Corruption as Collateral*

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Abstract

We explore the role of corruption in assisting finance, when conventional collateralized lending is limited in economies like China. We build an agency-friction theory, in which corruption helps the bank to overcome the soft-budget constraint and induce entrepreneurs to invest in high quality projects and repay their debts. When the anti-corruption campaign causes collateral damage on corruption-backed finance, banks' search for yields leads to alternative lending based on pledging physical asset or stock shares; accordingly, the price of physical assets and the amount of equity pledge rise. We examine Chinese data at the regional level and the firm level, and find evidence supporting our theory. We argue the anti-corruption campaign alone without further financial-market institutional reforms may hinder financial intermediation, giving rise to undesirable consequences.

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1 Introduction

We study the role of corruption as collateral to assist financing. Our particular examination of corruption's influence on finance goes way back to the long-standing question: is corruption bad for the economy? Answer from conventional wisdom is absolutely yes. When we compare an economy plagued by corruption with a frictionless benchmark, few would disagree that corruption distorts allocation. But the real economy is not frictionless. In an economy with loose law enforcement and disfunctioning of alternative social institutions, even mafia could contribute to order and safety of the society. In this sense, the conventional wisdom that eliminating corruption is good for the society could be wishful thinking. A deeper question is what is the role of corruption if we take other frictions in the economy as given. In an environment with incomplete law enforcement and credit history, power and trusting relationship could be essential to enforce financial contracts. In other words, corruption could act as an alternative collateral.

Formally, we first build a model of limited commitment, where the entrepreneur has the incentive to distract funding to less productive projects to increase private return and avoid debt repayment. This incentive subjects banks to soft budget constraints. Because the official has the power to allocate credit and tracks credit history, the bank and the entrepreneur facilitate unsecured lending by jointly establishing a corrupt relationship with the official. The value of an ongoing corrupt relationship thus corrects the incentive, makes unsecured lending possible and increases the productivity of projects. The bribe to the official is nothing but a reward for a much needed service in a loose legal environment.

The anti-corruption campaign deals a collateral damage to the corrupt relationship. For bank-entrepreneur pairs connected with officials investigated by the campaign, soft-budget constraint problem arises, subjecting entrepreneurs to strategic default and banks to non-performing loans. For those connected with other officials, the expected duration of the relationship is cut short, which makes the relationship less valuable, entrepreneurs' incentives harder to correct and deters entry of new corrupt relationships.

The decline of corruption-backed finance drives banks to search for yields and entrepreneurs for alternative forms of funding. The demand for other forms of collateral thus rises, driving up the price of such physical collateral as housing and the amount of entrepreneurs' own equity shares being pledged.

We further find empirical evidence consistent with these theoretical predictions. While the total amount of corruption-based finance is impossible to measure, we estimate the response in finance variables when the corruption nexus is blocked. Using regional and firm-level data, we find robust evidence that the non-perfoming rate of bank loans increases when anti-corruption campaign intensifies. This is a sign of tightening financing constraint or weaker incentive of the entrepreneur to repay the unsecured debt. We found that tightening constraint induced by declining profitability is less likely the case. At regional level, we find that (1) the aggregate amount of loans does not decline as a result of the campaign; (2) the demand for housing as collateral tends to rise when anti-corruption campaign intensifies. At firm level, we found that firms connected with implicated officials pledged more equity shares, while their profitability and equity value are not affected.

The literature on corruption and growth (Shleifer and Vishny 1993, Mauro 1995, Olken and Pande 2012) often emphasizes the negative effect of corruption on the economy. But, as Allen, J. Qian, and M. Qian 2005 put it, "the success of the private sector in China ... challenges the view that property rights and the lack of government corruption are crucial in determining financial and economic outcomes." The theory of corruption-backed finance proposed in this paper reconciles these views.

It builds on the soft budget constraint problem (SBC) facing financial intermediaries when borrowers face limited commitment and enforcement michansim is insufficient (Dewatripont and Maskin 1995, and Maskin and Xu 2001). As Boot 2000 argue, relationship lending is a way to overcome the SBC problem. Unlike conventional relationship lending, it is the corrupt relation with the official that makes unsecured lending possible. It echos the literature on contract enforceability and economic institutions (Greif 1993).

There is a recent empirical literature on corruption and finance in China. Chen and Kung (forthcoming) find evidence that corruption distorts land allocation in China. Fang, Lerner, Wu and Zhang (2018) find that when officials allocate directly subsidy or credit to support innovation, corruption may reduce innovation. We show that corruption could improve allocation of bank funding by supporting relationship lending. Li, Wang and Zhou (2018) find that the anti-corruption campaign inniated by President Xi shifts credit from less productive state-owned enterprises(SOEs) to more productive non-SOEs.

Measuring directly corruption is hard (Olken and Pande, 2012). Fisman (2001) pioneered an

alternative approach ot use the theory of market equilibrium, combined with data on market activity, to infer corruption activities. Our paper follows this approach and shed further light on the quantitative influence of corruption through fiancing.

2 Model

Unsecured bank lending is risky in China for two reasons. First, lax legal environment makes it hard for creditors to enforce loan repayment. Enforcement of personal bankruptcy and chase a defaulting entrepreneur has been very hard. In the lax legal environment, relationship lending is essential to enforce repayment of unsecured loans. Second, the credit history of an entrepreneur is opaque. This is not only because there lacks a well enforced country-wide system recording the credit history for entrepreneur, but also competition among banks and informal creditors fragments the credit history of an entrepreneur. Walking away from a banker, an entrepreneur may still have access to funding from another bank. This makes it hard for bankers to enforce loan repayment through relationship lending. In this environment, government officials have a unique advantage as the enforcer of loan repayment. They have the power to influence credit allocation across all banks and, through long-term relationships with the entrepreneur, they have the memory of an entrepreneur's credit history. In this environment, relationship lending enforced by officials and collateralized lending act as two alternative mechanisms to guarantee loan performance.

Time is discrete and lasts forever. The economy is populated by banks, entrepreneurs and government officials. Banks intermediate the allocation of an intermediate input. Entrepreneurs are endowed with technologies that use the intermediate input to produce consumption goods. Government officials have the power to direct the allocation of bank loans and law enforcement. The measure of government officials involved in loan allocation is denoted N^G. It may depend on such factors as the intensity of the anti-corruption campaign. There is a unit of measure of banks. The measure of entrepreneurs is determined by free entry.

All agents have linear utility over consumption and discount future utility at rate $\beta \in (0, 1)$. The utility from consuming one consumption good is one. At the end of a period, the entrepreneur is endowed with a linear technology that transforms labor into consumption goods. The utility cost of creating one consumption good is one.

In each period, banks are endowed with K units of the intermediate good. Banks can either allocate the intermediate goods to entrepreneurs or invest in a safe storage technology. The total output from the safe storage technology if banks allocate K^S units of the intermediate goods is $G(K^S)$, G being a smooth and concave function with $0 < G'(\cdot) < R_H$. Thus, the marginal return of the safe technology, r_0, is equal to

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

Each bank takes r_0 as given.

The entrepreneur may receive an investment opportunity with probability $\pi \in (0, 1)$ at the beginning of each period. There are three sub-periods in each period. All projects mature at the third subperiod and require a unit of intermediate good at the beginning of a period. Depending on an unobservable choice of the entrepreneur at the second subperiod, it may turn out to be of high quality or low quality. A high quality project generates output R_H. The output of a high quality project is pledgeable. If the entrepreneur chooses to default, all of its output can be seized by the bank. A low quality project requires one more unit of funding at the second subperiod. It generates θR_L units of pledgeable output and $(1-\theta)R_L$ units of private return for the entrepreneur. $\theta \in (0, 1)$ represents its pledgeability. The private return cannot be seized by the bank or the government official when the entrepreneur chooses to default. In addition to the project endowment, a subset of entrepreneurs' equity share of their own venture is partially pledgeable. The measure of entrepreneurs with s pledgeable share of their venture or less is $N^E(s)$, for $s \in [0, 1]$.

Banks provide three types of funding, unsecured loan, collateralized loan backed by physical assets such as real estate, and collateralized backed by the equity of the firm itself. An entrepreneur has access to one type of funding. We think of a firm with multiple sources of funding as a collection of entrepreneurs. Each entrepreneur maximizes her own value. Banks supply funding and firms allocate funding through a competitive loan market. Thus, the allocation of funding across funding types depends on the required return of the loan.

The physical collateral asset pays a unit dividend at the end of a period. The total supply of the asset is A. A competitive market to trade the collateral asset opens at the third subperiod of each period. The price of the asset, denominated in the consumption goods, is denoted q.

2.1 Soft Budget Constraint without Enforcement

In this section, we show that without corrupt official or collateral, entrepreneurs shirk in managing project quality, subjecting banks to soft budget constraints. (Dewatripont and Maskin (1995), Maskin and Xu (2001).)

Assumption 1. *Returns of entrepreneurs' projects and banks' opportunity cost satisfy the following conditions,* $R_H > R_L - r_0$, $2r_0 > \theta R_L > r_0$, $1 > \pi R_H$, $(1-\theta)R_L > R_H - r_0$.

$R_H > R_L - r_0$ means that the high quality project is more productive than the low quality one. Thus, it is socially optimal for the entrepreneur to choose high quality projects. $2r_0 > \theta R_L$ means that banks funding low quality projects will face default, thus generating non-performing loans. $\theta R_L > r_0$ means that banks find it suboptimal to terminate the low quality project at subperiod two. The limited commitment thus generates the classic soft budget constraint problem raised by Dewatripont and Maskin (1995). $1 > \pi R_H$ means that entrepreneur's expected return from investing intermediate goods without financial intermediation is too low, so that financial intermediation is essential.

$(1-\theta)R_L > R_H - r_0$ is related to entrepreneurs' incentive to shirk. Denote the 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 to fund long-term projects. Loose legal environment in China makes it easy for entrepreneurs to default, get away without punishment and continue borrowing from other creditors. Without enforcement mechanisms, the entrepreneur makes her decision based on current period payoffs, from choosing a low quality project, defaulting on the debt and running away with the private return $(1-\theta)R_L$, or from choosing a high quality project, repaying the debt and retaining the residual, $R_H - r$. Because $(1-\theta)R_L > R_H - r_0$ and $r \geq r_0$, we have

$$(1-\theta)R_L > R_H - r. \tag{2}$$

Under this condition, the entrepreneur's private return from choosing a low quality project, $(1-\theta)R_L$, exceeds her profit from a high quality project, $R_H - r$. The agency friction would lead to an socially inefficient quality choice. Collectively, Assumption 1 implies that $\max\{R_L - R_H, \theta R_L/2, \theta R_L - (R_L - R_H)\} < r_0 = G'(\cdot) < \theta R_L$.

Without enforcement mechanisms, banks expect that entrepreneurs will choose low quality projects and default strategically on bank loans. The strategic default subject banks to non-performing loans. In this case, their return to fund entrepreneurs' long-term projects is lower than their outside option, r_0. Thus, without additional enforcement mechanisms, banks are unwilling to fund these projects.

