r_0 \in [G'(K), G'(0)]$.

and runs away, she earns the private return $(1-\theta)R_L$. If she chooses a high-quality project and repays the debt, she retains the residual $R_H - r$. Because $R_H - r_0 < (1-\theta)R_L$ and $r_0 \leq r$, $R_H - r < (1-\theta)R_L$ must hold. Therefore, the private return of an entrepreneur with $s = 1$ from choosing a low-quality project, $(1-\theta)R_L$, exceeds her return from a high-quality project, $R_H - r$. The agency friction thus leads to a socially inefficient quality choice by an entrepreneur with $s = 1$. For an entrepreneur with $s < 1$, the return from enforcing a high-quality project, $s(R_H - r)$, is even smaller, but her private return from a low-quality project remains $(1-\theta)R_L$. Therefore, $s(R_H - r) < (1-\theta)R_L$ holds for all $s \in (0, 1]$. Apparently, a smaller s associates with a more severe moral-hazard problem.

Under Assumption 1, banks expect all entrepreneurs shall choose low-quality projects, subject banks to the SBC, default later, and leave with non-performing loans. In this case, banks will be unwilling to lend due to the SBC, unless there are additional enforcement mechanisms.

2.3 Corruption Enforces Commitment

Due to lax institutions, credit histories are either unobservable or can easily be counterfeited. However, government officials are powerful enough to grant or terminate entrepreneurs' access to banks. They have wide connections that reach every corner of the society, which gives them a collective memory of entrepreneurs' credit history as well as extensive capacity to impose punishment. An official, as long as staying in power, can punish a defaulting entrepreneur either by blocking her chances from faking a new credit history or by stopping banks from issuing her new loans. Hereby, government officials become the natural enforcers of financial commitments and the de facto intermediary in the unsecured loan market. They intermediate funding from banks to entrepreneurs in exchange of bribery.

Specifically, for an entrepreneur with s equity share of her firm, let the end-of-period continuation value of her relationship with an official to be $W(s)$, and her end-of-period value in case the relationship terminates to be $V(s)$. Suppose the official charges bribe $b(s)$ when a high-quality project matures. The entrepreneur has the incentive to choose high-quality projects if and only if

$$(1-\theta)R_L + V(s) \leq s(R_H - r) - b(s) + W(s) \tag{2}$$

The left-hand side of (2) refers to an entrepreneur's payoff from choosing a low-quality project and defaulting later; the right-hand side is her payoff from choosing a high-quality project and continuing the relationship with the official. When the entrepreneur chooses a low-quality project, the official

terminates the relationship and the entrepreneur is left with $V(s)$ instead of $W(s)$. Thus, $W(s)-V(s)$ captures the punishment for a defaulting entrepreneur. If this punishment is greater than her short-run net gain from shirking, $(1-\theta)R_L - s(R_H - r)$, the relationship with the official can correct an entrepreneur's short-term incentive and induce her to repay bank loans in full. In this sense, the net continuation value of a corrupt relationship, $W(s)-V(s)$, acts as collateral to back the loan repayment.[7]

As long as the relationship with the corrupt official generates a social surplus by incentivizing the entrepreneur to choose high-quality projects, the official can share the surplus by charging a bribe, $b(s)$. The value of $b(s)$ is determined through Nash bargaining. Denote the bargaining power of the entrepreneur to be γ, $b(s)$ satisfies the following:

$$\begin{aligned} b(s) =& \arg\max_{b} \left\{ s(R_H - r) - b + W(s) - [(1-\theta)R_L + V(s)] \right\}^{\gamma} b^{1-\gamma} \\ =& (1-\gamma) \left\{ [s(R_H - r) + W(s)] - [(1-\theta)R_L + V(s)] \right\} \end{aligned} \tag{3}$$

(3) relates $b(s)$ to the surplus generated by a corrupt relationship that corrects the short-term incentives of an entrepreneur. It is a fee for the financial intermediation service provided by the official. Together, (2) and (3) suggest the entrepreneur has the incentive to take high-quality projects, to pay a bribe to the corrupt official, and to repay bank loans as long as

$$(1-\theta)R_L + V(s) \leq s(R_H - r) + W(s) \tag{4}$$

In other words, as long as the surplus of enforcing a high-quality project is positive, the entrepreneur and the corrupt official will find an appropriate value for $b(s)$ so that the incentive constraint for the entrepreneur holds.

2.4 Anti-corruption Investigations

We introduce anti-corruption investigations into the model to allow for disruption of the corruptive lending. Due to anti-corruption investigations, an official faces a probability $\kappa \in [0,1]$ of being arrested and losing power at the beginning of every period. Higher value of κ stands for more intense investiga-

[7] Here corruption acts like collateral because entrepreneurs will lose the net gain from corruption if she defaults. However, corruption differs from conventional collateral because, in case of defaults, the conventional collateral value will be seized by the bank but here banks cannot take $W(s) - V(s)$.

tions.[8] We further assume, once the official gets investigated, the connected entrepreneur will forever be prohibited from forming a new corruptive relationship with any other officials unless she exits and re-enters. The continuation value of a corruptive relationship for the entrepreneur, $W(s)$, is

$$W(s) = \hat{\beta}(1-\kappa)\left[s(R_H - r) - b(s) + W(s)\right] + \hat{\beta}\kappa\left[(1-\theta)R_L + V(s)\right] \tag{5}$$

where $\hat{\beta} \equiv \beta(1-\delta)$ denotes the effective discount factor including the firm survival rate. $\hat{\beta}(1-\kappa)\left[s(R_H - r) - b(s) + W(s)\right]$ captures the entrepreneur's payoff from an ongoing relationship, in which she maintains high-quality projects, bribes the official, and continues as it goes. $\hat{\beta}\kappa\left[(1-\theta)R_L + V(s)\right]$ is an entrepreneur's payoff if the relationship is terminated by the anti-corruption investigation. Once the official gets investigated and arrested, the entrepreneur deviates to a low-quality project and reaps the private return $(1-\theta)R_L$ as she anticipates the relationship lending to end. Plugging (3) into (5) gives

$$\begin{aligned} W(s) = {} & \hat{\beta}(1-\kappa)\gamma\left[s(R_H - r) + W(s)\right] \\ & + \hat{\beta}\left[1-(1-\kappa)\gamma\right]\left[(1-\theta)R_L + V(s)\right]. \end{aligned}$$

Under Condition (4), the value for the entrepreneur increases in her bargaining power γ and decreases in the intensity of the anticorruption investigation κ. Higher γ raises the share of the surplus allocated to the entrepreneur; higher κ shortens the expected duration of a corruptive relationship.

The interest rate r charged by banks includes a premium associated with possible defaults induced by the soft-budget constraint. For simplicity, here we assume banks have little bargaining power over the official, so that the value of r leaves banks indifferent between lending through the corrupt official and taking the outside option G that yields a return of r_0. In the event of the official being investigated with probability κ, the bank funds one more unit to the low-quality project due to the SBC, makes the total amount of lending to be two, and scraps a value of θR_L. With probability $1-\kappa$ of the official's staying in power, no more loan is required and the return to the high-quality project chosen by the entrepreneur is r. Therefore, the expected loan size is $(1+\kappa)$. The break-even condition for banks to

[8] To keep the model simple, we do not consider additional penalties faced by the corrupt officials after the investigation other than losing briberies.

stay indifferent between the safe outside storage option and lending through the official is

$$(1+\kappa)r_0 = \kappa\theta R_L + (1-\kappa)r. \tag{6}$$

We can then derive the required return on a corruption-backed loan to be

$$r = \frac{(1+\kappa)r_0 - \kappa\theta R_L}{1-\kappa}. \tag{7}$$

The spread between the return rate to a corruption-backed loan and that to the safe-storage technology, $r - r_0$, is increasing in anti-corruption intensity κ. Banks charge a higher risk premium when κ is higher.

2.5 Alternative Financing

Now we introduce alternative financing options for the purpose of illustrating the substitution between corruption and more conventional collateral. Alternative financing options can be loans backed by physical assets, loans pledged with equity shares, or corporate-bond issuance. Here we model a a financing tool of particular relevance for our empirical investigations – loans backed by an entrepreneur's equity shares termed the Share Pledge Finance (SPF). In an economy with poor institutions, physical collateral can be difficult to keep track of, but the ownership and the market value of a publicly listed firm's equity shares are much easier to verify.

Although the SPF relaxes the borrowing constraint of a share holder, the agency friction between the pledging shareholder and other shareholders is still a concern. Thus borrowing with SPF is costly just as with other forms of collateral. Denote the monitoring cost per unit of loan to be ξ and again assume competitive banks retains no surplus. Then the interest rate at which entrepreneurs borrow through SPF is $r_p = \mathrm{r}_0 + \xi$.[9] If SPF is feasible for an entrepreneur with s equity share, the value for the entrepreneur from SPF is:[10]

$$V(s) = s\hat{\beta}(R_H - r_p) + \hat{\beta}V(s) = s\frac{\hat{\beta}(R_H - r_p)}{1-\hat{\beta}}.$$

We study the condition under which the SPF incentivizes an entrepreneur to undertake high-quality

[9] In China, when the interest rate on bank loans is around 4-5%, the interest rate on SPF could be as high as 8-9%.

[10] Here, we simplify the value function without including the future value from being randomly matched with a new corrupt official as, due to the competition for government officials among entrepreneurs, the expected entry value into corruption is zero.

projects. Defaulting on a loan with SPF would reduce an entrepreneur's shares, driving her to reap private returns from low-quality projects. Thus, her incentive constraint is

$$(1-\theta)R_L \leq s(R_H - r_p) + V(s) = \frac{s(R_H - r_p)}{1-\hat{\beta}}, \tag{8}$$

In this case, the equity share of an entrepreneur becomes the collateral she would lose in case of defaults. Apparently, (8) holds only for entrepreneurs whose shares are high enough. This requirement on shareholding is consistent with the observed high haircuts on loans with SPF. The punishment from losing equity collateral is more severe if the default leads to a sufficiently high loss of equity shares for the entrepreneur. This imposes a lower bound on the haircut from pledging equity as collateral.

$$s \geq \underline{s}^E = \frac{(1-\hat{\beta})(1-\theta)R_L}{R_H - r_0 - \xi}. \tag{9}$$

Entrepreneurs with $s \leq \underline{s}^E$ is unable to borrow against their equity shares. $\underline{s}^E$ is increasing in r_0 and ξ, indicating the measure of entrepreneurs who can borrow against their equity share is decreasing in the opportunity and monitoring cost of borrowing. In summary, the value for a type-s entrepreneur to use SPF is

$$V(s) = \frac{\hat{\beta}}{1-\hat{\beta}} s(R_H - r_0 - \xi)\mathbb{I}(s \geq \underline{s}^E). \tag{10}$$

Due to lax institutions it costly to monitor collateralized loans, entrepreneurs hence may prefer relationship loans through corrupted officials to collateralized loans. This condition will be derived later. They only switch to collateralized loans when they lose access to corruption backed finance as related officials are investigated. If SPF is the only alternative source of funding, an entrepreneur with share holding less than $\underline{s}^E$ will default in case the anti-corruption investigation instigates her connected official, and will forever lose her access to the financial market so that her firm may become a dormant, zombie firm.

