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Bribe payments under regulatory decentralization: Evidence from rights offering regulations in China

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ABSTRACT

This paper investigates why and how firms' bribe payments vary as a result of the interaction between firms and local public officials under the decentralized regulatory system for rights offerings implemented prior to 2001 in China. Using the gap between the estimated and reported total direct costs of rights offerings as a measure of firms' bribes payments in the process of rights offering applications under this system, we find that bribe payments are positively related to local governments' control rights, firms' opportunity costs of refusing to pay bribes, and the severity of firms' Jensen agency problems. We further show that after termination of the regulatory system, firms' bribe payments are substantially reduced, and local governments' control rights as well as the severity of firms' Jensen agency problems can no longer explain the variation in bribe payments.

1. Introduction

Decentralized regulation is widely implemented nowadays especially in developing countries (Bardhan and Mookherjee, 2006). By shifting regulatory power from the central government to local governments that have more local information, regulatory decentralization brings government "closer to people" (Fan et al., 2009), and may help improve efficiency in resource allocation. However, the delegation of authority under decentralization introduces a principal-agent relation, in which local officials are employed to make decisions based on the information that they have and the central government does not (Acemoglu and Verdier, 2000). As a result, there might be more room for local officials to be corrupt under decentralized regulation than under centralized regulation. Research on corruption under regulatory decentralization is of particular importance, as it can help us better understand the delegation problem within governments in a country/region and its impact on economic growth and government quality.

Previous studies on corruption under regulatory decentralization focus primarily on interactions between the central government and local governments. For instance, the hotly contested issues in the literature include whether the frequency and costliness of bribe extraction by corrupt officials are positively related to the number of government or administrative tiers and the number of local public officials in the country (Fan et al., 2009), and how local officials' corrupt behavior can be better monitored. To date, there has been little research on corruption as a result of the interactions between firms and local officials under regulatory decentralization. This is because the data utilized in most of the empirical studies in this area is country-level perception-based corruption indices or firm-level survey-based data on corruption (Fan et al., 2009; Olken, 2009). Both types of data can only capture aggregate corruption, and are not able to reveal sub-components of this country-level or firm-specific aggregate (Reinikka and Svensson, 2006). Thus, these data cannot be used to analyze the micro-dynamics of corruption (Reinikka and Svensson, 2006; Sequeira, 2012).

The purpose of this paper is to examine why and how firms' bribe payments vary as a result of the interactions between firms and local officials under regulatory decentralization. In particular, our work is motivated by three issues. First, we are interested in exploring how, under regulatory decentralization, local governments' control rights over local firms help explain the variation in bribe payments across firms. Second, we seek to understand

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how firms' costs of refusing to bribe impact bribe payments under regulatory decentralization. Third, we examine how agency problems arising from the conflicts of interest between executives and shareholders in firms are related to firms' bribe payments under regulatory decentralization.

The decentralized regulations for rights offerings implemented prior to 2001 in China present a unique regulatory setting for us to examine our research issues. Under this system, the Chinese central government pre-specified a set of requirements for rights issues, and assigned to each local government the maximum number of firms that could make rights issues, as well as the maximum shares that could be issued in a region. Then, each local government assessed whether firms located in the region under its jurisdiction met these requirements, and recommended the firms that were eligible for rights issues to the central government for final approval. This regulatory system created opportunities for local bureaucrats to be corrupt and extract bribes from the listed firms that competed for the limited quota of rights offerings in a region. Moreover, China's listed firms had a strong incentive to bribe local officials in order to obtain the privilege of rights offerings, given the fact that rights offerings were the dominant source of equity financing during this period. Thus, this regulatory and financing environment enables us to analyze how listed firms interact with local officials to determine bribe payments in the process of rights offering applications, as well as how the interactions help explain variations in bribe payments across firms. Importantly, termination of the decentralized regulatory system in 2001 presents a natural experiment for us to better understand how regulatory decentralization shapes firms' corrupt behavior by comparing their corrupt patterns before and after 2001. Analysis of the data after 2001 can enrich the evidence about the variation in firms' bribe payments observed before 2001 by ruling out alternative explanations.