2.2 Corruption-Backed Loans

Government officials can grant, as well as terminate, entrepreneurs' access to financial intermediaries, as long as they stay in power. This power makes them the enforcer of the financial market. Because the supply of power is limited, officials seek rent or bribe from it. Bribe from entrepreneurs is a promise to the return from projects. Since good projects generate higher return, officials have the incentive to enforce them, by punishing shirking entrepreneurs by terminating their access to future bank loans.

Anticorruption campaign or investigation in general may disrupt the official's role as the enforcer of relationship lending. Suppose an official may lose power with probability κ at the beginning of each period because of anticorruption investigation. When the investigation intensifies, the expected duration of relationship lending decreases. Memories of entrepreneurs' credit history are destroyed when officials are lifted of their power.

Suppose an official charges bribe b when a high quality project matures and denote V to be an official's value over the relationship with an entrepreneur when he stays in power in the current period.[1]

$$\begin{aligned} V &= \pi b + \beta(1-\kappa)V, \text{ or,} \\ V &= \frac{\pi b}{1-\beta(1-\kappa)}. \end{aligned} \tag{3}$$

Anticorruption diminishes official's incentive to provide the service of enforcing loan repayment. This is why we impose that the number of officials involved in relationship lending, $N^G(\kappa)$, is a decreasing function in κ.

[1] To keep the model minimal, we assume the officials do not face additional penalty after investigation other than termination of the corrupt relationship. We could also introduce additional penalty. But in the empirical work, we do not explore the implication of the severity of the additional penalty because of data limitation.

Let W be the equilibrium payoff of an entrepreneur if the corrupt official she is connected with stays in power.

$$W = \pi \left(R_H - r - b \right) + \beta \left[\kappa\pi(1-\theta)R_L + (1-\kappa)W \right], \tag{4}$$

The second component of W comes from choosing risky projects when the official is being investigated, so that the entrepreneur expects that the relationship will terminate. When the official faces investigation, the payoff for the entrepreneur to choose a low quality project is $(1-\theta)R_L$, because the relationship with the official would terminate. After losing the relationship, entrepreneurs unmatched with officials compete to find a new relationship. Positive expected payoff from being matched with an official induces new entrants. The congestion drives their continuation value in equilibrium to zero. thereby choosing the low quality projects. Equation (4) implies that

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

The incentive constraint for the entrepreneur is

$$R_H - r - b + \beta \left[\kappa\pi(1-\theta)R_L + (1-\kappa)W \right] \geq (1-\theta)R_L, \text{ or,} \tag{6}$$

(5) and (6) together imply that

$$b \leq R_H - r - \rho(1-\theta)R_L, \text{ where} \tag{7}$$

$$\rho = 1 - \frac{\beta\pi}{1 - \beta(1-\kappa)(1-\pi)}$$

The condition for a positive bribe to enforce the IC constraint is

$$\kappa \leq \frac{\pi}{(1-\pi)\mu} - \frac{1 - \beta(1-\pi)}{\beta(1-\pi)}. \tag{8}$$

where $\mu \equiv 1 - \frac{R_H - r}{(1-\theta)R_L} > 0$ represents the severity of the SBC problem. The official charges a bribe if the entrepreneur has the incentive to enforce In this case, rent seeking officials prevent the moral hazard of the entrepreneur and increases asset pledgeability. If the anticorruption campaign is too intensive, (8) implies that no entrepreneur can borrow through corruption. Intuitively, when the duration of the entrepreneur-official relationship is too short, the value of continuing the relationship

is not large enough to incentivize the entrepreneur. The bribe here is not a sign of inefficiency. Rather, it is increasing in the social surplus generated from corruption-backed loans.

Since corruption campaign leads to the termination of entrepreneur-official relationship, intensifying campaign increases the non-performing rate. It also increases the credit spread of corruption-backed loans. The break-even condition for bankers to lend to safe short-term projects and long-term projects with officials enforcing high quality projects whenever they are in power is the following:

$$r_0 = \frac{2\kappa}{1+\kappa}\theta R_L/2 + \frac{1-\kappa}{1+\kappa}r. \tag{9}$$

On the right hand side of equation (9), $(1-\kappa)/(1+\kappa)$ is the probability that a bank lends to an entrepreneur connected with an official that stays in power. In that case, the project pays back the promised return r. $2\kappa/(1+\kappa)$ is the probability that a bank lends to an entrepreneur connected with an official that loses power that period, because of anti-corruption campaign for example. In this case, the loan is non-performing and obtains return $\theta R_L/2$. From the break-even condition, we learn

$$r = \frac{(1+\kappa)r_0 - \kappa\theta R_L}{1-\kappa}. \tag{10}$$

The credit spread banks charge over unsecured loans, $r - r_0$, is increasing in anticorruption intensity.

(10) and (8) together imply the following Lemma.

Lemma 1. *If $R_L < R_H \frac{1-\beta+\beta\pi}{1-\beta+\theta\beta\pi}$, there exists a unique cutoff of anticorruption intensity $\bar{\kappa}(r_0)$ below which bank loans can be backed by the relationship between the entrepreneur and the corrupt official. The threshold is decreasing in r_0.*

Proof. From (10) and (8),

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

Let

$$\Gamma(\kappa; r_0) = R_H - \frac{(1+\kappa)r_0 - \kappa\theta R_L}{1-\kappa} - \left[1 - \frac{\pi}{\frac{1}{\beta} - (1-\pi)(1-\kappa)}\right](1-\theta)R_L$$

$\Gamma(\kappa; r_0)$ is decreasing in κ, $\Gamma(1^-; r_0) < 0$. By Assumption 1, $r_0 \leq \theta R_L$.

$$\begin{aligned}\Gamma(0; r_0) &= R_H - r_0 - \left[1 - \frac{\pi}{\frac{1}{\beta} - (1-\pi)}\right](1-\theta)R_L \\ &\geq R_H - R_L + \frac{\pi}{\frac{1}{\beta} - (1-\pi)}(1-\theta)R_L.\end{aligned}$$

If

$$R_L < R_H \frac{1 - \beta + \beta\pi}{1 - \beta + \theta\beta\pi},$$

$\Gamma(0; r_0) > 0$, there exists a unique $\bar{\kappa}$ such that $\Gamma(\bar{\kappa}; r_0) = 0$. Because $\Gamma(\kappa; r_0)$ is decreasing in r_0, $\bar{\kappa}$ is decreasing in r_0. □

The amount of funding allocated to relationship lending is[2]

$$K^G = N^G(\kappa)(1+\kappa)\chi(\kappa, \bar{\kappa}). \tag{11}$$

where

$$\chi(\kappa, \bar{\kappa}) \begin{cases} = 1, & \text{if } \kappa < \bar{\kappa}, \\ \in [0,1], & \text{if } \kappa = \bar{\kappa}, \\ = 0, & \text{if } \kappa > \bar{\kappa}. \end{cases}$$

To make sure that the amount of funding allocated to relationship lending is decreasing in κ, assume that the measure is sensitive to anticorruption campaign so that $\frac{d \log N^G(\kappa)}{d \log \kappa} < -1$.[3]

Remark 1. The particular environment of the Chinese economy is reflected in the model, in that without the involvement of a government official, a credit relationship between the bank and the entrepreneur will last only one period. We could generalize the model to allow credit relationship not involving government officials to last more than one period. The value of such a relationship would act as the outside option of those relationship involving government officials, limiting the rent officials can extract. When the duration of these relationships is longer than those involving

[2] In each period, a fraction κ of relationship loans are disrupted, subjecting banks to soft budget constraint problem, forcing banks to lend one more unit of loan for each of these projects. So the total amount of unsecured loans is $1 - \kappa + 2\kappa = 1 + \kappa$.

[3] The measure of corrupt officials can be determined through a free entry condition. Denote the distribution of fixed entry cost into a corrupt relationship to be $F(\cdot)$. $N^G = F(V)$. Because the value of a corrupt relationship for the official, V, is decreasing in κ, N^G is decreasing in κ.

officials, corruption as a financial nexus would be inessential. We do not introduce this ingredient to the model only to keep it parsimonious.

2.3 Conventional Collateralized Lending

We showed that corrupt officials may be essential to enforce relationship lending in an environment where the duration of a credit relationship is not long lasting otherwise. When anticorruption campaign decreases the supply of funding through relationship lending, collateralized loans to finance their investment may play a more important role.

The substitution between unsecured and secured loans is a crucial part of our empirical strategy. Because the relationship lending enforced by officials are by definition illusive, we look at how anticorruption campaign affects the demand for collateralized lending instead.

We consider first a physical asset as collateral, then entrepreneur's own equity. Own equity as collateral is different from other collateral assets because the equity value depends directly on the entrepreneur's incentive to choose high quality projects.

2.3.1 Asset as Collateral

We show first that collateral gives entrepreneurs incentive to enforce high quality investment, thus makes bank funding available to entrepreneur. The demand for the asset as collateral will affect the asset price. This is in spirit of liquidity-based asset pricing model of Holmstrom and Tirole (2001).

For entrepreneurs with access to the collateral market and thus collateralized lending, they seek to secure financing by purchasing collateral assets. Denote the value of the entrepreneur at the end of a period to be U. Suppose that securing repeated financing from the bank requires a units of the collateral asset. Suppose the entrepreneur pledges enough collateral to enforce ex post high quality investment, the value of the entrepreneur,

$$U = -qa + \frac{\beta\left[a + \pi\left(R_H - r_0\right)\right]}{1-\beta},$$

where $-qa$ is the utility cost of purchasing a units of the collateral asset when an entrepreneur enters the credit market at the end of a period. $\frac{\beta}{1-\beta}a$ is the fundamental value of the asset, or the present value of the dividend from the asset. $\frac{\beta\pi(R_H - r_0)}{1-\beta}$ is the return from borrowing from banks

and investing in high quality projects repeatedly.

Because of the free entry of entrepreneurs, $U = 0$, from which we learn

$$q = \frac{\beta}{1-\beta} + \frac{\pi}{a}\frac{\beta(R_H - r_0)}{1-\beta}, \tag{12}$$

where the second term is the collateral premium in the asset price. $\frac{\beta\pi(R_H - r_0)}{1-\beta}$ is the expected payoff from production for an entrepreneur financing high quality invest repeatedly. Without the collateral asset, the entrepreneur has the incentive to shirk ex post, invest in low quality projects that generate high non-pledgeable private return, and default strategically. The collateral asset increases the pledgeable output ex post, punishes shirking and enforces quality choices that align with the ex ante incentive of the entrepreneur. This value generated by pledging collateral is spread across a units of collateral.