2.6 Equilibrium

Before we characterize the equilibrium, a few lemmas should be given and several further assumptions should be made.

Lemma 1. *With the value of ξ approaching $R_H - G'(K)$, only entrepreneurs with equity shares large*

enough can borrow, and they borrow through corruption as long as

$$s \geq \underline{s}^{CO} \equiv \frac{(1-\hat{\beta})(1-\theta)R_L}{R_H - r}. \tag{11}$$

where r is determined by (7).

Lemma 1 posits corruption will become the only tool for finance when the monitoring cost of SPF is too high. $G'(K)$ is the lowest possible value for r_0. When ξ approaches $R_H - G'(K)$, the value of borrowing through SPF would be too low for SPF to be profitable. In that case, only entrepreneurs with equity shares above (11) can overcome the moral-hazard problem and borrow through corruption; those with s below this threshold cannot borrow at all. Higher κ raises this threshold by implying greater risks associated with corruption.

Now we focus on the case when ξ is of appropriate value, so that entrepreneurs have potential access to both corruption and SPF. To focus on the substitution effect between corruption and SPF, we assume all entrepreneurs can borrow with SPF:

Assumption 2. *The value of ξ and s is such that $s \geq \underline{s}^{E}$ for all entrepreneurs.*

For Assumption 2 to hold, ξ must be of appropriate value for SPF to be profitable. We further assume firms are aware of the moral hazard associated with s so that all entrepreneurs hold enough equity shares to access SPF. In this case, two conditions are required for an entrepreneur to choose corruption over SPF. First, the surplus from corruption must be positive: $(1-\theta)R_L + V(s) \leq s(R_H - r) + W(s)$. Second, the value of utilizing corruption-backed finance must exceed that of using the SPF: $V(s) \leq W(s)$. The precise implications of the two conditions are summarized in Lemma 2.

Lemma 2. *Under Assumption 2, entrepreneurs with connections to officials utilize corruption for finance if and only if their equity shares meet the following condition:*

$$s \geq \underline{s}^{C} \equiv \frac{(1-\theta)R_L}{R_H - r + \frac{\hat{\beta}}{1-\hat{\beta}}\xi}, \tag{12}$$

where r is determined by (7).

Lemma 2 suggests the followings. Higher ξ lowers the threshold $\underline{s}^{C}$: with higher cost of monitoring SPF, entrepreneurs are more likely to utilize corruption. Higher κ, however, raises $\underline{s}^{C}$: with greater

risks associated with corruption, required risk premium for corruption-backed lending increases, so that fewer entrepreneurs can undertake corruption for borrowing.

The equilibrium measure of entrepreneurs connected with corrupt officials is determined by new relationship formation as well as exit induced by the anti-corruption investigation. The law of motion for this measure from period t to $t+1$ is

$$C^E_{t+1}(s) = \alpha \left[N^E(s) - N^E(\underline{s}^C_t) - C^E_t(s)\right] \mathbb{I}(s > \underline{s}^C_t) - (\kappa + \delta) C^E_t(s). \tag{13}$$

Let $C^E(s)$ to denote the steady-state measure of entrepreneurs borrowing through corruption with equity shares smaller or equal to s. At the steady state,

$$C^E(s) = \frac{\alpha}{1 + \alpha + \kappa + \delta} \left[N^E(s) - N^E(\underline{s}^C)\right] \mathbb{I}(s \geq \underline{s}^C),$$

In each period, a fraction κ of corruption-backed loans are disrupted, causing entrepreneurs to undertake low-quality projects and forcing banks to lend one more unit of loan resources for each of these projects due to the SBC. Therefore, the expected amount of loans taken by an average project initially financed through corruption is $1 - \kappa + 2\kappa = 1 + \kappa$, and the total amount of loans allocated through corruption at period t is $K^C_t = C^E_t(1)(1 + \kappa)$. At the steady state, K^C_t equals

$$K^C = \frac{\alpha(1 + \kappa)}{1 + \kappa + \alpha + \delta} \left[1 - N^E(\underline{s}^C)\right]. \tag{14}$$

(14) suggests intensified anti-corruption investigations, captured by higher κ, induces a direct and an indirect effects on the total amount of loans issued through corruption. On the one hand, higher κ increases K^C: more entrepreneurs plan on defaulting by choosing low-quality projects, which forces banks to issue additional loans due to the SBC, so that K^C rises. This effect is direct. On the other hand, higher κ causes more exit and discourages entry by raising $\underline{s}^C$, so that K^C declines. This effect is indirect, and takes place with further dynamics in entry and exit. When κ rises suddenly due to the initiation of the national anti-corruption campaign, it is the direct effect that takes place right away. Since we analyze the steady-state equilibrium only, we make the following assumption to make sure the implications of our comparative-static exercises with higher κ are similar to changes in K^C during the transitionary dynamics:

Assumption 3. *Intermediate inputs occupied by corruption, K^C, increases in the anti-corruption intensity κ.*

Assumption 3 ensures the direct effect of higher κ dominates: additional loan resources required by more low-quality projects is greater than the decline in the measure of entrepreneurs undertaking corruption for finance. It is meant to capture the on-impact effect of the anti-corruption campaign on non-performing loans.

The equilibrium measure of entrepreneurs who use SPF equals the total amount of loans issued through SPF, K_t^E. At the steady state,

$$K^E = K_t^E = 1 - \frac{\alpha}{1+\alpha+\kappa+\delta}\left[N^E(1) - N^E(\underline{s}^C)\right], \forall t. \tag{15}$$

To ensure that the equilibrium is well defined, we assume that the total supply of loan resources is large enough:

Assumption 4. $K \geq 1+\kappa$.

$1+\kappa$ is the possibly largest demand for loans: every entrepreneur borrow through corruption and κ fraction requires additional loan resources. Assumption 4 ensures the total loan demand by entrepreneurs is always weakly less than the total supply, so that loan resources allocated to safe-storage technology is nonzero: $K^S \geq 0$.

Definition 1. Given the anti-corruption intensity κ, a stationary equilibrium consists of the return rate on safe loans, r_0, the return rate on corruption-backed loans, r, the amount of intermediate inputs allocated to safe storage, K^S, to the corruption lending, K^C, and to the SPF lending, K^E, the participation threshold for the corruption borrowing, $\underline{s}^C$, and that for the SPF borrowing, $\underline{s}^E$, such that the required return rate on safe loans, r_0, clears the loan market:

$$K = K^S + K^C + K^E.$$

Moreover, r_0 is determined by (1), r by (7), K^C by (14), $\underline{s}^C$ by (12), $\underline{s}^E$ by (9), and K^E by (15).

The following proposition characterizes the conditions for the existence of a unique stationary equilibrium: it exists when the alternative form of finance is costly, agents are patient enough, and the anti-corruption investigation is not too intensive.

Proposition 1. *For $\xi > \underline{\xi}$, $\beta > \underline{\beta}$ and $\kappa < \overline{\kappa}$ and under Assumptions 1, 2, and 4, there exists a unique equilibrium where corruption-backed finance is active, entrepreneurs with both connections to officials and access to SFP, choose corruption-backed finance if the entrepreneur's share holding satisfies* (12).

The proof is presented in the appendix. Proposition 1, together with Lemma 1, highlights the implications of institutional frictions on borrowing and lending. In our model, this is captured by the monitoring cost ξ. When this cost is too high, conventional financing channels are turned off completely (Lemma 1). When this cost is sufficiently low, corruption-backed finance may be in-conesequential as in some developed economies. When this cost remains at an intermediate range, both conventional and unconventional financing channels stay active, acting as imperfect substitutes for facilitating economic development.

The next proposition summaries our model's key predictions to be taken to data for empirical investigations:

Proposition 2. *In an equilibrium with all financing channels active, under assumption 3, intensifying anti-corruption investigations by raising κ causes the return on safe investments, r_0, to rise and:*

1. *firm connected with the investigated officials will default, and the amount of non-performing loans will rise.*

2. *firms connected with the investigated officials will pledge more equity shares for borrowing, their defaults will appear strategic, and their equity value will decline on impact.*

The proof is presented in the appendix. Proposition 2 summarizes two sets of predictions capturing how intensified anti-corruption investigations impact the equilibrium outcome. The first set predicts that, when an corrupt official gets investigated, his corruptive relationships with entrepreneurs terminate so that entrepreneurs default on previous, corruption-backed loans; consequently, non-performing loans rise. The intuition is straightforward: the financial commitments enforced by the corrupt official is broken by his arrest, and entrepreneurs default.

However, alternative theories on corruption can also generate the first set of predictions of Proposition 2. In the stories captured by Chen and Kung (2018) and Fang et al. (2018), corrupt officials offer resources like land contracts with favorable pricing or substantial subsidies to their connected firms in exchange of bribes; when these officials get investigated, the connected firms will likely default on

some of the existent loans because losing resources can limit their debt-payment capacity. Therefore, the positive relationship between defaults, non-performing loans and the anti-corruption investigations, although consistent with our theory, does not necessarily prove corruption's role as financial intermediation.

The second set of predictions of Proposition 2 point to a substitution effect: under Assumption 2, defaulting entrepreneurs substitute corruption with SPF for further borrowing, so that their firms' operations remain unaffected and their defaults appear strategic. These firms' equity value drops on impact because SPF is more costly: the entrepreneurs chose corruption over SPF because $V(s) \leq W(s)$. Moreover, higher κ causes $r_0 = G'(K^S)$ to rise, because funding held up in non-performing loans squeezes out K^S. Higher r_0 reduces $V(s)$ by raising $r_p = r_0 + \xi$, which contributes to a further decline in firms' equity value.

The prediction on strategic default is unique to our proposed role of corruption as financial intermediation. In alternative corruption theories, firms may default with the arrest of the connected officials, but their defaults must accompany deteriorations in performance or financial status. These firms would have no reasons to suddenly default on existent loans if their business is somehow not at all affected by the arrest of the official, unless the official had played a key role in getting those loans. By contrast, firms in our theory default because the arrest of the official breaks the commitment mechanism, regardless of how the anti-corruption investigation impacts firm performance. Whether such defaults appear strategic is conditional on whether these firms can access other financing tools for further resources.

For simplicity, we model SPF as the only alternative financing tool to corruption. But firms can substitute corruption with many other tools for defaults to appear strategic. They can borrow against physical collateral for example. With poor institutions, physical assets are usually hard to verify, and must be another inferior alternative. For similar reasons, corporate bond issuance can be another inferior alternative. When ξ is sufficiently high, as Lemma 1 predicts, all alternative financing tools would shut down completely, leaving corruption the only option for finance.

3 Data

Now we turn to data to investigate the empirical relevance of corruption for finance. For two reasons, we choose to examine data from China, although we believe corruption is utilized for finance in many countries. In 2013, the Chinese president initiated a national anti-corruption campaign that lasted until today. This campaign has generated significant increases in the number of investigations and arrests, resulting in rich data variations to test our predictions. Moreover, the central bank of China has implemented significant financial institutional reforms to activate more financing tools. This provides an ideal institutional background for identifying the substitution effect between corruption and other financial tools as a key component of our theory's predictions.

We look for two types of data in particular: data on the intensity of anti-corruption investigations or on the identifications of firms implicated by the investigations; and data on financial indicators, especially on firm defaults and on non-performing loans. We compile such data from China at the regional level and at the firm level.

3.1 Regional Data

Our regional panel covers 30 Chinese provinces (excluding Tibet) from 2000 to 2015. We focus on two regional indicators.

The first indicator measures regional anti-corruption intensity as the number of officials newly put under investigation for corruption - namely - the "Shuang Gui" officials. This information is published by the 2001-2016 Procuratorial Yearbooks of China.[11] We only consider the arrests of "Shuang Gui" officials with bureaucratic ranks at or above the county or division administration level ("Chu Ji"). In principle, this indicator reflects either the amount of regional on-going corruptive activities or the intensity of local anti-corruption investigations. For two reasons, we believe it is changes in the latter rather than in the former that drive variations in this number in China. Firstly, corrupt officials are usually arrested for corruptive activities performed many years ago; Guo (2008) reports the time lag between the year of the occurrence of corruptive activities and the year of their formal investigation to be as long as 5-8 years in China. Secondly, during national anti-corruption campaigns local governors usually make a specific effort to arrest more corrupt officials, because this is a time point when the

[11] Procuratorial Yearbooks of China publish statistics of the previous year. For example, the 2001 year book reports activities occurring up until 2000.

central government views increased enforcement figures as an important political achievement and an indication of commitment to the party leader. As shown by Figure 1, the number of arrests jumps up sharply at 2013, the year of the initiation of the campaign. It is unlikely that the amount of corruptive activities increased by so much so quickly, especially at a time point right after the Chinese president made an announcement to fight corruption.

The second indicator measures the amount of regional non-performing loans. We compile this data from the 2006-2015 China Banking Regulatory Commission Annual Reports. Non-performing loans are defined as the sum of outstanding "sublime loans", "dubious loans", and "damaged loans" held by all financial institutions by the end of the year. A loan is considered "sublime" as long as the borrower has displayed incapacity to make loan payments and the lender expects to recover 50%-70% of the principle; it is considered "dubious" if the lender expects to recover 25% -50% of the principle; it is considered "damaged" if less than 25% of the principle is expected to be recovered. Our data on regional non-performing loans include those borrowed by firms, by all institutions, and by households. Ideally, we would like to have data on non-performing loans borrowed by firms only; unfortunately this data is not available at the regional level. Nonetheless, the 2015 China Banking Regulatory Commission Report documents over 90% of total non-performing loans in China were initially borrowed by firms. Hereby, we use the amount of total non-performing loans to approximate those by firms.

Additionally, we obtain data on regional real GDP growth from the China Statistical Yearbooks. Real GDP growth is calculated as the annual growth in GDP index measured in fixed prices. We us this indicator to control for regional economic activities.

3.2 Firm-level Data

We put together a quarterly panel of 3438 non-financial firms publicly listed in the Shanghai or Shengzhen Stock Exchanges from the first quarter of 2007 to the fourth quarter of 2017. We choose to examine publicly listed firms, because detailed information on their performance and financial status are publicized on a regular base and because they are usually well connected and can access multiple financial tools. Information on firm characteristics, including age, size, and ownership types, and on firm financial status, such as the asset level, cash holdings, and leverage ratio, are from the China Stock Market and Accounting Research Database (CSMAR). This database is considered the Chinese equivalent of the Compustat in the U.S.. The full sample size is 100162. This panel is unbalanced, as

not all firms were present for the entire sample period.

Two data series in this panel are collected on our own. Official records on firm defaults are gathered based on the announcements by the Supreme People's Court of China. Firms implicated by the anti-corruption investigations, together with the timing of their first implications, are identified according to information publicized by China's Central Commission Discipline Inspection as well as information reported by news media.

Firm Defaults The Supreme Court of China continually publicizes a list of defaulting firms, called "Shi Xin" firms, together with their specific dates of defaults. The defaulting dates are the days when these firms or some of their branches were ruled by the local court as having failed to fulfill their debt responsibilities. We match this list with our quarterly panel according to firm name, location, and ownership information. In particular, we create a dummy variable S_{it} that equals one if firm i or one of its branches is announced by the court to have defaulted at least once in quarter t, and zero otherwise. This way we are able to identify 437 public firms with 695 records of defaults from 2007 to 2017.

Anti-corruption Implications We identify firms implicated by anti-corruption investigations as follows. Firstly, we collect a sample of corrupt officials based on publicized information on corruption investigation cases. China's Central Commission of Discipline Inspection continually reports the names and the titles of corrupt officials as well as the specific dates when their investigation cases for corruption were established. Here we restrict our attention to officials at or above the deputy-minister level at the central government or the deputy-governor level at the provincial government, as we believe only higher-level officials can effectively enforce debt commitments.

Secondly, we search for public firms financially linked with the arrested corrupt officials by utilizing Baidu, Yahoo, Bing, and Google search engines. In particular, we apply a search algorithm to collect all the news involving any publicly listed firms as well as the exact names and/or the job titles of any corrupt officials in our sample. Then we manually check each pieces of news, to exclude those reporting activities involving no financial or economic transactions (for example, news saying that the prime minister paid a visit to a factory), and to keep those reporting business transactions (for example, news saying the governor helped a firm to get a loan). The remaining sample yields 128 public firms implicated by anti-corruption investigations that were established at various time points, ranging from

the second quarter of 2010 to the fourth quarter of 2017. [12]

Based on information obtained as above, we are able to create a dummy variable C_{it} that equals one if, in quarter t, China's Central Commission of Discipline Inspection formally establishes an investigation case of an official who has been financially linked with firm i, and zero otherwise.

3.3 Measurements, Trends, and Summary Statistics

Table 1 summarizes the regional sample statistics for 30 provinces. Panel A reports statistics in levels. From 2000 to 2015, each province reports an average of 95 officials at or above the county or division administration level newly put under formal investigations for corruption every year. The sample on regional non-performing loans covers the years from 2006 to 2015: the amount of regional non-performing loans averages 23.4 billion RMB. Panel B reports statistics in annual growths. From 2000 to 2015, regional "Shuang Gui" officials grew by 9.7% annually, and real GDP grew by 11.6%; from 2006 to 2015, non-performing loans grew by 8.7% annually.

Table 2 summarizes the firm-level data statistics. Age is defined as the number of years between the year of firms' registration to the present. The leverage ratio is the ratio of total debts over total assets. Real assets and real fixed assets are calculated by deflating the value of total assets and fixed assets with the provincial fixed-investment price index published by China's Statistical Year books. Cash is the end-of-the-quarter outstanding level of cash and cash equivalents. Long Loan is the outstanding value of loans borrowed from banks or financial institutions with terms over a year; Short Loan is the value of borrowings with terms within a year.[13] We examine two types of financing tools: pledged stock is a quantity measure, as the number of stock shares pledged for borrowing; bonds are the sum of the outstanding principle and interest value of company-issued bonds. All variables are winsorized between 1% and 99%.

According to Panels A and B of Table 2, an average publicly listed firm in our sample is fairly large: it employs 5571 workers, ages 15.4 years, and displays a leverage ratio of 0.45. It has quarterly sales of 3.47 billion RMB, quarterly profit of 0.26 billion RMB, and cash holdings of 1.31 billion RMB. It holds real assets of 6.8 billion and real fixed assets of 1.6 billion RMB. It carries short-term loans of

[12] Li, Wang, and Zhou (2018) examine corruption cases established since 2012 and were able to identify 61 implicated firms. If we also restrict our search to cases after 2012, then we get 69 implicated firms. The difference in the sample size between our search and theirs may arise from permanent deletion of some old news or more recent news disclosures.

[13] The CSMAR database does not specify if short-term loan is borrowed from banks/financial institutions or from other firms/individuals or both.

0.99 billion and long-term loans of 1.03 billion RMB. It has pledged 0.12 billion shares of stocks and issued corporate bonds of 0.37 billion RMB.

We apply a measure from Davis and Haltiwanger (1992) to address two data concerns in our sample. Firstly, firm-level variables in China are often non-stationary when measured in levels or log levels, because China experienced extensive institutional reforms as well as frequent policy changes during our sample period. For example, in 2008 China implemented the biggest stimulus packages at the time around the world, causing asset prices to change dramatically in the following years (Ouyang and Peng, 2015). This suggests that we should examine variables measured in growths rather than in levels. Secondly, the conventional growth measures or log-first-difference measures may bias the results by generating value of infinities, because many firm-level variables contain significant number of zero value: for example, the variable "pledged stock" often equals zero, as many firms pledged some equity shares at some point, stopped pledging equity shares for many quarters, and started to pledge equity shares again. Therefore, we follow Davis and Haltiwanger (1992) to measure non-ratio variables Y_{it} as

$$2\left(\frac{Y_{it} - Y_{i(t-4)}}{Y_{it} + Y_{i(t-4)}}\right). \tag{16}$$

(16) measures quarterly annual growth as growth from the same quarter of the last year, which removes any existent seasonalities. Moreover, value of variables measured by (16) stays strictly within $[-2, 2]$ as long as Y_{it} is non-negative, and thus avoids the value of infinities.[14]

Firm Statistics calculated based on (16) are reported in Panel C of Table 2: from the first quarter of 2007 to the last quarter of 2017, annual growth rate for an average firm is around 12% for most variables: sales, profits, real assets, real fixed assets, and short-term and long-term loans. For cash holdings, the average annual growth is 7%; for pledged stock and for corporate bonds, the annual growth is around 30%.