The incentive constraint of the entrepreneur is

$$(R_H - r_0) + a(1+q) \geq (1-\theta)R_L + \beta U = (1-\theta)R_L.$$

The payoff for the entrepreneur to choose high quality projects and repay bank loans is on the left hand side of the incentive constraint. It includes the cum-dividend value of the collateral asset, $a(1+q)$. If the entrepreneur chooses to default, she loses the collateral she pledges. By Assumption 1, soft budget constraint problem arises without pledged collateral. The minimal amount of collateral needed to avoid the problem is

$$a = \frac{(1-\theta)R_L - (R_H - r_0)}{1+q}. \tag{13}$$

The collateral requirement, (13), together with the asset pricing equation (12), implies collateral demand from each entrepreneur with access to the collateral market is

$$a^* = (1-\beta)\left[(1-\theta)R_L - \left(1 + \frac{\pi\beta}{1-\beta}\right)(R_H - r_0)\right]. \tag{14}$$

Because the asset price is increasing in the return from investment in a high quality project, $(R_H - r_0)$. The amount of collateral required to enforce no-shirking is decreasing in $(R_H - r_0)$. The total

measure of projects financed by collateral assets is

$$K^C = A/a^*. \tag{15}$$

(15) and (12) together imply that the equilibrium asset price, given r_0, is

$$q = \frac{\beta}{1-\beta} + \frac{\pi}{a^*}\frac{\beta(R_H - r_0)}{1-\beta}. \tag{16}$$

The liquidity premium in the collateral price is increasing in the entrepreneur's payoff from investing in high quality projects, $(R_H - r_0)$, but decreasing in the private return from shirking.

$$\frac{\partial q}{\partial (R_H - r_0)} > 0 > \frac{\partial q}{\partial \left[(1-\theta)R_L\right]}.$$

2.3.2 Share Pledge Financing

Share pledge finance (SPF) has gained popularity since 2016. Before the introduction of SPF, the main share holders of a company are restricted from selling their shares to the market. This policy is imposed to reduce the agency friction between the main share holder, creditors and smaller share holders. The introduction of SPF relaxes the borrowing constraint of the main share holder. But the agency friction induced by equity dilution is still a major concern.

Share pledge financing by the entrepreneur is different from pledging other collateral assets because the value of the collateral is linked to the incentive of the entrepreneur. Default on the loan reduces the entrepreneur's share of the firm, increasing her incentive to reap the private return from a low quality project. Then, the value of the firm is only positive if the entrepreneur retains high enough share and decides to enforce high quality investment. This means that the punishment from equity collateral is more severe if default leads to a sufficient high share of equity reduction. This imposes a lower bound on the haircut from pledging equity as collateral.

To solve for the bound, we need first consider the value of an entrepreneur who retains s share of future investments. If she still obtains funding and enforces high quality investment, the value of her share of the firm after debt repayment is

$$W^E(s) = s\frac{\beta\pi(R_H - r_0)}{1-\beta}.$$

To achieve this value, the entrepreneur must have the incentive to repay the loan and maintain high quality investment on behalf of the bank and other shareholders. The agency friction imposes a borrowing constraint on her. The payoff from default is $(1-\theta)R_L$, the private gain from a low quality project. This gives the incentive constraint:

$$\begin{aligned} s(R_H - r_0) + W^E(s) \geq (1-\theta)R_L, \text{ or equivalently,} \\ s \geq \underline{s} \equiv \frac{(1-\theta)R_L}{R_H - r_0}\frac{1-\beta}{1-\beta(1-\pi)}. \end{aligned} \tag{17}$$

If the entrepreneur's share of returns from future investments is less than $\underline{s}$, her project won't be funded.

If $r_0 \leq R_H - \frac{1-\beta}{1-\beta(1-\pi)}(1-\theta)R_L$ so that $\underline{s}$ is less than 1. Otherwise, no entrepreneur can borrow through SPF. The lower bound on the share of equity implies that only a subset of entrepreneurs have access to funding by pledging equity as collateral. The measure of projects financed by pledging equity is

$$K^E = N^E(1) - N^E(\underline{s}). \tag{18}$$

2.4 Equilibrium Characterization

Definition 1. Given the anticorruption intensity κ, a stationary equilibrium consists of return of safe loans, r_0, return of risk loans, r, allocation of the intermediate input to safe storage, K^S, to relationship lending enforced by corrupt officials, K^C, loans backed by the collateral assets, K^C, and loans backed by equity, K^E,price of the collateral asset, q, and minimal share requirement on the equity collateral, $\underline{s}$, such that

1. The required return of safe bank loans, r_0, clears the market:

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

   The return of the safe technology is determined by (18), the return of risky loans enforced by corrupted officials by (10);

2. K^G is determined by (11).

3. Given r_0, the price of the collateral asset is determined by (16) and K^C by (15);

4. Given r_0, $\underline{s}$ is determined by (17) and K^E by (18).

Proposition 1. *Under some regularity conditions*[4]*, there exists a unique equilibrium where corruption-backed finance is active when anticorruption intensity κ is small enough.*

Proof. Given r_0, $K^S = G'^{-1}(r_0)$. So, K^S is decreasing in r_0. From (15), K^C is decreasing in r_0. From (17), $\underline{s}$ is increasing in r_0. Since K^E is decreasing in $\underline{s}$ according to (18), K^E is also decreasing in r_0. Therefore given κ, the net demand for the intermediate input is decreasing r_0. Whenever there exists an equilibrium, the equilibrium is unique. There always exists an equilibrium. But depending on the equilibrium value of r_0, some channel of financing may or may not be active. Under the regularity conditions, we can show the corruption-backed finance is active when κ is below $\bar{\kappa}$. □

Proposition 2. *When the intensity of anticorruption campaign increases, r_0 decreases, the amount of non-performing loans increases, the collateral asset price increases, and the amount of equity pledged in SPF increases when SPF is active.*

Claims in Proposition 2 will be tested empirically. The intuition behind the proposition is that as the anticorruption campaign intensifies, the measure of projects funded by relationship lending decreases, while the non-performing rate of existing loans enforced by investigated officials increases. The excess lending capacity drives up the demand for safe projects and lowers its return. This in turn drives banks to search for yield. The search for yield in turn drives up the demand for collateral and lowers the standard for pledging equity collateral. Thus, the model predicts (1) the anti-corruption campaign, in a loose legal environment, may increase non-performing rate of unsecured loans; (2) facing restrictions over corrupt relationships, entrepreneurs rely more collateralized loans.

If the planner cares about output in the current model, she should allocate as much funding to the two collateral channels first, which generates R_H units of output per input, then to corruption-backed channel, which generates $[(1-\kappa)R_H + \kappa R_L]/(1+\kappa)$, per input. The last option is to

[4]These conditions are

$$G'(K) < \max\{\theta R_L/2, R_H - (1-\theta)R_L\},$$
$$G'(0) > \theta R_L.$$
$$R_H < R_L < R_H\left(1 + \frac{(1-\theta)\beta\pi}{1-\beta+\theta\beta\pi}\right)$$

use outside option that generates $G'(K^s)$ per input. The two collateral channels dominate the corruption channel because corruption investigation makes corruption-backed bank loans risky. But entrepreneurs may not be able to choose the other two channel because of limited supply of physical and equity collateral. The limited supply of physical collateral makes it expensive to use. Its limited supply could be due to moral hazard, financial repression, financial underdevelopment, etc. The limited supply of pledgeable share can be due to ownership requirement and under development of the equity market. Only firms listed on the stock exchange can pledge their shares.

3 Empirical Examination

We examine our theory using data at the regional level and the firm level.

3.1 Regional Data

Our regional sample is compiled from China's Statistical Year Book, China's Scientific Statistical Year book, China's Land and Resources Statistical Yearbook, Procuratorial Yearbook of China, and China Banking Regulatory Commission Annual Reports. The sample covers 30 provinces from 2000 to 2015 with Tibet excluded. We examine three regional indicators.

Regional anti-corruption intensity is measured by the number of officials newly put under investigation for corruption by local prosecutors ('Shuang Gui' officials), compiled from 2000-2015 Procuratorial Yearbook of China. We only consider officials with bureaucratic rank at or above the county or division administration level ('Chu Ji'). We believe regional variations in this number reflect changes in local anti-corruption effort rather than the amount of corruption, for the following reasons. Firstly, in China there is usually a long lag between the year when an corrupt official was involved in corrupt activities for the first time and the year when he is formally investigated for corruption. Guo (2008) reports this lag to range between five to eight years on average. Secondly, rarely do local prosecutors put more corrupt officials under investigation because they observe more corrupt activities; instead, it is almost always due to the push by the central government. For example, the number of corrupt officials rose sharply in 2013 after President Xi initiated the national anti-corruption campaign. Party leaders interpret increased enforcement figures as political achievement and stronger commitment to the anti-corruption campaign (Manion, 2004).

Data on regional loans are complied from the 2000-2015 China's Statistical Year Book for Cities, which report the end-of-the-year amount of outstanding loans held by all regional financial institutions. The city-level outstanding loan is aggregated up to the province level. Here loans include regular bank loans of various terms, financial leasing, trusted lending, entrusted lending, bank acceptance, and cash advances.

Data on regional non-performing loans are from the 2006-2015 China Banking Regulatory Commission Annual Reports. Non-performing loans are referred to by Chinese regulations as the sum of overdue loans, idle loans, and bad loans. A loan is considered overdue as soon as its payment passes the due date, considered idle if overdue for more than three years, and considered bad if a debtor or guarantor declares bankruptcy or death, if the lender cannot fully recover the loan principle from the collateral, or if local courts or regulations determine that the loan cannot be repaid.

3.2 Regional Statistics and Average Trends

Table 1 summarizes the regional sample statistcis, together with a few other variables we apply in the regional examination. Data on housing prices are from the National Development and Reform Committee. Data on land are from China's Land and Resources Statistical Yearbook. Land is measured in hectare, as the amount of land approved for construction.

Panel A, Table 1, reports regional sample statistics in levels. From 2000 to 2015, in each province about 95 officials are newly put under formal investigation for corruption every year on average; total amount of outstanding loans averages 1185 billion RMB (about the same magnitudes as of regional nominal GDP); total outstanding non-performing loans averages 23.4 billion RMB, accounting for about 2.3% of the total loans.[5] Panel B reports statistics in growths. From 2000 to 2015, regional outstanding loan grows annually at 18.6% on average; non-performing loan grows annually at 8.7%. The average annual growth rate for real GDP, for residential house price, office house price, and land for construction are 2.9%, 10.3%, 13.5%, and 31.5% correspondingly.

Figure 2 plots the time-series average of the regional non-performing loans, against the average number of newly "Shuang Gui" officials for 30 provinces. The two series both jump sharply starting

[5]China experienced very high non-performing loan ratio due to the lasting influence of the Asia Financial Crisis in 1998. The non-performing rate declined steadily starting from 2000 and declined further more since 2008, partly due to the rollover effect caused by the 2008 Stimulus Package. This ratio stabled around 2010. We apply year dummies to captures aggregate trends in the regional regression.

from the year of 2013 when the national anti-corruption campaign initiated. Before 2013, every year for each province about 89 officials were newly put under corruption investigation. Starting from 2013, the number of "Shang Gui" officials rose from 96 in 2013 to an average of 127 in 2014 (a 32% increase) and to 143 officials in 2015 (a further 12.5% increase). Meanwhile, the 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).

3.3 Regional Evidence

We examine regional data based on the following specification:

$$Y_{it} = \alpha_i + L(\gamma)C_{it} + \beta X_{it} + \epsilon_{it} \tag{19}$$

Y_{it} is the dependent variable 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 a set of controls including year dummies and regional GDP. ϵ_{it} is an error term.