4 Non-performing Loans and Firm Defaults

With the regional panel and the firm panel, we test our theory's key predictions captured by Proposition 2. The first null to test is that intensified anti-corruption investigations cause non-performing loans to

[14] In Panel C of Table 2, the quarterly annual growth of profit ranges from −0.12 to 12.79 because profit can be negative. Nonetheless, it avoids the value of infinities. When calculating the growth rates of profits based on (16), we take the absolute value of the denominator of (16).

rise, and firms connected with the investigated officials will default accordingly.

4.1 Regional Non-performing Loans

Figure 2 plots the time series of the average value of regional non-performing loans against the average number of "Shuang Gui" officials across 30 provinces. The former reflects the amount of defaults occurring within an average province. The latter indicates local anti-corruption intensity. The two series should be positively correlated under the null. As shown by Figure 2, both series jump sharply starting from 2013, the year when the national anti-corruption campaign initiated: the average number of regional "Shang Gui" officials rose from 96 in 2013 to 127 in 2014 (a 32% increase) and to 143 officials in 2015 (a further 12.5% increase); meanwhile, the average amount of regional non-performing loans rose from 18.2 billion RMB in 2013 to 26.6 billion RMB in 2014 (a 46% increase), and to 40.3 billion RMB in 2015 (a further 51.5% increase). The correlation coefficients of the two series is 0.08 before 2008, and 0.96 afterward.

However, time-series plots can only be suggestive whether our theory is consistent with the data. Many other factors can generate or mask existent data patterns. For example, in Figure 2 the amount of non-performing loans declines steadily and sharply between 2005 and 2010, while the number of "Shuang Gui" officials appears relatively stable. This is because since the early 2000s the Chinese government made a successful effort to reduce the large amount of bad loans arising during the 1998 Asia Financial Crisis.[15] These strong dynamics can easily cover the positive correlation between the amount of non-performing loans and the number of "Shuang Gui" officials potentially present in the early 2000s. For similar reasons, the seemingly strong correlation between the two series post 2008 can be driven by certain latent common factors.

To test the null formally, we run an OLS regression with the regional panel. This allows us to control for some of the aggregate and regional factors. In particular, we test the following specification:

$$N_{it} = \alpha_i + L(\gamma)C_{it} + \beta X_{it} + \epsilon_{it} \tag{17}$$

N_{it} is the amount of non-performing loans for region i in year t. α_i is a regional dummy. $L(\gamma)$ is a lag polynomial, C_{it} is the anti-corruption indicator as the number of "Shuang Gui" officials. X_{it} is

[15] Some remaining bad loans were further eliminated by the debt rollover when the 2008 Stimulus Package was implemented (Chen et al., 2019)

a set of controls including year dummies and regional real GDP. ϵ_{it} is an error term. All variables except the dummies are measured in log-first differences (growth rates). The parameter of interest is γ, reflecting the relationship between non-performing loans and the anti-corruption intensity. The regional fixed effect presumably captures the cross-region variations due to long-term economic factors such as culture, industry mix, transportation cost, labor force composition, and etc. Year dummies are to control for the influences of aggregate economic factors such as national fiscal policies, monetary policies, or variations in aggregate economic environment such as the global financial crises. Regional real GDP are to control for other local economic factors. We experiment with various lag lengths as well as with or without controls to check the robustness of our results.

Table 3 presents the OLS regression results of (17). Without controlling for the year dummies or regional GDP, a 10% increase in the number of "Shuang Gui" officials is associated with a contemporaneous increase of about 4% in non-performing loans, a cumulative one-year increase of about 9%, and a cumulative two-year increase of about 12%; all three estimates are significant at the 1% level. After controlling for the year dummies and the regional GDP, the estimated γ's remain positive, but with reduced point estimates. In particular, a 10% increase in the number of "Shuang Gui" officials is associated with an increase in regional non-performing loans of 1% contemporaneously, 2% cumulatively in one year, and 2.3% cumulatively in two years. All estimates on γ stay statistically significant at the 10% level or higher. Also, the estimated coefficients on regional GDP are all negative, consistent with the common belief that non-performing loans rise when local economies turn bad.

The results reported in Table 3 suggest regional non-performing loans are positively related to local anti-corruption intensities, which supports the null and remains robust after controlling for aggregate and local economic factors. However, there are two limitations in applying the regional data to test the null.

Firstly, variations in C_{it}, the measured anti-corruption intensity, cannot be fully exogenous. A positive estimate on γ may not reflect the causality running from C_{it} to N_{it}, but can be driven by latent factors causing C_{it} and N_{it} to co-move. Local economic performance can be one of these factors: bad economic performance raises non-performing loans and attracts the attention of the central government who pushes local prosecutors to investigate harder, causing more corrupt officials to be arrested. Hereby, regional economic performance creates an upper bias on the estimate for γ; controlling for local GDP corrects for but may not fully eliminate this bias. Also, in 2014 the Chinese government initiated a

plan of "capacity reduction" for heavy-supply industries; officials working in target industries get a lot of investigations. At the same time, firms in these industries experience great difficulty in obtaining new loans, and become more likely to default on existent loans (Chang et al., 2016). In this case, C_{it} to N_{it} rise together for target industries, also generating an upper bias on γ.

Secondly, testing our theory with regional data lacks test power: alternative mechanisms of corruption can generate a positive estimate on γ as well. In our theory, corrupt officials enforce loan payments; the anti-corruption investigation breaks the commitment so that firms default. Hence, intensified investigation arrests more officials, driving more firms to default; consequently, non-performing loans rise. In an alternative theory of corruption, an official exercises power to allocate resources directly under his control – such as tax credit or business permits – to firms in exchange for bribery. If this official gets investigated, his connected firms will lose these resources, which harms firm performance, constrains firms' debt-payment capacity, and drives firms to default. Intensified investigations arrest more officials, constrain more firms' debt-payment capacity, and cause non-performing loans to rise with more defaulting firms. Therefore, higher C_{it} can raise N_{it} even if corruption never function as financial intermediation.

4.2 Firm Defaults

To identify the true causality running from the anti-corruption investigations to defaults, we investigate more detailed firm-level data by performing the following difference-in-difference (DID) estimations:

$$S_{it} = \alpha_i + \alpha_t + \gamma P_{it} + \beta X_{it} + \epsilon_{it} \tag{18}$$

S_{it} is a default dummy for firm i in quarter t, it equals one if in quarter t firm i or one of its branches defaults at least once. α_i and α_t are firm and quarter-year fixed effects. ϵ_{it} is an error term. P_{it} is a dummy that equals one if an official connected with firm i had been under investigation for corruption on or before quarter t, and equals zero if the investigation has not yet taken place or will never occur. This is a DID estimation with variations in treatment timing (Bertrand and Mullainathan, 2003). The treated firms are the firms identified to be implicated by the anti-corruption investigation. The staggered occurrence of the corruption cases implies that the corresponding control firms are not restricted to firms never implicated. In fact, Equation (18) takes as a control group all firms that have

not *yet* been implicated by quarter t even if some will be later. γ is the parameter of interest, capturing the impact of the anti-corruption investigation implication on firm default probability.

In (18), X_{it} are a set of controls including firm size, the leverage ratio, and real asset growth. Moreover, we include additional province-specific, industry-specific time trends to control for the potential impact of any other policy reforms over the sample period. Firm size is measured as the number of employees in log levels. All other variables except for the leverage ratio and the dummies are measured in quarterly annual growth based on (16). We experiment with and without controlling for firm size, for real asset growth, and for the leverage ratio. All specifications include the standard quarter-by-year and firm fixed effects for the DID estimation.

Our findings are summarized in Table 4. Column (1) displays the result of a basic linear probability specification. We find that default probability is about 0.7% higher among the implicated firms after their being implicated. Since the average default probability is 0.69% per quarter in our sample, this suggests default probability *doubles* after being implicated by the anti-corruption investigation. In Columns (2) -(4), we account for several firm characteristics that may be correlated with the fact of being implicated by the anti-corruption investigation. As expected, bigger, larger real-asset-growth, and lower-leverage firms are less likely to default. Accounting for these additional but likely endogenous controls, however, does not change the result that being implicated by the anti-corruption investigation raises default probability by at least 0.6%. All estimates are significant statistically at the 5% level or above.

We further investigate issues of reverse causality that may bias our results. As explained earlier, an industry aimed by the government to reduce excessive capacity experience great difficulty in obtaining new loans, and thus more likely to default; meanwhile, government officials taking charge of this industry get plenty of investigations. Likewise, firms located in a province experiencing an economic contraction will default more frequently, which attracts the attention of the investigation agency and causes more local officials to be investigated. Although such possible biases are minimized in our regression by controlling for industry-by-year and province-by-year fixed effects, an alternative way, however, to address reverse causality issues is to examine the dynamic effect of the anti-corruption investigation implication on defaults.

In practice, in column (5) we replace the single D_{it} dummy with four dummy variables to track the effect of the anti-corruption investigation "before" and "after" the implication: before^{-2} and before^{-1}

are dummy variables that equal one for a firm implicated by the anti-corruption investigation two quarters and one quarter prior to the implication, before^0 equals one for an implicated firm in that first quarter of being implicated, after^1 equals one for an implicate firm that was implicated last quarter, and after^{2+} equals one for an implicated firm that was implicated at least two quarters ago. Before^{-2} and before^{-1} allow us to assess whether any increased tendency to default can be found prior to the implication of the anti-corruption investigation. Finding such an "effect" could be a sign of some reverse causality. In fact, we find the estimated coefficient on the before^{-2} and before^{-1} dummies both to be statistically insignificant; the estimated coefficient on before^{-1} is even negative. This suggests these implicated firms showed no prior trend of defaulting more than their peers. The estimated effect of the anti-corruption investigation in the quarter of the implication, before^0, is still statistically insignificant, probably because it takes several months for the court to reach a ruling on a default. The estimated effect rises to 2.2% one quarter after the implication, and remains positive afterward. This is consistent with a causal interpretation of our basic result that a firm is more likely to default after being implicated.

We also check the sensitivity of this result to alternative probability estimation models. Column (6) uses a probit model and finds similar evidence of an increase in default probability following the implication. A logit model delivers similar result that are not reported here.