We run the OLS regression of Equation (19), measuring Y_{it} as the amount of active loans or that of the non-performing loans. All variables except the dummies are measured in log first differences (growth rates). Our parameter of interest is γ, reflecting the relationship between loan variables and the anti-corruption indicator. The regional fixed effect 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, when included, are to control for the influences of aggregate economic factors such as national fiscal policy, monetary policy, or the deterioration in aggregate economic environment due to the global financial crises. Regional output are to control for other local economic factors that can impact bank loans. We experiment with various lag lengths as well as with or without controls. The results are reported in Table 1.

3.3.1 Bank Loans

Panel A of Table 2 summarizes regional evidence on the link between bank loans and the anti-corruption intensity. Columns under "Model 1" present the results without controlling for year dummies or regional GDP: a 10% increase in the number of "Shuang Gui" officials is associated with

a contemporaneous *decline* in regional bank loan issuance of around 0.5%; the magnitude of the decline rises cumulatively in one year to around 1.2%, significant at the 5% level, and cumulatively in two years to 1.75%, significant at the 10% level. This suggests a negative relationship between the local anti-corruption intensity and the bank loan issuance: when more officials are put under investigation for corruption, less loans are being approved.

However, columns under "Model 2" shows, once we control for year dummies and the regional GDP, the estimated γ's turn statistically insignificant. The R squares and the F statistics both rise largely, but the estimated coefficients on regional GDP are statistically insignificant. This suggests aggregate factors, captured by the year dummies, are likely key determinants for regional loan issuance. To understand this, it is important to know that the banking system in China is highly centralized. Almost each year, the central government makes a detailed investment plan supplemented by a detailed credit allocation plan to finance certain industries. Commercial banks, although allowed with discretions to choose specific firms that will receive the loan, have to follow these plans to allocate credit to industries specified in the plan. Therefore, the total amount of loans at the regional level is largely determined by details in each year's central planning together with local economic characteristics such as industry mix, captured in our regression by the year dummies and the regional fixed effect.

The significant estimates on γ without controlling for year dummies imply regional anti-corruption intensity reflects some of the aggregate factors that determine central government's credit allocation for the year. Nonetheless, the estimated γ's remain negative, implying the relationship between the anti-corruption intensity and the loan issuance, if any, to be inverse.

3.3.2 Non-performing Loans

Panel B of Table 2 presents regional evidence on the link between non-performing loans and the anti-corruption intensity. Without controlling for the year dummies or regional GDP, a 10% increase in the number of "Shuang Gui" officials is estimated to be associated with an about 4% contemporaneous increase in the amount of non-performing loans, a cumulative increase of about 9% in one year, and a cumulative increase of about 12% in two years; all three estimates are significant at the 1% level. After controlling for the year dummies and regional GDP, the estimated γ's remain negative, but with reduced point estimates. In particular, a 10% increase in the number of "Shuang

Gui" officials is associated with a 1%, 1.9%, and 2.1% increase in regional non-performing loans contemporaneously, cumulatively in one year, and cumulatively in two years. All estimates on γ stay statistically significant.

Results reported in Panel B, Table 2, suggest a positive and statistically significant relationship between the anti-corruption intensity and the amount of non-performing loans: more existing loans turn bad when more local officials are put under investigation for corruption. This supports our theory of corruption as collateral: corrupt officials direct loans and enforce hard budget constraint so that entrepreneurs commit to high-quality projects with pledgable output; when the official is arrested, hard budget constraints turn soft, the entrepreneur deviates to low-quality projects, consequently the loan turns bad.

Several remarks should be made. Firstly, controlling for year dummies and regional GDP does *not* turn the estimates on γ statistically insignificant, but it does reduce γ's point estimates. Moreover, R squares and F statistics both rose largely; estimated coefficients on regional GDP are negative and statistically significant at the 5% level or above. This implies aggregate factors including macroeconomic policies and/or central planning on credit allocation, together with regional economic performance, are still important determinants for the amount of regional non-performing loans, in addition to local anti-corruption intensity.

Secondly, we propose corruption as an important financial nexus for economies like China, and present evidence showing blocking this nexus causes the amount of non-performing loans to rise. However, corruption can distort or facilitate credit allocation in many ways besides financial intermediation. For example, an official in the central government can change the aggregate investment plan so that more credit are allocated to regions where their connected entrepreneurs' businesses locate; we let year dummies to control for this potential channel. Alternatively, a local official can exercise power to allocate resources directly under his control, such as tax credit or business permits, to entrepreneurs in exchange for bribery; when the corrupt official gets arrested, his connected entrepreneur will lose previous advantages in production and, consequently, likely fail to pay off some of his existent loans. In this case, the non-performing loan arises due to *indirect* impact of the arrest of the corrupt official, indirectly through its consequence on firm production. We include regional GDP to control for impact of corruption channels other than the financial nexus.

Thirdly, when corrupt officials are arrested, banks will seek for other channels to issue loans on

the one hand, as the total amount of regional credit has been ordered by the central government, which explains why controlling for year dummies turns all the negative estimates on "Shuang Gui" officials insignificant in the bank-loan regression. On the other hand, the existing loans previously enforced by corrupt officials will turn bad as entrepreneurs will deviate to bad-quality projects, causing rises in the amount of non-performing loans. This explains why the positive estimates on "Shuang Gui" officials remain statistically significant even after controlling for year dummies and regional GDP in the non-performing-loan regression.

3.3.3 Prices of Housing as Physical Collateral: OLS

According to our theory, when the anti-corruption investigation causes collateral damage on corruption-backed finance, banks' search for yields leads to alternative lending, including those based on pledging physical asset; consequently, the price of physical assets rises.

We test this prediction by investigating the relationship between the anti-corruption investigation intensity and housing prices. We focus specifically on houses as a collateral asset because lenders in China consider housing as the most favorable lending collateral, relative to other commodities or assets, because the existence and ownership of a house is easier to validate.[6] First, we examine our regional panel based on the following specification:

$$P_{it} = \alpha_i + L(\gamma)C_{it} + L(\delta)C_{jt} + \beta X_{it} + \epsilon_{it} \tag{20}$$

P_{it} is the prices of housing, either residential or office, for region i in year t. α_i is a regional dummy. $L(\gamma)$ and $L(\delta)$ are lag polynomials, C_{it} is the local number of "Shuang Gui" officials. C_{jt} is the number of "Shuang Gui" officials in the nearest neighborhood region, defined as the neighborhood province whose capital city shares the shortest physical distance from the capital city of province i. X_{it} is a set of controls including year dummies, to capture aggregate conditions, and regional villa housing price, to reflect other local housing-market factors. ϵ_{it} is an error term.

We include neighborhood anti-corruption intensity in (20) for the following reason. In reality, there are three kinds of demand for housing: as production capital, as a consumption good, or as

[6] For example, the macroeconomics research team of PingAn Securities reports in September 2017 that loans backed by various kinds of housing collateral constitutes 37.8% of total outstanding loan by commercial banks by the first half of 2017.

lending collateral. While the anti-corruption investigation may possibly influence all three of them, we are interested in collateral-demand driven housing-price changes only. Nonetheless, houses can be used as production capital or as a consumption good only locally; but those as collateral assets can be utilized both locally as well as in neighborhood regions. Put intuitively, entrepreneurs may buy houses in neighborhood regions, at the purpose of borrowing from neighborhood banks to ease local needs for loans; this can be especially true if their local financial channel becomes blocked by the anti-corruption investigation. In that sense, estimates on $L(\gamma)$ in (20) would capture the impact of local anti-corruption investigation on prices of housing as production capital, as consumption good, and as a collateral asset, while those on $L(\delta)$ presumably reflect that on housing price only as a collateral asset only.

We run the OLS regression of Equation (20) separately for residential housing prices and for office housing prices, with all variables measured in log-first differences except for the dummies. Table 3 reports the results: the estimated coefficients on C_{it} or C_{jt} are mostly positive, but statistically significant only on C_{it} for local residential housing price accumulatively in one year, and on C_{jt} for local office housing price contemporaneously. In particular, a 10% increase in *local* "Shuang Gui" officials is associated with an accumulative 0.5% increase in local residential housing price in one year; and a 10% increase in *neighborhood* "Shuang Gui" officials is associated with an about 1% increase in contemporaneous local office housing price. Both estimates are statistically significant at the 5% level.

Results reported in Table 3 are consistent with our theoretical predictions. We believe the anti-corruption investigation are more likely to depress rather than stimulate short-run demand for housing as production capital or as a consumption good, either by reducing business opportunities or by causing uncertainty about the future, and consequently tends to reduce housing prices. Therefore, the positive and significant estimates of the coefficients on "Shuang Gui" officials should be caused by rising demand for housing as collateral, stimulated by bank's search for yields as the anti-corruption investigation blocks some of the corruption-backed financing channels. We interpret the insignificant estimates on contemporaneous C_{it}, as that the negative influence of C_{it} through the production-capital or consumption-good demand channel competes with its positive influence through the collateral-demand channel, giving rise to insignificant estimates.

3.3.4 Prices of Housing as Physical Collateral: 2SLS

However, it is important to note that the positive and significant estimate on the coefficient of C_{jt} for office housing price may not reflect our theoretical implication. Instead, it is possible that entrepreneurs shift their business to nearby regions as they lose certain corruptive profitabilities due to the investigation of their connected official. Such channels may or may not be related to our propsed corruption-backed finance. For example, the owner of a local restaurant who used to host fancy dinners for corrupt officials may be forced to close his business in province i when the anti-corruption investigation intensifies there, and move to the nearby province j to open a new restaurant. This can drive up office housing prices in province j, but may be unrelated to the financing channel.

To further explore whether the positive and significant estimates on the coefficient of C_{jt} reported in Table 3 are due to the corruption-backed finance blocked by the anti-corruption investigation, we experiment with the OLS and 2SLS regressions based on the following specification:

$$P_{it} = \alpha_i + \gamma N_{jt} + \beta X_{it} + \epsilon_{it} \tag{21}$$

In (21), P_{it} is the office-housing prices for province i, N_{jt} is non-performing loans for neighborhood province j. X_{it} are a set of control variables including year dummies, lagged local office-housing prices, contemporaneous local residential-housing prices, and local non-performing loans. We first run the OLS regression of (21) to examine the correlation between P_{it} and N_{jt}. Then we run the 2SLS regression of (21), instrumenting N_{jt} with the neighborhood "Shuang Gui" officials C_{jt} as well as the neighborhood real GDP, and estimate the response of P_{it} to changes in N_{jt} driven by changes in the two instruments. We apply office-housing price as the dependent variable because Table 3 reports neighborhood anti-corruption investigation raises contemporaneous local office price. We choose non-performing loans as the endogenous variable to satisfy the relevance criteria for an instrument, as Table 2 reports the number of "Shuang Gui" officials is positively and significantly correlated with the non-performing loans *only* once controlling for year dummies. We use neighborhood rather than local "Shuang Gui" officials as instrument at the purpose of trying to meet the exogeneity criteria for an instrument, as neighborhood investigation is relatively more exogenous to local performance. Again, all regressions are conducted in log-first differences except for the dum-

mies. We experiment with and without the controls (except for the dummies), and with various instrument lags or leads to check the robustness of the results.

Table 4 reports our findings. The OLS estimates of the coefficient on N_{jt} are both statistically insignificant with or without additional controls, implying negligible correlation between local office-housing prices and neighborhood non-performing loans. However, the estimated coefficient on N_{jt} turns positive and statistically significant when N_{jt} is instrumented by C_{jt}: in particular, a 10% increase in neighborhood non-performing loans raised by neighborhood anti-corruption investigation causes *local* office-housing price to rise by about 20%, significant at the 10% level or above. Put intuitively, while N_{jt} appears unrelated to P_{it}, the anti-corruption investigation driven increases in N_{jt} do have positive and significant impact on P_{it}. This is consistent with the results reported in Table 3, further suggesting the positive correlation between neighborhood "Shuang Gui" officials and local office-housing prices takes place through the finance channel.

However, C_{jt}, like any instruments, cannot be fully exogenous to other factors influencing P_{it}. As explained earlier, when the anti-corruption investigation intensifies in province j, entrepreneurs may shift businesses from province j to province i, also causing province i's office-housing prices to rise. If this happens extensively in reality, then the 2SLS estimates on the coefficient of N_{jt} would be biased upward, reflecting a direct positive impact of C_{jt} on P_{it} in addition to the one taking place through N_{jt}. We explore this possibility by performing 2SLS regression again, replacing the instrumet C_{jt} by real GDP growth in province j. The idea is that, if the anti-corruption investigation drives entrepreneurs to shift businesses, economic contractions in province j would do the same thing and cause the same impact on P_{it}. Nonetheless, Table 4 reports the estimated coefficient on N_{jt}, when instrumented by province j's real GDP growth, is negative and statistically insignificant. This implies the potential influence of entrepreneurs' moving businesses across provinces on local office-housing prices may not be present or, even if it does, only to a statistically insignificant extent.

We summarize findings reported in Table 4 as the following: while neighborhood non-performing loan appears uncorrelated with local office-housing prices, its increases driven by the anti-corruption investigation *do* raise local office-housing prices; moreover, neighborhood real GDP does not seem to have the same effect on asset prices as the neighborhood anti-corruption investigation does. This supports our theory's prediction that banks start to search for yields when the corruption-backed finance is blocked by the anti-corruption investigation, driving up asset price of physical collateral .

3.4 Firm-level Data

Our firm panel consists of information on 2677 non-financial firms publicly listed in the Shanghai or Shengzhen Stock Exchange from the first quarter of 2007 to the fourth quarter of 2015. The panel is unbalanced, as not all firms are present for the entire sample period. Information on firm characteristics, including age, size, and ownership type, and on firm financial status, such as the asset level, cash holdings, leverage ratio, for the 2677 sample firms are from the China Stock Market and Accounting Research Database (CSMAR).

The full sample size is 70752. We match our firm panel with official records on firms' defaults, announced by the Supreme People's Court of China, and cases of corruption investigations, publicized by China's Central Commission Discipline Inspection.

3.4.1 Firm Defaults

We identify firms with records of defaults together with the specific timing of each default, by compiling a unique data set based on publicized information of the Supreme People's Court of China. To the best of our knowledge, we are the first-time compilers and users of this data set.

The Supreme Court of China continually publicizes a list of firms, together with the specific dates of the court rulings, that have been ruled by local courts as failing to fulfill their debt contracts. We match this list with our panel of public firms based on firm name, location, and ownership information. In particular, we create a dummy variable S_{it} that equals one if firm i is announced by the Supreme court as a defaulting firm in quarter t, and zero otherwise. We identify 154 firms with 232 records of defaults, among which 43 firms default more than once. The timing of identified defaults spans over the entire sample period.

3.4.2 Anti-corruption Implications

Following Li, Wang, and Zhou (2018), we collect a sample of corruption investigation cases initiated and publicized by China's Central Commission of Discipline Inspection. Attention is restricted to only cases involving corrupt officials at or above a certain level, namely, the deputy-minister level at the central government or the deputy-governor level at the provincial government. Then, we utilize Baidu and Google search engines, searching for news involving the investigated corrupt officials to identify public firms that have been reported as having corruptive transactions with the investigated

officials. Our search yields 88 public firms implicated by corruption investigations. Corrupt officials linked with these firms had their investigation cases established at various time points, ranging from the fourth quarter of 2009 to the fourth quarter of 2015.[7]

3.5 Measurements, Summary Statistics, and Aggregated Trends

Table 5 summarizes our firm-level panel data statistics. Age is defined as the number of years a firm remains present in the CSMAR database. The leverage ratio is that of total debt over total assets. Real assets and real tangible assets are calculated by deflating the total asset and tangible asset levels with the provincial fixed-investment price index published by China's Statistical Year books. Cash is the end-of-the-quarter cash-holding level. Pledged Stock is a quantitity measure, as the number of stock shares pledged for borrowing. All variables are winsorized between 1% and 99%.

In most of our firm-level investigations, we examine growth measures to incorporate the possibility that, in China with extensive institutional reforms and frequent policy changes, many firm-level outcome variables measured in levels or log levels may not be stationary. Moreover, some firm-level variables contain a significant number of zero values. For example, the variable "pledged stock" often equals zero, as many firms pledged some stocks at some point, stopped pledging stocks for many quarters, and started to pledge stocks again. In this case, the conventional growth measures or log-first-difference measures can generate values of infinities, and consequently bias the regression results. Following Davis and Haltiwanger (1992), we measure growth in firm-level outcome variables as (22), so that their values stay strictly within $[-2, 2]$ unless the outcome variable contains negative values. Moreover, we employ annual-growth measures to remove possible seasonality.

$$2\left(\frac{Y_{it} - Y_{i(t-4)}}{Y_{it} + Y_{i(t-4)}}\right) \tag{22}$$

Table 5 reports the following summary statistics. An average firm in our sample employs 4612 workers, aged 8.6 years, and displays a leverage ratio of 0.45. The oldest firm age is 25 years. Firm size measured as the number of employees ranges from 38 to 61231. An average firm displays

[7] Li, Wang, and Zhou (2018) examine corruption cases established since 2012 and were able to identify 61 implicated firms. Our search restricted to cases after 2012 yielded 69 implicated firms. The difference in the sample size may arise from permanent deletion of some old news or more recent news disclosure of certain corrupt transactions.

mean levels of quarterly sales, profit, and cash holdings of 1.4, 0.1, and 1.1 billion RMB; it holds 6 billion and 5.6 billion real assets and real tangible assets. From the first quarter of 2007 to the last quarter of 2015, an average firm experienced annual profit growth of 7%, sales growth of 10%, cashing holdings growth of 6%, real asset growth of 12% and real tangible asset growth of 11%.

Figure 3 presents the time-series plots of the numbers of implicated firms and firm defaults aggregated from the firm panel. The numbers of new implications and new defaults are plotted at the top, and the total accumulated numbers at the bottom. Both panels show that anti-corruption implications and defaults are highly correlated: the correlation coefficients of the two series for the top and the bottom panels are 0.84 and 0.99. They are also highly synchronized: before the initiation of the national anti-corruption campaign in 2013, every quarter only one firm was implicated by the anti-corruption investigation; starting from 2013, this number jumps up to 6; before 2013, every quarter about two firms were recorded with defaults; after 2013 this number rises to 15. Accordingly, the total number of firms implicated by the anti-corruption investigation jumps from 12 at the end of 2012, to 26 at the beginning of 2014, and reaches 88 by the end of 2015. The corresponding statistics for the accumulated number of defaults are 44, 92, and 213.

Our theory predicts the anti-corruption investigation blocks the corruption-based financial nexus, causing firms to deviate to low-technology projects, default, and extract private rents. This prediction is supported by Figure 3, which shows the anti-corruption investigation implications and firm defaults are strongly correlated. However, one can argue that such pattern is driven by other policy changes and institutional reforms during the sample period. For example, in recent years Chinese government exercised a policy reinforcements of "excessive capacity reduction" by forbidding banks to issue loans to certain industries, which caused great financial difficulties in related industries.

Therefore, we exercise a detailed firm-level regression, attempting to account for latent aggregate factors, industry factors, and regional factors, at the purpose of providing a more accurate estimate of the relationship between firm defaults and the anti-corruption investigations. We do this by performing a difference-in-difference estimation.

3.6 Firm-level Evidence

We apply a difference-in-difference (DID) approach to our panel of public firms:

$$Y_{it} = \alpha_i + \alpha_t + \gamma D_{it} + \beta X_{it} + \epsilon_{it} \tag{23}$$

Y_{it} is an outcome variable for firm i in quarter t. α_i and α_t are firm and quarter-year fixed effects. ϵ_{it} is an error term. D_{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. γ is the parameter of interest, capturing the impact of the anti-corruption investigation implication. This is a DID estimation with variations in treatment timing (Bertrand and Mullainathan, 2003). The treated firms are the 88 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 (23) takes as a control group all firms that have not *yet* been implicated by quarter t even if some will be later on.

In (23), X_{it} are a set of controls such as the firm age, firm size, the leverage ratio, cash holdings, real asset holdings, real tangible asset holdings, profit, sales, ownership, and etc. Most importantly, we include additional province-by-year fixed effects and industry-by-year fixed effects to control for the potential impact of any other policy reforms over the sample period. The firm age and size are in log levels. All other variables except for the leverage ratio and the dummies are measured in annual growth based on (22).

3.6.1 Defaults and the Anti-corruption Implications

We first run a DID estimation of (23) to examine how the anti-corruption investigation implication influences firms' defaulting probabilities, letting Y_{it} in (23) to be S_{it}. S_{it} equals one if firm i is recorded by the Supreme Court of China as with a new defaulting record in quarter t, and equals zero otherwise. We experiment with and without controlling for firm size, the real asset growth, and the leverage ratio. All specifications include the standard quarter-by-year and firm fixed effects for the DID estimation, as well as additional region-by-year and industry-by-year fixed effects.

Our findings are summarized in Table 6. Column (1) displays the result of a basic linear

probability specification. We find that the defaulting probability is about 1.5% higher among the implicated firms. Since the average defaulting rate is 0.3% per quarter in our sample, this is an astonishingly large effect. In Column (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 higher-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 the defaulting probability by at least 1.5%. All estimates are significant at the 5% level.

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 may experience great difficulty in obtaining new loans, and thus more vulnerable to the defaulting probability; meanwhile, government officials taking charge of this industry can be more likely to be investigated. Likewise, firms located in a province experiencing an economic contraction will default more, which can attract the attention of the investigation agency and cause 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} is a dummy variable that equals one for a firm implicated by the anti-corruption investigation two quarters prior to the implication, before^{-1} equals one for an implicated firm one quarter prior to the implication, before^{0} equals one for an implicated firm in that quarter, 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.

Interestingly, we find the estimated coefficient on the before^{-2} and before^{-1} dummies both to be negative and significant, suggesting the implicated firms were actually *less* likely to default prior to the implication. This is consistent with our theory: firms actively utilizing the corruption-based finance obtain loans more easily with the help of the corrupt official; they would experience a

stable flow of financial resources, and thus be subject to smaller defaulting probabilities. Also, the estimated effect of the anti-corruption investigation in the quarter of the implication, before^0, is still negative and significant, likely due to the fact that it takes several months for the court to reach a ruling on a default. The estimated effect rises to 4.4% one quarter after the implication, and remains positive afterward. This is consistent with a causal interpretation of our basic result that the anti-corruption investigation implication causes a firm more likely to default.