5 Strategic Defaults

Now we investigate the power of the test of our theory, examining whether our identified defaults caused by anti-corruption implications can differentiate our theory from alternatives. As explained earlier, the anti-corruption investigation can hurt an implicated firm in many ways. In an alternative theory of corruption, an official offers resources directly under his control – such as subsidies or exclusive contracts with favorable pricing – to his connected firms in exchange of bribery. When this official gets arrested, his connected firms experience declines in sales, profits, or cash flows by losing resources, which limits firms' capacity to pay debts; as a result, default probability rises even if the official never assisted any of these firms in finance. Therefore, the mere finding that the anti-corruption investigation raises defaults cannot differentiate our theory from alternative corruption theories or, put differently, it lacks test power.

Nonetheless, Proposition 2 gives an unique prediction: firms default *strategically* following the anti-corruption investigation, as long as the other financing channels are active. That is to say, these firms have the capacity to turn to alternative channels for finance, so that neither their performance nor their financial status are severely impacted after the official loses power. They choose to default on previous, corruption-backed loans, not because they do not have the capacity to pay, but because the arrest of the official breaks the commitment. This prediction is unique to our theory on corruption as a commitment-enforcement mechanism.

In this section, we test the second set of predictions of Proposition 2 based on our sample of publicly listed firms. As shown by the summary statistics reported in Table 2, our sample firms are big and financially strong. In China, publicly listed firms are usually well connected with access to various financing tools, and are most capable of defaulting strategically. In reality, however, there are many small, private firms that probably have corruption as their only tool for finance. After their being implicated by the anti-corruption investigation, these firms may leave the market once and for all. We purposefully choose not to examine these firms, not only because their data are not as detailed, but also because their lack of capacity for strategic default cannot help differentiate our theory from alternatives.

5.1 Defaults are Strategic

To investigate if our identified defaults are indeed strategic, we estimate how the anti-corruption investigations influence firm performance and financial status, again by exercising a DID estimation:

$$Y_{it} = \alpha_i + \alpha_t + \gamma P_{it} + \beta X_{it} + \epsilon_{it} \tag{19}$$

Firm Performance We let Y_{it} in (19) to be gross profit, net profit, gross sales, net sales, and cash holdings. “Gross" sales or profits calculate the totals of all inflows, while “net" sales or profits consider those from operations only. P_{it} is the same DID dummy for the anti-corruption implication as in (18). X_{it} are a set of control variables: firm size as the number of employees in log levels, real asset growth, and the leverage ratios. We run DID estimations for each of these performance variables. As usual, all specifications include firm fixed effects, quarter-by-year fixed effects, and additional province-specific,

industry-specific time trends; and all dependent variables are measured as quarterly annual growths.[16]

The estimation results are reported in Table 5. We find the anti-corruption investigations have negligible influence on most of the performance measures: the four estimated coefficients on the implication dummy for gross sales, net sales, gross profits, and net profits are all statistically insignificant. Cash holdings, however, are estimated to *rise* by 3.07% after a firm becomes implicated. Apparently, none of these results suggest firm performance deteriorates after the arrest of firms' connected official; as a matter of fact, these firms' cash holdings appear improved.

We further investigate two sets of accounting variables to explore whether the anti-corruption implications restrain firms' financial capacity.

Firms' Ability to Pay Debts The first set of accounting variables measure firms' ability to pay debts, consisting of five indicators all calculated as fractions of liquid liabilities: Current Rate measures the value of liquid assets; Quick Rate the value of liquid assets net of inventory; Super Quick Rate the value of the sum of cash, short-term securities, and and receivables; Cash Rate 1 the value of net cash flows; and Cash Rate 2 the value of net cash flows from operations only. Higher value of these measures imply more sufficient liquidity to make debt payments. We let Y_{it} to be each of these five indicators and run DID regressions of (19) one by one.

The results are reported in Panel A of Table 6. Maybe surprisingly, we find implicated firms' ability to pay debts appears *stronger* after their being implicated: four out of the five estimated coefficients on the implication dummy are positive and statistically significant. These results are consistent with the estimated increase in cash holdings reported in Table 5, implying implicated firms somehow seem to hold more cash or liquid assets relative to their liquid liabilities.

Of course, the fact of being implicated itself cannot give firms more cash or strengthen their debt-payment abilities, since the anti-corruption investigation undoubtedly serves as an adverse shock at least in the short run. We interpret the increase in cash holdings to be an endogenous response, as firms make a specific effort to hedge against risks arising from the anti-corruption implication. Similar results have been reported by Ma et al. (2019), who find Chinese firms hold more cash once exposed to external risks, and by Gao and Xu (2018), who document U.S. firms accumulate more cash during

[16]The results in this subsection are based on measurements of the dependent variables calculated following Davis and Haltiwanger (1992). However, alternative measures as log-first difference would generate similar results as long as the performance variable does not contain frequent zero values.

recessions. Also note that Cash Rate 2, the measure that excludes cash flows from finance, is the only indicator estimated not to rise following the implication. This suggests the extra cash may come through alternative finance.

Firms' Ability to Keep Loans in Good Standing The second set of accounting variables consist of four indicators that measure firms' ability to keep loans in good standing: liquidity-loan ratio equals the ratio of liquid asset net of liquid liability over total loans; profit-over-financial-cost ratio is the ratio of net profit over total financial cost; cash-over-financial-cost ratio equals the ratio of net cash inflows from operations only over total financial cost; and cash-over-urgent-debt ratio the ratio of net cash inflows from operations over total debts due within a year. Higher value of these measures imply stronger ability to make loan payments. Again we run DID regressions of (19) one by one, letting Y_{it} to be each of the four indicators in each regression.

The results are reported in Panel B of Table 6. Again, our estimates suggest that, firms' ability to keep loans in good standing does not weaken after the implication, if not improves. Out of the four estimates on the coefficient of the implication dummy, three are statistically insignificant, one is statistically significant at the 5% level but is positive. The liquidity-loan ratio, the only indicator estimated to rise following the implication, is also the only measure whose numerator reflects additional liquid resources from alternative finance.

The test results reported in Tables 5 and 6, together with those in Table 4, provide a powerful support for corruption as financial intermediation. They show that our sample publicly listed firms, even though their performance does not worsen and their loan-payment ability does not weaken, nonetheless choose to default following the arrests of their connected officials. Alternative corruption theories cannot explain our findings: if firms in those theories default following the implication, their default cannot be strategic. It is our theory that offers an unique explanation: corruption serves as a commitment mechanism to enforce financial contracts; firms default because the arrests of corrupt officials break the commitment.

5.2 Alternative Financing

By no means, our theory predicts defaults driven by anti-corruption investigations must be strategic. Lemma 1 posits corruption as the only financing option when the monitoring cost for other collateral is

sufficiently high, and firm would never default strategically. Therefore, firms default strategically only if they can access alternative financing. Proposition 2 predicts the stock-pledge finance – an alternative to corruption – to become *more* active for strategically defaulting firms. In an economy with poor institutions like China where physical collateral frequently turns "ghost", publicly listed firms' equity shares should act as an easily tractable and enforceable asset for collateralized borrowing.[17] Corporate bonds is another financing alternative.

To test if implicated firms substitute corruption with other alternatives, we perform DID estimations on firms' outstanding short-term and long-term loans as well as two alternative financing tools: stocks shares pledged for borrowing and corporate bonds. As throughout this paper, we include firm fixed effects, quarter-by-year fixed effects, province-specific time trends, and industry-specific time trends in all specifications. We also control for gross profit growth, real asset growth, and leverage rate. All dependent variables are measured as quarterly annual growth based on (16).

The results are reported in Table 7. The estimates show negligible impact of the anti-corruption implications on the borrowings of publicly listed firms connected with investigated, corrupt officials: the estimated coefficients on the implication dummy are statistically insignificant for both short-term and long-term loans. However, the number of stocks pledged for loans are estimated to rise by 11%, significant at the 10% level. We interpret these results as firms turn to alternative financing following the implication, and SPF should be one of the alternatives. Also, corporate bonds as another alternative are estimated to rise by 31%, significant at the 1% level. All this evidence suggests financing alternatives other than corruption indeed become more active following the implication, complementing our findings on strategic defaults.

5.3 Dynamics in Firm Value

Proposition 2 further predicts, when a corrupt official gets arrested, his connected firms' value drops on impact, not only because SPF is more costly but also because the extra loan resources occupied by non-performing loans raise interest rates. We test this prediction by estimating (19), letting Y_{it} to be firm i's stock price in quarter t. This way, the estimated coefficient on the implication dummy captures the impact of the implication on the market value of a firm.

[17] China passed the Guaranty Law that became effective in 1995 and passed the Real Rights Law that became effective in 2007. Both laws specify equity shares can be used as collateral. However, SPF did not gain much popularity until post 2010.

We utilize two quarterly stock price measures: the price on the last day of the quarter and the average daily price over the entire quarter. Table 8 summarizes the results. Columns (1) and (5) report the basic regression results without additional controls: implicated firms' stock prices are estimated to decline by 12% in quarters following the implication, significant at the 1% level. Columns (3) and (7) show controlling for real asset growth, profit growth, and the leverage ratio reduces the point estimate to 11%, still significant at the 1% level. These findings support Proposition 2's prediction that firm value drops after being implicated.

Our theory's comparative static exercises cannot capture further dynamics in firm value during the transitory dynamics. However, over time firm value will likely recover again. As more firms turn to SPF, loan resources occupied by non-performing loans free up, which lowers the interest rate and raises firm value. Moreover, although the model assumes for simplicity that an implicated firm will forever be excluded from corruption, in reality a firm can form a new corruptive relationship after remedying its damaged reputation and finding another corrupt official; this also raises firm value.

To investigate further dynamics in firm value, we add in the regression a duration measure that indicates the number of quarters between the quarter of the implication and the current quarter. We let this measure to interact with the implication dummy so that it equals zero for all quarters before the implication. The estimated coefficient on the duration measure hereby captures the dynamics in firm value following the implication. Columns (2), (4), (6), and (8) of Table 8 report the estimate on the coefficient of the duration measure to be around 1.2%, significant at the 1% level; meanwhile, the point estimate of the coefficient on the implication dummy rises to around 21%. Altogether, the results summarized in Table 8 suggest a firm's value declines by 12% on average among all the quarters following the implication; in particular, it drops by about 21% on impact, and recovers by about 1.2% per quarter afterward.