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 defaulting probability following the implication of the anti-corruption investigation. A logit model delivers similar result that are not reported here.

3.6.2 Strategic Defaults

By its very nature, the anti-corruption investigation can kill an implicated firm's business opportunities in many ways. Once an official gets arrested, a firm that used to obtain substantial subsidies from this corrupt official will experience declines in cash flows; and a firm that used to get exclusive infrastructure contracts with favorable pricing from this corrupt official will face a drop in profit. In both scenarios, the implicated firm will default more likely and more often. However, this is not due to the blocked corruption-finance nexus proposed by our theory.

To address the issue that the positive impact of the anti-corruption implications on defaults may be caused by channels unrelated to the corruption-based finance, we exercise the DID estimation on firm performance by letting Y_{it} in (23) to be profit, sales, and cash holdings. Table 7 reports the results. All specifications include additional province-by-year and industry-by-year fixed effects. Columns (2), (4), and (6) also control for asset holdings and the leverage ratio. We find larger asset-growth and higher-leverage firms display larger profit, sales, and cashing-holding growths. However, maybe surprisingly, the estimated coefficients on the implication dummy are all statistically insignificant, negative for some and positive for some other specifications. This suggests the anti-corruption implication imposes negligible impact on firm profit, sales, and cash holdings.

We interpret the above results as that, once implicated by the anti-corruption investigation, firms default strategically. That is to say, even if their profit, sales, or cashing holdings do not decline, they choose to default nonetheless. The evidence on strategic defaults supports our theory:

the investigation of the corrupt official destroys a firm's incentive to fulfill loan agreement, due to the collateral damage on the corruptive relationship; accordingly, the firm deviates to low-technology projects, defaults, and extracts private rents.

In addition to the statistical results reported in Table 7, we present here a specific case of strategic default. Figure 4 displays the time series of cash holdings for one of our sample firms, Wuhan Steel (Shanghai Stock Exchange identity 600005). Wuhan Steel became implicated by the anti-corruption investigation in the third quarter of 2015, and defaulted immediately in the following quarter. Meanwhile, Wuhan Steel did not experience declines in cash holdings. In fact, Figure 4 shows its cash holdings rose considerably around the quarter of implication.

3.6.3 Pledging Equity Collateral

According to our theory, the anti-corruption investigation blocks the corruption-based financial nexus, drives banks to search for yields, causes firms to utilize alternative collaterals. This subsection investigates how firms' option of pledging equity collateral is affected.

Accordingly, we run the DID estimation, letting Y_{it} in (23) to be the number of stock shares pledged for borrowing measured as annual growth based on (22). The results are reported in Table 8.

3.6.4 Equity Collateral and Firm Characteristics

The results are reported in Table 9.

3.6.5 PSM based DID

To be written

4 Conclusion

To explore the role of corruption in assisting finance, we build a theory that shows corrupt relations with the government official could help sustain relationship lending. In the theory, officials have the power to allocate bank loans and exercise the power depending on the credit history of entrepreneurs.

Bribe rewards the official to enforce high quality investment and loan repayment. Repeated credit allocation gives entrepreneurs the incentive to repaying bank loans.

To confirm the efficiency-improving role of corruption in assisting finance in an environment with lax legal enforcement, we empirically identify the substitution effects between corruption-backed finance and conventional collateral-backed finance. We found that, consistent with the theoretical prediction, when the anti-corruption campaign intensifies, non-performing loans increase, more firms default strategically, and demand for such collaterals as housing and entrepreneurs' own shares increase.

We argue that while anti-corruption campaign is intended to improve the efficiency of the economy, it may have the unintended consequence of thwarting relationship lending, if it is not accompanied by reforms on law enforcement. China has not established the bankruptcy procedure for individual citizens yet. The recent effort by the supreme court to establish such a procedure could complement the government's effort to reduce corruption.

References

Allen, Franklin, Jun Qian, and Meijun Qian (2005). "Law, finance, and economic growth in China". In: *Journal of Financial Economics* 77.1, pp. 57–116.

Boot, Arnoud WA (2000). "Relationship Banking: What do We Know?" In: *Journal of Financial Intermediation* 9.1, pp. 7–25.

Dewatripont, Mathias and Eric Maskin (1995). "Credit and efficiency in centralized and decentralized economies". In: *The Review of Economic Studies* 62.4, pp. 541–555.

Greif, Avner (1993). "Contract enforceability and economic institutions in early trade: The Maghribi traders' coalition". In: *The American Economic Review*, pp. 525–548.

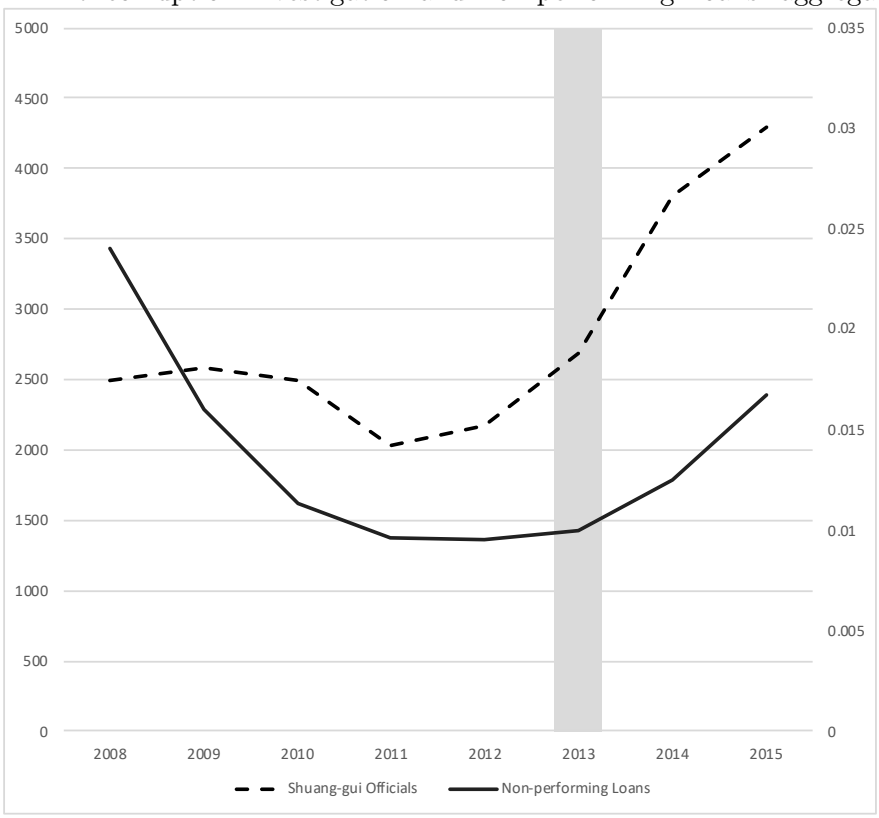
Maskin, Eric and Chenggang Xu (2001). "Soft budget constraint theories: From centralization to the market". In: *Economics of Transition* 9.1, pp. 1–27.

Mauro, Paolo (1995). "Corruption and growth". In: *The Quarterly Journal of Economics* 110.3, pp. 681–712.

Olken, Benjamin A and Rohini Pande (2012). "Corruption in Developing Countries". In: *Annual Review of Economics* 4.1, pp. 479–509.

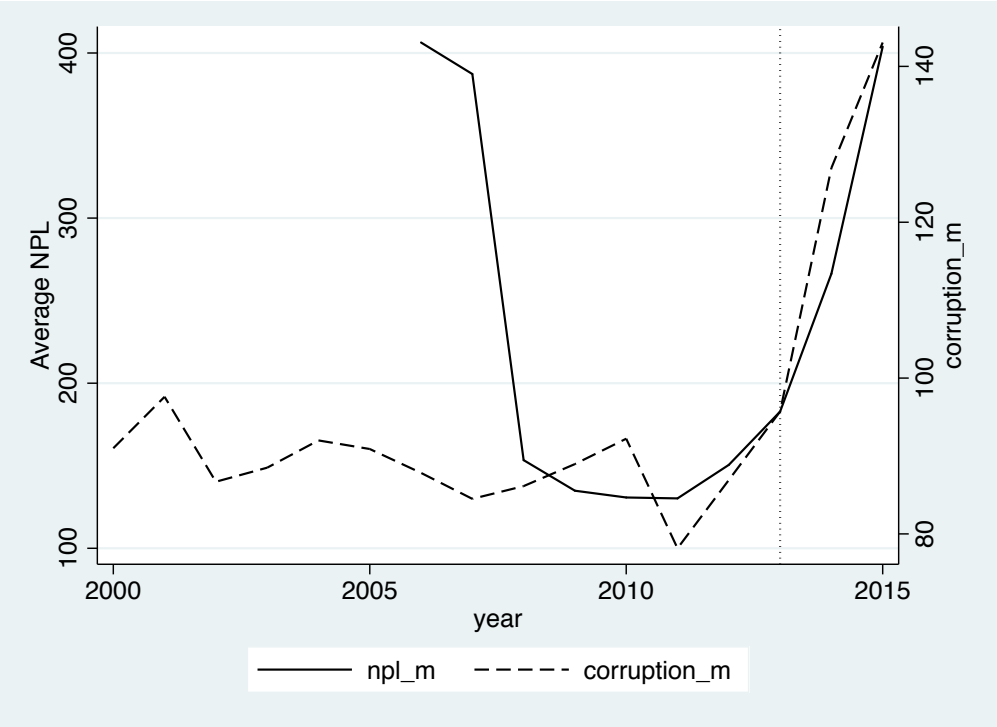
Shleifer, Andrei and Robert W Vishny (1993). "Corruption". In: *The Quarterly Journal of Economics* 108.3, pp. 599–617.

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



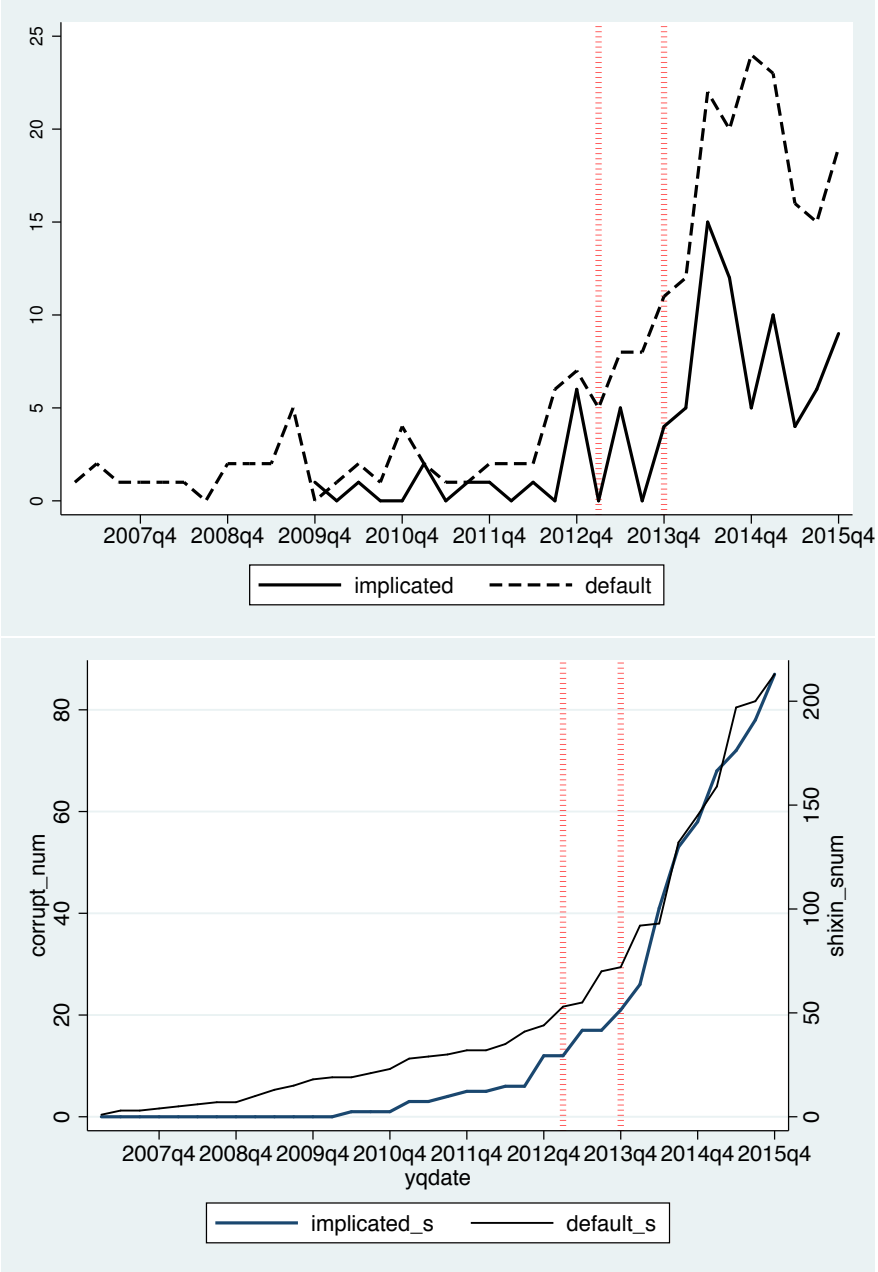
Note: Aggregate time-series plots of annual data from 2008 to 2015. "Shuang Gui" officials, plotted against the left axis, is measured as the number of officials newly put under investigation for corruption. Non-performing loans, plotted against the right axis, is measured as the ratio of defaulting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

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



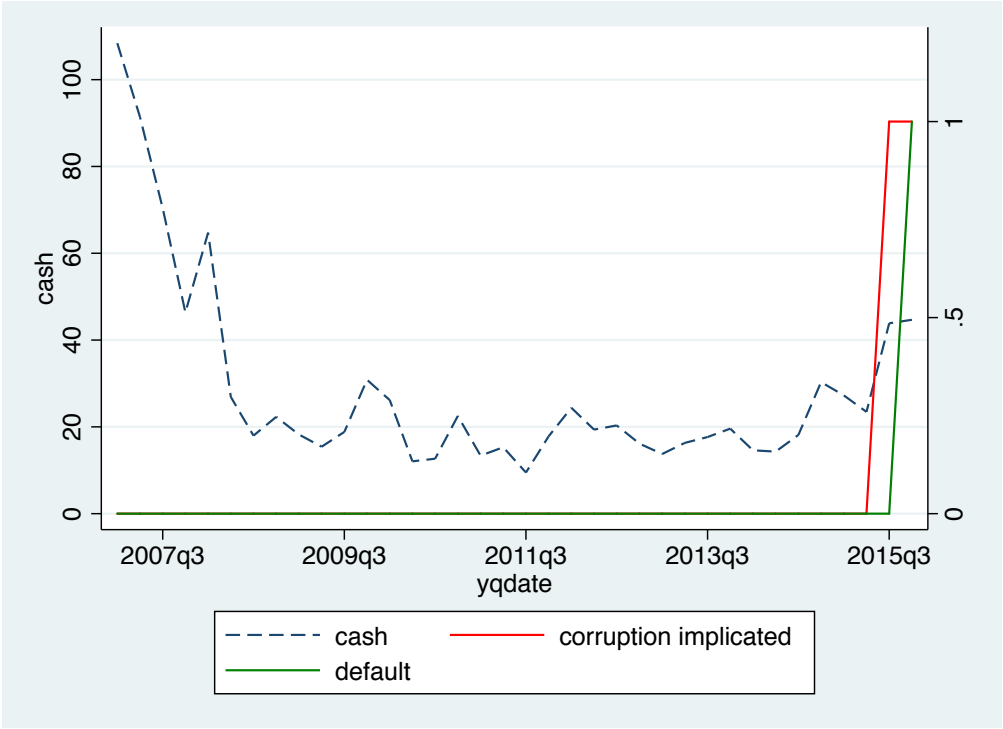
Note: time-series plots of the 2000-2015 regional average amount of non-performing loans (left axis) and the average number of "Shuang Gui" officials newly put under corruption investigation (right axis) for 30 provinces. Non-performing loans are in 100 millions RMB. "Shuang Gui" officials are in number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

Figure 3: Corruption Implications and Defaults: firm-level aggregates



Note: The top panel presents the time-series plots of the total numbers of newly implicated firms (implicated) and of those newly recorded with defaults (default). The bottom panel presents the plots of the corresponding accumulated total numbers of implications ($implicated_s$) and of defaults ($default_s$). The red vertical lines indicate the national anti-corruption campaign initiated in 2013. Data on anti-corruption investigation is 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.

Figure 4: Strategic Default: Wuhan Steel (600005 SH)



Note: Time series plots of the cash-holding level of Wuhan Steel (600005 SH), which turns corruption-implicated in Quarter 3 of 2015 and was recorded with loan default in Quarter 4 of 2015. The red line indicates the corruption implication dummy; the green line indicates the default dummy. See text for more details.

Table 1: Summary Statistics of an Annual Panel of 30 Regions

	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
Loan (100 mill RMB)	480	2000-2015	11852	14046	349	95178
Non-performing Loan (100 mill RMB)	300	2006-2015	235	258	6	1773
Real GDP (100 mill RMB)	480	2000-2015	4090	3125	264	14531
Residential Housing Price (RMB/square meter)	480	2000-2015	3762	3068	854	22300
Office Housing Price (RMB/square meter)	480	2000-2015	6487	4771	850	28917
Land (hectare)	479	2000-2015	13357	10844	142	97936
Panel B: In Annual Growth						
Corrupt Official	425	2001-2015	0.097	0.409	-0.870	3.652
Loan growth	450	2001-2015	0.186	0.275	-0.523	2.217
Non-performing loans	270	2007-2015	0.087	0.454	-0.861	2.391
Real GDP	450	2001-2015	0.029	0.041	-0.068	0.149
Residential house prices	450	2001-2015	0.103	0.093	-0.140	0.524
Office house price	450	2001-2015	0.135	0.370	-0.658	3.726
Land	448	2001-2015	0.315	0.903	-0.839	4.665

Note: Data on corrupt officials is from the Procuratorial Yearbook of China, measured as the number of officials newly put under investigation for corruption. Data on outstanding loans, GDP, and GDP price defaltors are from the China's Statistical Year Book; data on outstanding non-performing loans is from the China Banking Regulatory Commission Annual Reports; data on land is from the China's Land and Resources Statistical Yearbook. Data on housing prices are from the National Development and Reform Committee. Growth in real GDP and in land are winsorized between 1% and 99%. See text for details.

Table 2: Regional Evidence: Loan and Corruption

Panel A: Bank Loan						
Corruption		(1)			(2)	
Contemporaneous	-0.039	-0.048	-0.063	-0.002	-0.002	-0.003
	(0.041)	(0.041)	(0.051)	(0.022)	(0.025)	(0.033)
Cumulatively		-0.094***	-0.127***		-0.009	-0.011
in one year		(0.034)	(0.045)		(0.038)	(0.049)
Cumulatively			-0.175**			-0.027
in two years			(0.081)			(0.072)
cumulative coeff.				0.232	0.496	0.577
on regional output				(0.151)	(0.355)	(0.433)
Region fixed effects	yes	yes	yes	yes	yes	yes
Year fixed effects	no	no	no	yes	yes	yes
R square	0.003	0.006	0.010	0.633	0.635	0.639
F statistics	0.89	4.28	4.36	45.11	38.87	43.25
sampel size	425	387	351	425	387	351

Panel B: Non-performing Loan						
Corruption		(1)			(2)	
Contemporaneous	0.382***	0.401***	0.396***	0.097*	0.116*	0.106**
	(0.104)	(0.087)	(0.075)	(0.047)	(0.050)	(0.044)
Cumulatively		0.888***	0.914***		0.192**	0.189**
in one year		(0.115)	(0.110)		(0.078)	(0.077)
Cumulatively			1.213***			0 .215**
in two years			(0.181)			(0.100)
Cumulative coefficients				-2.775**	-3.532**	-3.577**
on regional output				(1.048)	(1.617)	(1.652)
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	0.738	0.740	0.737
F statistics	13.60	42.33	28.79	58.94	49.99	59.15
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"), using data on 30 provinces from 2000 to 2015. Data on non-performing loans starts from 2006. Robust standard errors clustered by regions are in parentheses.The regression is based on a panel of All estimations are conducted in growth rates and include regional fixed effects. ***1%-level significance; ** 5%-level significance; * 10%-level significance. See text for more details.

Table 3: Regional Evidence: Corruption and Housing Prices

Dependent Variable: Regional Housing Price				
Local Corruption	Residence House		Office House	
Contemporaneous	0.013	0.021	0.028	0.034
	(0.015)	(0.015)	(0.066)	(0.056)
Cumulatively		0.051**		0.055
in one year		(0.023)		(0.046)
Neighborhood Corruption				
Contemporaneous	0.005	0.001	0.105**	0.107**
	(0.008)	(0.009)	(0.045)	(0.051)
Cumulatively		-0.006		0.052
in one year		(0.016)		(0.053)
Control				
Villa housing price	0.105***	0.109***	0.171**	0.140*
	(0.021)	(0.020)	(0.078)	(0.078)
Region fixed effects	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes
R square	0.454	0.491	0.089	0.093
F statistics	25.36	36.95	9.84	8.27
Sample size	406	368	406	368

Note: OLS estimates on local corruption and neighborhood corruption, using data on 30 provinces from 2000 to 2015. Corruption is the number of "Shuang-gui" officials. Neighborhood region refers to the province whose capital city is the nearest. Robust standard errors 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: Regional Evidence: Corruption, Housing Price, and Non-performing Loans