6 Conclusion

We proposes corruption can be indispensable for lending in an environment with poor institutions. A theoretical framework is built to show the corruptive relations with government officials can serve as financial intermediation: corrupt officials enforce financial commitments; bribes reward the official; repeated loan issuance gives entrepreneurs the incentive to commit. To differentiate our theory from

alternatives, we derive some unique but testable predictions: firms default on existent, corruption-backed loans when implicated by the anti-corruption investigation; such defaults appear strategic as long as firms manage to substitute corruption with other collateral. We examine panel data from China, and find powerful evidence supporting these predictions.

Our findings suggest the anti-corruption campaign, although intended to improve the social efficiency, may cause an unintended consequence of thwarting relationship lending if not accompanied by reforms on institutions. In this regard, recent efforts by the Chinese supreme court to publicize information on firm defaults and by the central bank to activate more financial tools should complement the central government's fight against corruption.

Although our framework highlights corruption's social benefit as financial intermediation, more elements can be added for considering corruption's social cost. Heterogeneity in firm productivity can be introduced to evaluate corruption's impact on capital misallocation. Small firms' reaction to the anti-corruption investigation can be examined to explore how corruption facilitates small and medium businesses. Our framework can also be applied to investigate how corruption impacts other forms of finance, such as housing collateral, and other economic outcomes, such as housing prices. We leave these for future research.

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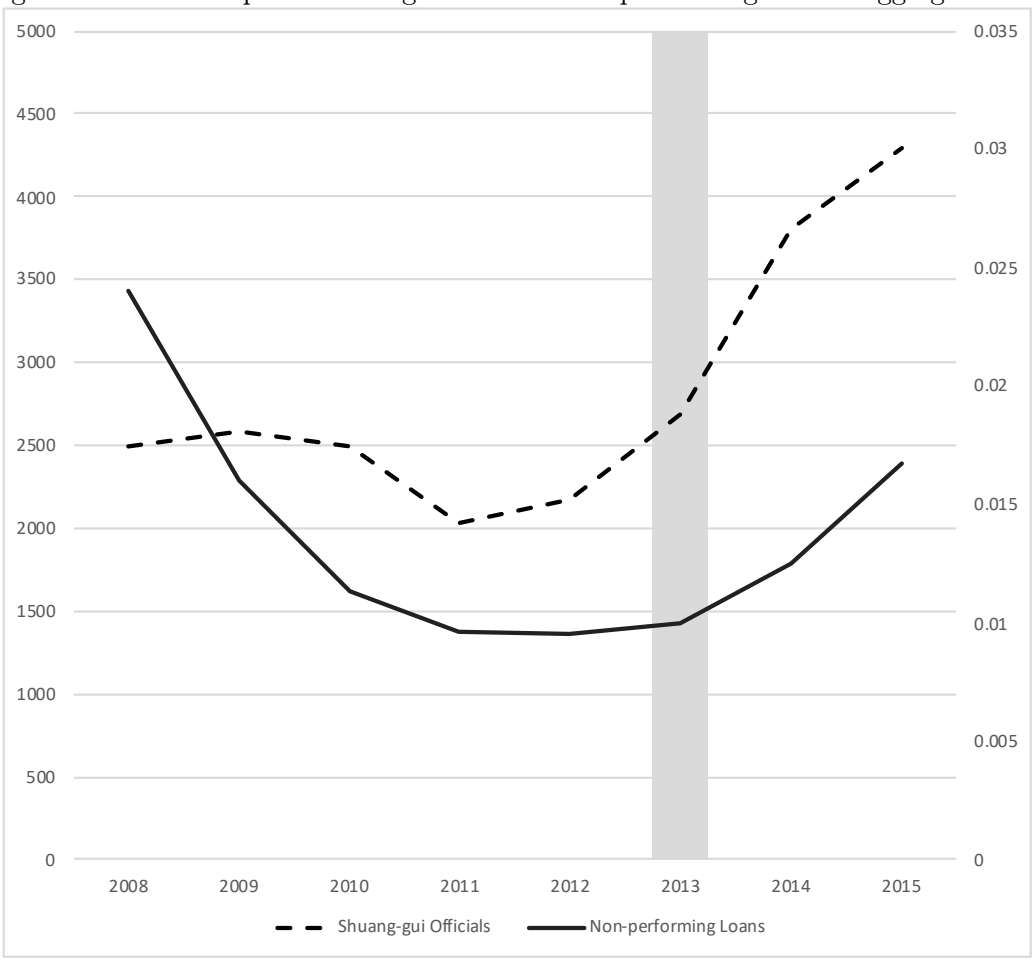
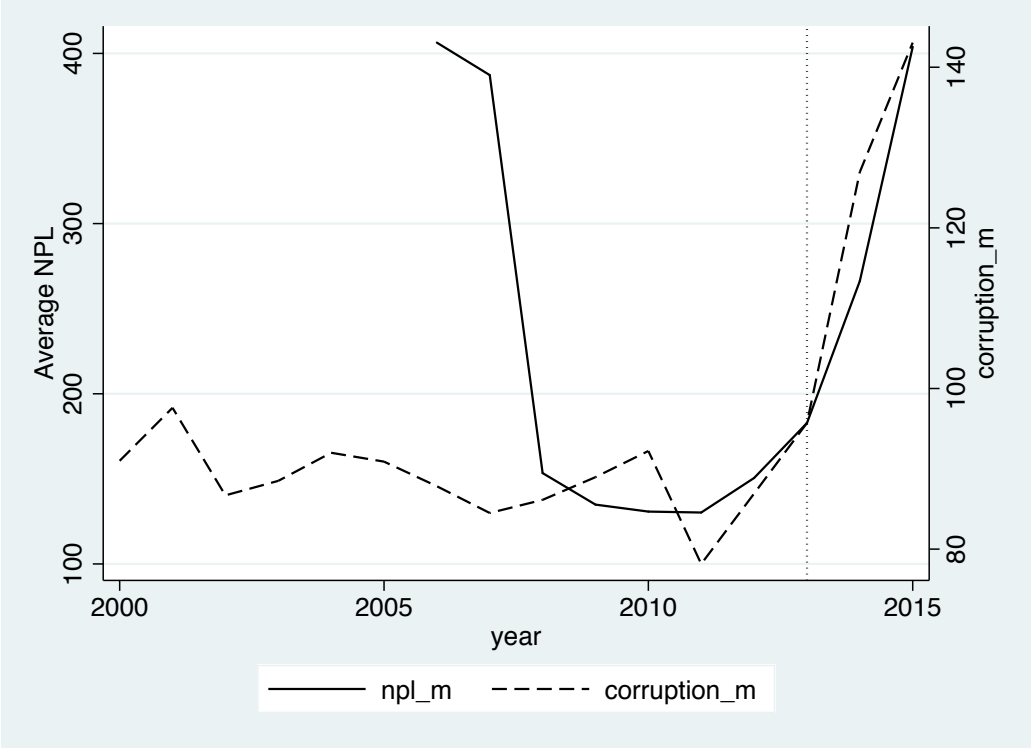
Figure 1: Anti-corruption Investigations and Non-performing Loans: aggregate data



Note: Aggregate time-series plots of annual data from 2008 to 2015. "Shuang Gui" officials, plotted against the left axis, is measured as the total number of officials newly put under investigation for corruption calculated as the total sum of our regional sample. Non-performing loans, plotted against the right axis, is measured as the ratio of defaulting loans to total gross loans. 2013 is the year when the national anti-corruption campaign initiates. Data on corrupt officials is compiled from the 2007-2016 Pro-curatorial Yearbooks of China. Data on non-performing loans is from the IMF Financial Soundness Indicator Dataset. See text for more details.

Figure 2: Anti-corruption Investigations and Non-performing Loans: regional averages



Note: time-series plots of the 2000-2015 regional average amount of non-performing loans (left axis) and the average number of "Shuang Gui" officials newly put under corruption investigation (right axis) for 30 provinces. Non-performing loans are in 100 millions RMB. "Shuang Gui" officials are in number of individuals. The dotted vertical line indicates the 2013 initiation of the national anti-corruption campaign. See text for more details.

Table 1: Summary Statistics: annual regional panel

	No. of obs.	Years covered	Mean	S.D.	Minimum	Maximum
Panel A: In Levels						
Corrupt Officials (no. of individuals)	464	2000-2015	95	58	4	320
Non-performing Loans (100 mill RMB)	300	2006-2015	234.6	258.0	6.2	1772.8
Panel B: In Annual Growth						
Corrupt Officials	425	2001-2015	0.097	0.409	-0.870	3.652
Non-performing loans	270	2007-2015	0.087	0.454	-0.861	2.391
Real GDP	450	2001-2015	0.116	0.026	0.03	0.238

Note: Data on corrupt officials is from the Procuratorial Yearbooks of China, measured as the number of officials newly put under investigation for corruption. Data on outstanding non-performing loans is from the China Banking Regulatory Commission Annual Reports. Data on real GDP growth is from the China Statistical Year books. See text for details.

Table 2: Summary Statistics of: quarterly firm panel (1q2007-4q2017)

	No. of obs.	Mean	S.D.	Minimum	Maximum
Panel A: Basic Information					
Default	100,162	0.0069	0.0830	0	1
Anti-corruption	100,162	0.0179	0.1327	0	1
Age	100,162	15.38	5.57	0	50
No. of employee	99,053	5,571	19,375	37	60,966
Leverage ratio	99,264	0.45	0.23	0.04	1.16
Panel B: in Levels					
Gross Sale (100 mill RMB)	99,262	34.72	88.54	0.06	630.15
Gross Profit (100 mill RMB)	99,262	2.64	7.12	-3.56	52.03
Cash (100 mill RMB)	99,269	13.06	29.87	0.04	217.16
Real Asset (100 mill RMB)	98,751	67.52	162.82	1.38	1190.58
Real Fixed (100 mill RMB)	98,756	16.06	45.24	0.02	341.18
Short Loan (100 mill RMB)	96,890	9.94	24.46	0	170.99
Long Loan (100 mill RMB)	91,884	10.29	35.53	0	265.93
Pledged Stock (100 mill shares)	42,304	1.27	2.15	0	136.64
Bonds (100 mill RMB)	85,545	3.72	13.98	0	104.60
Panel C: in Annual Growths					
Sale Growth	85,996	0.12	0.37	-1.11	1.57
Profit Growth	86,088	0.13	2.45	-11.77	12.79
Cash Growth	86,103	0.07	0.567	-1.36	1.73
Real Asset Growth	85,638	0.12	0.24	-0.44	1.29
Real Fixed Growth	85,590	0.11	0.37	-1.16	1.56
Short Loan Growth	73,563	0.12	0.93	-2	2
Long Loan Growth	53,027	0.12	1.11	-2	2
Pledged Stock Growth	27,899	0.30	0.82	-2	2
Bonds Growth	15,329	0.35	1.11	-2	2

Note: Summary statistics of key variables for 3438 firms listed in Shanghai or Shenzhen Stock Exchange from 2007 to 2017. *Default* is a dummy that equals one if the company is reported by the Supreme Court as having records of loan defaults in that quarter, and equals zero otherwise. $Anti-corruption$ is a dummy that equals one if the company is reported to have corruptive connections with an official that has been under investigation for corruption in that quarter or before, and zero otherwise. value of all variables except for Default, Anit-corruption, and Age are winsorized between 1% and 99%. Growth refers to annual growth measured as the change in the value from the same quarter of last year to the current quarter divided by the average value of these two quarters, following Davis and Haltiwanger (1992). Data on investigated corrupt officials are from the China's Central Commission of Discipline Inspection; data on defaults are from the the Supreme People's Court of China. See text for more details.

Table 3: Regional Non-performing Loans: OLS

"Shuang Gui" Officials		(1)			(2)	
Contemporaneous	0.382***	0.401***	0.396***	0.097*	0.114**	0.107**
	(0.104)	(0.087)	(0.075)	(0.047)	(0.050)	(0.046)
Cumulatively		0.888***	0.914***		0.208**	0.207**
in one year		(0.115)	(0.110)		(0.079)	(0.080)
Cumulatively			1.213***			0 .232**
in two years			(0.181)			(0.100)
Cumulative coefficients				-4.469**	-3.728*	-4.125*
on regional output				(1.754)	(2.215)	(2.2value76)
Region fixed effects	yes	yes	yes	yes	yes	yes
Year fixed effects	no	no	no	yes	yes	yes
R square	0.085	0.204	0.217	0.728	0.724	0.721
F statistics	13.60	42.33	28.79	50.47	54.65	54.55
Sample Size	245	237	231	245	237	231

Note: OLS estimates of the coefficients on the number of officials newly put under investigation for corruption ("Shuang Gui"), based on a sample of 30 provinces from 2006 to 2015. Column (1) reports those without controlling for regional GDP growth or including year fixed effects. Column (2) reports those with controls. Robust standard errors clustered by regions are in parentheses. All estimations are conducted in growth rates. ***1%-level significance; ** 5%-level significance; * 10%-level significance. See text for more details.

Table 4: Firm Defaults: Difference in Difference

	Dependent Variable: Default Dummy					
	Linear Probability Model					Probit Model
	(1)	(2)	(3)	(4)	(5)	(6)
Anti-Corruption	0.007***	0.007***	0.006**	0.006**		0.101**
	(0.002)	(0.002)	(0.003)	(0.003)		(0.051)
ln(employee)		-0.002***	-0.002***	-0.002***		
		(0.000)	(0.001)	(0.001)		
Real Asset growth			-0.006***	-0.006***		
			(0.001)	(0.001)		
Leverage				0.007***		
				(0.003)		
Before^{-2}					0.008	
					(0.007)	
Before^{-1}					-0.001	
					(0.007)	
Before^{0}					-0.001	
					(0.007)	
After^{1}					0.022***	
					(0.007)	
After^{2+}					0.007***	
					(0.003)	
Region×trends	yes	yes	yes	yes	yes	yes
Industry×trends	yes	yes	yes	yes	yes	yes
Quarter×year fixed effects	yes	yes	yes	yes	yes	yes
Firm fixed effects	yes	yes	yes	yes	yes	yes
R square	0.0087	0.0089	0.0092	0.0093	0.0088	0.11
Sample Size	100,162	99,033	85,431	85,431	100,162	100,162

Note: Difference-in-difference estimation results of firm defaults on anti-corruption implications. Default dummy equals one if the company or one of its branches is reported by the Supreme Court as having records of loan defaults in that quarter, and equals zero otherwise. Anti-corruption is a dummy that equals one if the company is reported to have corruptive connections with an official that has been under investigation for corruption in that quarter or before, and zero otherwise. The regression is based on a quarterly panel of 3438 publicly listed firms from 2007 to 2017. Data on anti-corruption investigation is from China's Central Commission of Discipline Inspection; data on defaults are from the the Supreme People's Court of China. Standard errors clustered by firms are reported in parenthesis. ***1%-level significance; **5%-level significance; *10%-level significance. See text for more details.

Table 5: Defaults and Firm Performance : Difference in Difference

	Gross Profit	Net Profit	Gross Rev.	Net Rev.	Cash Holdings
Anti-Corruption	-0.0157	0.0795	0.0021	0.005	0.0307*
	(0.0806)	(0.0784)	(0.0102)	(0.0101)	(0.0159)
ln(emp)	-0.0126	0.0140	0.0329***	0.0308***	-0.0285***
	(0.0174)	(0.0169)	(0.0022)	(0.0022)	(0.0034)
Real Asset Growth	0.9242***	0.8900***	0.6889***	0.6724***	1.2181***
	(0.0389)	(0.0379)	(0.0050)	(0.0049)	(0.0076)
Leverage	0.3173***	0.2869***	0.0581***	0.0670***	-0.0017
	(0.0786)	(0.0765)	(0.0100)	(0.0100)	(0.0155)
Region×trends	yes	yes	yes	yes	yes
Industry×trends	yes	yes	yes	yes	yes
time fixed effects	yes	yes	yes	yes	yes
Firm fixed effects	yes	yes	yes	yes	yes
R square	0.0113	0.0112	0.2448	0.2410	0.2520
Sample Size	85,422	85,422	85,339	85,191	85,430

Note: Difference-in-difference estimation results of firm performance on anti-corruption implications. All five dependent variables are measured as quarterly annual growth based on Davis and Haltiwanger (1992). "Anti-Corruption" is the difference-in-difference dummy that equals one if the firm is reported to have corruptive connections with an official that has been under investigation for corruption in that quarter or before, and zero otherwise. The regression is based on a quarterly panel of 3438 publicly listed firms from 2007 to 2017. Standard errors clustered by firms are reported in parenthesis. ***1%-level significance; ** 5%-level significance; * 10%-level significance. See text for more details.

Table 6: Defaults and Financial Status: Difference in Difference

Panel A: Debt-payment Ability

	Current Rate	Super Quick Rate	Quick Rate	Cash Rate 1	Cash Rate 2
Anti-Corrup	0.2407***	0.2918***	0.2320***	0.2056***	-0.0021
	(0.0977)	(.0849)	(0.0911)	(.0707)	(.0133)
ln(emp)	-0.2564***	-0.1961***	-0.2435***	-0.1762***	0.0082**
	(0.0412)	(0.0343)	(0.0386)	(0.0286)	(0.0041)
Real Asset	-0.2628***	-0.2132***	-0.1814***	-0.1022**	-0.0328***
	(0.0667)	(0.0537)	(0.0630)	(0.0460)	(0.0066)
Leverage	-6.7209***	-4.9040***	-5.8393***	-3.5314***	-0.1161***
	(0.2658)	(0.2020)	(-5.8393)	(0.1670)	(0 .0226)
R square	0.2259	0.1980	0.2080	0.1690	0.1194
Sample Size	82,246	82,245	82,246	82,205	82,244

Panel B: Ability to Keep Loans in Good Standing

	Liquidity/Loan	Profit/Fin.Cost	Cash/Fin.Cost	Cash/Urgent Debt
Anti-Corruption	8.0962**	-0.7479.	0.2676	-0.1578
	(3.3899)	(2.8013)	(3.2624)	(1.1376)
ln(employee)	-0.8158	0.8823	-1.7709*	0.1495
	(0.6213)	(0.7565)	(1.0447)	(.2459)
Real Asset Growth	-0.9772	2.6195**	-5.7070***	-0.1319
	(0.9704)	(1.2119)	(1.9215)	(0.4747)
Leverage	-57.0567***	2.7582	1.1559	-7.2153***
	(4.6080)	(4.0519)	(5.4794)	(1.5423)
R square	0.0422	0.0048	0.0033	0.0236
Sample Size	69,820	82,225	82,225	65,177

Note: Panel A presents the difference-in-difference estimation results of the five indicators that measure firms' debt payment ability; Panel B presents those of the four indicators that measure firms' ability to make loan payments. "Anti-corruption" is the difference-in-difference dummy that equals one if the company is reported to have corruptive connections with an official that has been under investigation for corruption in that quarter or before, and zero otherwise. The regression is based on a quarterly panel of 3438 publicly listed firms from 2007 to 2017. Standard errors clustered by firms are reported in parenthesis. ***1%-level significance; **5%-level significance; *10%-level significance. See text for more details.

Table 7: Alternative Financing: Difference in Difference

	Short Loan	Long Loan	Pledged Stocks	Bonds
	(1)	(2)	(2)	(3)
Anti-Corruption	0.0280	-0.0085	0.1110*	0.3088***
	(0.0456)	(0.0607)	(0.0620)	(0.1228)
ln(age)	-0.6480***	-0.3465***	-0.8781***	-0.5952*
	(0.0777)	(0.1314)	(0.1066)	(0.3302)
Real Asset Growth	1.0749***	1.3952***	0.3460***	0.8648***
	(0.0294)	(0.0357)	(0.0209)	(0.1006)
Leverage	1.0328***	0.8185***	-0.5023***	0.8584***
	(0.0572)	(0.0930)	(0.0464)	(0.2776)
Region×time trends	yes	yes	yes	yes
Industry×time trends	yes	yes	yes	yes
Quarter×year fixed effects	yes	yes	yes	yes
Firm fixed effects	yes	yes	yes	yes
R square	0.1051	0.1039	0.0730	0.2202
Sample Size	72,974	52,747	27,692	15,258

Note: Difference-in-difference estimation results of the outstanding loans with terms less than a year (Short Loan), loans with terms of at least a year (Long Loan), of the quantity of stock shares pledged for borrowing (Pledged Stocks), and of corporate bonds (Bonds). All four dependent variables are measured as quarterly annual growth based on Davis and Haltiwanger (1992). Anti-corruption is the difference-in-difference dummy that equals one if the company is reported to have corruptive connections with an official that has been under investigation for corruption in that quarter or before, and zero otherwise. The regression is based on a quarterly panel of 3438 publicly listed firms from 2007 to 2017. Standard errors clustered by firms are reported in parenthesis. ***1%-level significance; **5%-level significance; *10%-level significance. See text for more details.