Panel A: OLS and 2SLS Estimates Dependent Variable: Regional Office-housing Price						
	OLS		2SLS			
			IV: Neighborhood		IV: Neighborhood	
Endogeneous Variable			Output		Corruption	
Neighborhood	0.019	0.023	-0.435	-0.612	2.08*	1.829**
Non-performing Loan	(0.036)	(0.052)	(0.280)	(0.385)	(1.096)	(0.943)
Controls						
Local	-0.041	-0.023	0.254	0.393	-0.799*	-0.682*
Non-performing Loan	(0.081)	(0.065)	(0.228)	(0.288)	(0.488)	(0.415)
Lagged Local		-0.348***		-0.310***		-0.399***
Office-housing Price		(0.079)		(0.076)		(0.128)
Local		0.841***		0.717***		0.921*
Residence-housing Price		(0.287)		(0.215)		(0.525)
Region fixed effects	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes
R square	0.095	0.239				
Sample size	270	270	270	270	254	254
Panel B: 2SLS First-stage Statistics Dependent Variable: Neighborhood Non-performing Loans						
Coef. on Instrument			-2.043***	-2.200***	0.084**	0.085**
			(0.571)	(0.660)	(0.041)	(0.040)
Sanderson-Windmeijer Test for Excluded Instrument						
F-statistics			12.79	11.12	4.48	4.56
F-test P-value			0.0004	0.0010	0.0354	0.0339
Kleibergen-Paap rk LM Test for Under Identification						
Chi-sq(1) Statistics			12.61	11.08	6.04	6.218
Chi-sq(1) P-value			0.0004	0.0009	0.0140	0.0126
Anderson-Rubin Wald Test for Weak Instrument						
Chi-sq(1) Statistics			2.98	3.38	13.25	12.46
Chi-sq(1) P-value			0.0844	0.0659	0.0003	0.0004

Note: OLS and 2SLS estimates of the relationship between regional office-housing price and neighborhood non-performing loans, using data on 30 provinces from 2006 to 2015. Corruption is the number of "Shuang-gui" officials. Output is regional real GDP. Robust standard errors 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 5: Summary Statistics of a Quarterly Firm Panel (1q2007-4q2015)

	No. of obs.	Mean	S.D.	Minimum	Maximum
Age	70,721	8.6	6.1	0	25
No. of employee	70,547	4611.5	8881.8	38	61231
Leverage ratio	70,709	0.45	0.23	0.04	1.20
Default	70,752	0.003	0.06	0	1
(The number of firms with Default ever equaling one=154.)					
(The first quarter of 2007 is the earliest quarter for default=1)					
Anti Corruption	70,752	0.009	0.093	0	1
(The number of firms with Anti corruption ever equaling one=88.)					
(The fourth quarter of 2009 is the earliest quarter for anti-corruption dummy=1)					
In Levels, winsorized between 1% and 99%					
Profit (100 mill RMB)	69,450	0.99	2.83	-2.63	20.38
Sale (100 mill RMB)	69,450	13.84	34.35	0.03	236.11
Cash (100 mill RMB)	70,709	11.34	25.17	0.04	183.65
Real Asset (100 mill RMB)	70,709	60.00	147.86	1.48	1123.78
Real tangible (100 mill RMB)	70,709	56.87	141.43	1.34	1076.62
Pledged Stock (100 mill shares)	70,752	0.08	0.29	0	1.94
In Annual Growth, winsorized between 1% and 99%					
Profit Growth	59,032	0.07	1.85	-5.49	5.48
Sale Growth	59,028	0.10	0.42	-1.31	1.61
Cash Growth	60,162	0.06	0.56	-1.34	1.70
Real Asset Growth	60,162	0.12	0.23	-0.41	1.19
Real Tangible Growth	60,162	0.11	0.22	-0.44	1.15
Pledged Stock Growth	13,349	0.33	1.71	-2	2

Note: Summary statistics of the dependent and control variables for 2677 firms listed in Shanghai or Shenzhen Stock Exchange from 2007 to 2015. *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. Leverage is debt divided by total assets. *Age* is the number of years ever appear in CSMAR database. Growth refers to the annual growth in the value of the corresponding variable, measured as the change the value from the same quarter of last year to current quarter divided the average value of these two quarters. Data on anti-corruption investigation is 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 6: Default and Anti-Corruption: Difference in Difference

	Dependent Variable: Default Dummy					
	Linear Probability Model					Probit Model
	(1)	(2)	(3)	(4)	(5)	(6)
Anti-Corruption	0.016**	0.016**	0.015**	0.015**		0.686*
	(0.008)	(0.007)	(0.007)	(0.007)		(0.4127)
ln(employee)		-0.001**	-0.001**	-0.002*		
		(0.000)	(0.000)	(0.002)		
Real Asset growth			-0.003**	-0.003**		
			(0.001)	(0.001)		
Leverage				0.004*		
				(0.002)		
Before^{-2}					-0.008***	
					(0.002)	
Before^{-1}					-0.009***	
					(0.001)	
Before^{0}					-0.008***	
					(0.002)	
After^{1}					0.044*	
					(0.025)	
After^{2+}					0.015	
					(0.010)	
Region×year fixed effects	yes	yes	yes	yes	yes	yes
Industry×year fixed effects	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	0.010	0.011	0.011	0.011	0.011	0.152
Sample Size	70721	70537	60057	60057	70721	2648

Note: Default dummy 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. The regression is based on a panel of 2677 public firms from 2007 to 2015. Data on anti-corruption investigation is from the China's Central Commission of Discipline Inspection; data on defaults are from the the Supreme People's Court of China. Standard errors clustered by regions are reported in parenthesis. ***1%-level significance; **5%-level significance; *10%-level significance. See text for more details.

Table 7: Firm Performance and Anti-Corruption: Difference in Difference

	Dependent Variable					
	Profit Growth		Sales Growth		Cash Growth	
	(1)	(2)	(3)	(4)	(5)	(6)
Anti-Corruption	-0.091	-0.036	-0.033	0.015	-0.073	0.006
	(0.101)	(0.101)	(0.036)	(0.023)	(0.050)	(0.044)
Asset Growth		0.881***		0.785***		1.306***
		(0.037)		(0.017)		(0.035)
Leverage		0.406***		0.157***		-0.053
		(0.089)		(0.024)		(0.035)
Region×year fixed effects	yes	yes	yes	yes	yes	yes
Industry×year fixed effects	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	0.0068	0.0163	0.0556	0.2026	0.0222	0.2588
Sample Size	59032	59032	59028	59028	60162	60162

Note: Growth is the annual growth in the value of the corresponding variable, measured as the change the value from the same quarter of last year to current quarter divided the average value of these two quarters. See notes to Table 6 for variable definitions and data sources. Standard errors clustered by regions are reported in parentheses. ***1%-level significance; **5%-level significance; *10%-level significance. See text for more details.

Table 8: Equity Collateral and Anti-Corruption: Difference in Difference

	Dependent: Equity Collateral Growth				
	(1)	(2)	(3)	(4)	(5)
Anti-Corruption	0.513***	0.575***	0.606***	0.606***	
	(0.171)	(0.167)	(0.167)	(0.163)	
Real Asset growth		0.613***	0.607***	0.608***	
		(0.084)	(0.089)	(0.086)	
Profit growth			0.010**	0.010**	
			(0.004)	(0.004)	
Leverage				-0.600***	
				(0.155)	
Before^{-2}					-1.338***
					(0.429)
Before^{-1}					-0.777
					(0.511)
Before^{0}					0.437
					(0.476)
After^{1}					0.142
					(0.556)
After^{2+}					0.314
					(0.214)
Region×year fixed effects	yes	yes	yes	yes	yes
Industry×year fixed effects	yes	yes	yes	yes	yes
Quarter×year fixed effects	yes	yes	yes	yes	yes
Firm fixed effects	yes	yes	yes	yes	yes
R square	0.035	0.041	0.040	0.041	0.035
Sample Size	13349	13349	13168	13168	13349

Note: Equity Collateral Growth is the annual growth in the amount of equity used as a collateral for loans, measured as the change in equity collateral from the same quarter of last year to current quarter divided the average amount of these two quarters. See notes to Table 6 for variable definitions and data sources. Standard errors clustered by regions are reported in parenthesis. ***1%-level significance; **5%-level significance; *10%-level significance. See text for more details.

Table 9: Anti-corruption Effect and Firm Characteristics: DID

	Dependent Variable: Equity Collateral Growth					
	(1)	(2)	(3)	(4)	(5)	(6)
Anti-Corruption	2.888**	3.654***	1.701***	1.995***	1.707***	1.984***
	(1.400)	(1.202)	(0.461)	(0.479)	(0.439)	(0.482)
Interaction with firm characteristics						
Anti-Corruption×Size	-0.317*	-0.400**				
	(0.180)	(0.155)				
Anti-Corruption×Asset			-0.385**	-0.437**		
			(0.165)	(0.172)		
Anti-Corruption×Tangible					-0.396**	-0.444**
					(0.165)	(0.178)
Controls						
Profit Growth		0.015*		0.015*		0.015*
		(0.009)		(0.009)		(0.009)
Asset Growth		0.611***		0.613***		0.613***
		(0.084)		(0.084)		(0.084)
Leverage		-0.604***		-0.592***		-0.592***
		(0.144)		(0.145)		(0.145)
Region×time trends	yes	yes	yes	yes	yes	yes
Industry×year fixed effects	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	0.0270	0.0329	0.0270	0.0328	0.0270	0.0328
Sample Size	13349	13168	13349	13168	13349	13168

Note: Size, Asset, and Tangible are measured, correspondingly, as the time-series average of the log-level of the number of employees, the deflated value of asset holdings, and the deflated value of tangible holdings for each firm. See notes to Table 6 for variable definitions and data sources. Standard errors clustered by regions are reported in parentheses. ***1%-level significance; **5%-level significance; *10%-level significance. See text for more details.

Table 10: Anti-corruption Effect and Ownership Type: DID

	Dependent Variable: Equity Collateral Growth				
	(1)	(2)	(3)	(4)	(5)
Anti-Corruption	0.560***	0.690***	3.894***	2.100***	2.079***
	(0.168)	(0.243)	(1.443)	(0.665)	0.650)
Anti-Corruption× SOE dummy	-1.035	-1.133*	-1.123**	-1.082)**	-1.076**
	(0.732)	(0.663)	(0.506)	(0.512)	(0.510)
SOE dummy	-0.335*	-0.295**	-0.303**	-0.297**	-0.296**
	(0.189)	(0.149)	(0.149)	(0.149)	(0.149)
Anti-Corruption×Size			-0.411**		
			(0.180)		
Anti-Corruption×Asset				-0.424**	
				(0.191)	
Anti-Corruption×Tangible					-0.428**
					(0.191)
Controls					
Profit Growth		0.015*	0.015	0.015	0.015
		(0.009)	(0.009)	(0.009)	(0.209)
Asset Growth		0.609***	0.608***	0.610***	0.610***
		(0.076)	(0.076)	(0.076)	(0.076)
Leverage		-0.578***	-0.579)***	-0.568***	-0.568***
		(0.155)	(0.154)	(0.155)	(0.155)
Region×time trends	yes	yes	yes	yes	yes
Industry×year fixed effects	yes	yes	yes	yes	yes
Quarter×year fixed effects	yes	yes	yes	yes	yes
Firm fixed effects	yes	yes	yes	yes	yes
R square	0.0274	0.0332	0.034	0.033	0.033
Sample Size	13349	13168	13168	13168	

Note: See notes to Table 6 for variable definitions and data sources. Standard errors clustered by regions are reported in parentheses. ***1%-level significance; **5%-level significance; *10%-level significance. See text for more details.