Table 8: Firm Value: Difference in Difference

	End-of-quarter Stock Price				Average Daily Stock Price			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Anti-Corrup	-0.1229***	-0.2246***	-0.1054***	-0.1960***	-0.1256***	-0.2199***	-0.1096***	-0.1939***
	(0.0188)	(0.0183)	(0.0115)	(0.0170)	(0.0116)	(0.0178)	(0.0110)	(0.0165)
Duration		0.0131***		0.0118***		0.0121***		0.0109***
		(0.0017)		(0.0016)		(0.0017)		(0.0016)
Real Asset			0.3709***	0.3711***			0.3845***	0.3846***
			(0.0055)	(0.0055)			(0.0053)	(0.0053)
Leverage			-0.4075***	-0.4074***			-0.4381***	-0.4380***
			(0.0114)	(0.0114)			(0.0111)	(0.0111)
Profit			0.0035***	0.0035***			0.0028***	0.0028***
			(0.0004)	(0.0004)			(0.0004)	(0.0004)
Region-specific trends	yes	yes	yes	yes	yes	yes	yes	yes
Industry-specific trends	yes	yes	yes	yes	yes	yes	yes	yes
time-fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Firm-fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
R square	0.3177	0.3181	0.3615	0.3619	0.3136	0.3140	0.3666	0.3670
Sample Size	97,313	97,313	83,801	83,801	97,313	97,313	83,801	83,801

Note: Difference-in-difference estimation results of firm value measured as stock prices. Anti-corruption is the difference-in-difference dummy that equals one if the company is reported to have corruptive connections with an official that has been under investigation for corruption in that quarter or before, and zero otherwise. Duration equals the number of quarters between the quarter of the implication and the current quarter and equals zero before the implication quarter. The regression is based on a quarterly panel of 3438 publicly listed firms from 2007 to 2017. Standard errors clustered by firms are reported in parenthesis. ***1%-level significance; **5%-level significance; *10%-level significance. See text for more details.

7 Appendix For Online Publication

7.1 Proof of Proposition 1

Proof. The equilibrium has to satisfy a set of conditions,

(1) Implications of Assumptions 1 is

$$\max\{R_L - R_H, \theta R_L/2, \theta R_L - (R_L - R_H)\} < r_0 = G'(K^S) < \theta R_L$$

So,

$$\max\{R_L - R_H, \theta R_L/2, \theta R_L - (R_L - R_H)\} < G'(K) < G'(0) < \theta R_L$$

which requires,

$$G'(K) < \max\{\theta R_L/2, R_H - (1-\theta)R_L\}, \tag{20}$$

$$G'(0) > \theta R_L. \tag{21}$$

$$R_H < R_L < R_H\left(1 + \frac{(1-\theta)\beta}{1-(1-\theta)\beta}\right) \tag{22}$$

(2) For there exists type s for which the gain from trade in corruption backed finance

$$s(R_H - r) + W(s) \geq (1-\theta)R_L + V(s),$$

we have,

$$s \geq \underline{s}^C = \frac{(1-\theta)R_L}{R_H - r + \frac{\hat{\beta}}{1-\hat{\beta}}\xi}. \tag{23}$$

When the monitoring cost of the alternative channel of funding is zero, no one participates in corruption-backed finance, because $(1-\theta)R_L > R_H - r$ under assumption (**??**). For

$$\underline{s}^C = \frac{(1-\theta)R_L}{R_H - r + \frac{\hat{\beta}}{1-\hat{\beta}}\xi} < 1$$

we must have the following condition on ξ,

$$\begin{aligned}\xi &\geq \frac{1-\hat{\beta}}{\hat{\beta}}\left[(1-\theta)R_L - R_H + r\right] \\ &= \frac{1-\hat{\beta}}{\hat{\beta}}\left[(1-\theta)R_L - R_H + \frac{(1+\kappa)r_0 - \kappa\theta R_L}{1-\kappa}\right] \\ &\geq \frac{1-\hat{\beta}}{\hat{\beta}}\left[(1-\frac{\theta}{1-\kappa})R_L - R_H + \frac{(1+\kappa)G'(0)}{1-\kappa}\right].\end{aligned}$$

This can be thought of as a condition on κ,

$$\kappa \leq \frac{\xi - \frac{1-\hat{\beta}}{\hat{\beta}}\left[(1-\theta)R_L + G'(0) - R_H\right]}{\xi + R_H + G'(0) - R_L}$$

(3) In addition to the tradeoff the entrepreneur in a corrupt relationship faces at the beginning of each period, she also faces a tradeoff at the end of each period, when she can choose whether to let go the corrupt relationship and borrow wish stock-pledge finance. If the entrepreneur prefers financing through the corrupt relationship, $W(s) \geq V(s)$, which implies that

$$\begin{aligned}r_p = r_0 + \xi &\geq (1-\kappa)\gamma r + (1-(1-\kappa)\gamma)\left[R_H - (1-\theta)R_L/s\right] \\ &= \gamma r_0 + (1-\gamma)\left[R_H - (1-\theta)R_L/s\right] + \kappa\gamma\left\{r_0 + R_H - \theta R_L - (1-\theta)R_L/s\right\}\end{aligned}$$

Suppose the condition above holds for all s. Then,

$$\kappa \leq \frac{(1-\gamma)\left[r_0 + (1-\theta)R_L - R_H\right] + \xi}{\gamma\left(r_0 + R_H - R_L\right)}$$

For positive ξ, when κ is small enough, then (2) and (3) are both satisfied

(4) for $\underline{s}^E = \frac{(1-\beta)(1-\theta)R_L}{R_H - r - \xi} < 1$,

$$\xi < R_H - G'(0) - (1-\beta)(1-\theta)R_L.$$

(5) for $\underline{s}^E < \underline{s}^C$, notice that

$$\begin{aligned}\underline{s}^C - \underline{s}^E &= \frac{(1-\theta)R_L}{R_H - r + \frac{\hat{\beta}}{1-\hat{\beta}}\xi} - \frac{(1-\hat{\beta})(1-\theta)R_L}{R_H - r - \xi} \\ &= (1-\hat{\beta})(1-\theta)R_L \frac{\hat{\beta}\left(R_H - r\right) - (1+\hat{\beta})\xi}{\left[(1-\hat{\beta})(R_H - r) + \beta\xi\right]\left(R_H - r - \xi\right)}\end{aligned}$$

As long as $r + \xi < R_H$, this means that

$$\begin{aligned}\xi &\leq \frac{\hat{\beta}}{1+\hat{\beta}}(R_H - r) \\ &= \frac{\hat{\beta}}{1+\hat{\beta}}\left[R_H - r_0 - \frac{\kappa}{1-\kappa}\left(2r_0 - \theta R_L\right)\right]\end{aligned}$$

For the lower bound of ξ to be smaller than the upper bound

$$\frac{1-\hat{\beta}}{\hat{\beta}}\left[(1-\theta)R_L - R_H + \frac{(1+\kappa)r_0 - \kappa\theta R_L}{1-\kappa}\right] \leq \frac{\hat{\beta}}{1+\hat{\beta}}\left[R_H - r_0 - \frac{\kappa}{1-\kappa}\left(2r_0 - \theta R_L\right)\right]$$

The right hand side is decreasing in κ and the left hand side is increasing in κ. Let κ_1 be such that the

$$\kappa \leq \frac{R_H - G'(0) - \left(1-\hat{\beta}^2\right)(1-\theta)R_L}{R_H + G'(0) - \left(1-\hat{\beta}^2\right)R_L - \hat{\beta}^2\theta R_L} \leq \frac{R_H - r_0 - \left(1-\hat{\beta}^2\right)(1-\theta)R_L}{R_H + r_0 - \left(1-\hat{\beta}^2\right)R_L - \hat{\beta}^2\theta R_L}$$

To guarantee that the RHS is greater than zero,

$$\begin{aligned}&\left[R_H - G'(0)\right] - \left(1-\hat{\beta}^2\right)(1-\theta)R_L \geq 0 \\ \Leftrightarrow &\hat{\beta}^2 \geq \frac{(1-\theta)R_L + G'(0) - R_H}{(1-\theta)R_L} = 1 - \frac{R_H - G'(0)}{(1-\theta)R_L}\end{aligned}$$

Collecting conditions we have,

$$\hat{\beta} \geq \underline{\beta} = \sqrt{1 - \frac{R_H - G'(0)}{(1-\theta)R_L}}$$

$$\underline{s}^C < 1 \rightarrow \kappa \leq \kappa_1 = \frac{\xi - \frac{1-\hat{\beta}}{\hat{\beta}}\left[(1-\theta)R_L + G'(0) - R_H\right]}{\xi + R_H + G'(0) - R_L}$$

$$W(s) \geq V(s), \forall s \geq \max\{\underline{s}^E, \underline{s}^C\} \rightarrow \kappa \leq \kappa_2 = \frac{(1-\gamma)\left[r_0 + (1-\theta)R_L - R_H\right] + \xi}{\gamma\left(r_0 + R_H - R_L\right)}$$

$$\underline{s}^E < \underline{s}^C \rightarrow \kappa \leq \kappa_3 = \frac{R_H - G'(0) - \left(1 - \hat{\beta}^2\right)(1-\theta)R_L}{R_H + G'(0) - \left(1 - \hat{\beta}^2\right)R_L - \hat{\beta}^2\theta R_L}$$

For $\xi > \underline{\xi} \equiv \frac{1-\hat{\beta}}{\hat{\beta}}\left[(1 - \frac{\theta}{1-\kappa})R_L - R_H + \frac{(1+\kappa)G'(0)}{1-\kappa}\right]$, $\hat{\beta} > \underline{\beta}$ and $\kappa < \overline{\kappa} \equiv \min\{\kappa_1, \kappa_2, \kappa_3\}$, entrepreneurs with connections to officials choose corruption backed finance when $s \geq \underline{s}^C$, entrepreneurs without connections rely on SPF if $s \geq \underline{s}^E$.

K^S, K^C, and K^E are all weakly decreasing functions r_0, if there exists an equilibrium, the equilibrium must be unique. When $r_0 = G'(K)$, $K^S = K$, so that $K^S + K^C + K^E$ exceeds the total supply of capital. When $r_0 = G'(0)$, $K^S = 0$, $K^S + K^C + K^E < 1 + \kappa \leq K$, by assumption 4. Therefore, there exists an equilibrium with $G'(K) \leq r_0 \leq G'(0)$. □

7.2 Proof of Proposition 2

Proof. By assumption 3, intensifying anticorruption campaign increases capital demand from corruption backed finance, K^C, for any given risk free rate r_0. By 15, an increase in κ increases K^E. Thus, to clear the capital market, r_0 has to increase. □