A key empirical challenge in our research is to measure firms' bribe payments. Since bribes are primarily paid in the form of cash in rights offering applications, bribing local officials substantially boosted the total direct costs of rights offerings for listed firms. Thus, the anomalous patterns in the total direct costs of rights offerings are an indication of bribery practices, and can be used to detect firms' bribe payments. However, the direct costs reported in the rights offering prospectus include only underwriting fees and other direct fees, such as filing fees, legal and accounting fees, advertising expenses, and other costs. Given the fact that the underwriting fees, which are the main component of the reported direct costs of rights offerings, are typically low in China, it is unlikely for China's listed firms to hide bribe payments in these accounting items in the prospectus.[1] In fact, bribes are often hidden by managers as managing costs in various accounting categories in an effort to cover up their illicit behavior (Cai et al., 2011). For this reason, bribes are usually referred to as implicit costs (Xie and Lu, 2003). Unfortunately, in our context, the implicit costs of rights offerings are not readily available,[2] as it is practically impossible to isolate rights offering-related bribes under the management expense accounting category from real or other types of corruption-related records.

In this paper, implicit costs of rights offerings are estimated by comparing available reported direct costs with the actual direct cost predictions from theoretical models. More specifically, we first estimate actual direct costs of rights offerings based on a firm's investment Euler equation, which is derived from the firm's investment model. Then, we subtract the reported direct costs from the estimated direct costs to obtain implicit costs of rights offerings. This difference largely reflects total bribe payments for rights offerings, as there are essentially no non-cash forms of bribe payments in the context under consideration.

While our data on corruption is indirect, it is objective and replicable compared with the perception-based and survey-based corruption data (Sequeira, 2012). Moreover, our data is non-aggregate corruption data, as it contains the bribe payments only for rights offerings under the decentralized regulatory system for rights offerings. Thus, it is particularly suited to unveiling micro-dynamics of corruption, whereas tests of the determinants of bribe payments using aggregate data cannot easily exclude alternative explanations, given the fact that the perception-based and survey-based methods are not able to control for the regulatory setting in which a particular type of corruption data is generated. With detailed information about the context in which corruption occurs, our specific data could provide us with conclusive evidence about the determinants of firms' corrupt behavior under the decentralized regulatory system for rights offerings. Importantly, since China's listed firms were all involved in competition for the limited quotas of rights offerings in their respective regions under this system, our data reflects bribery practices of the listed firms operating in various industries and located in various regions in China. This allows us to investigate the cross-sectional variation in bribe payments across industries and regions under the same regulations.

Based on the estimated implicit costs, we find that China's listed firms pay substantial bribes under the decentralized regulatory system for rights offerings implemented prior to 2001. However, bribe payments vary across regions and firms, depending on local governments' control rights, firms' power of refusing to bribe, and the severity of firms' agency problems. More specifically, firms in regions with a high degree of local government intervention in the economy pay high bribes, as local officials in these regions have strong control over local firms and are better able to demand a high bribe. We also illustrate that firms located in regions with a highly market-oriented bank financing system tend to pay low bribes, as they are more capable of obtaining financing from sources other than rights offerings, implying that the opportunity cost of refusing to bribe is low. Finally, we find that firms with severe free cash flow agency problems (Jensen, 1986) pay high bribes, as these firms tend to over-value bribery benefits, due to the fact that non-pecuniary benefits will factor into managerial decisions.

Our results also show that after 2001, China's listed firms' bribe payments are greatly reduced and the variation in bribe payments can no longer be explained by the degree of local government intervention and the degree of severity of firms' Jensen-type agency problems. Our findings highlight some important characteristics of both bribe takers and bribe payers that influence their corrupt behavior in a given regulatory environment, and may have important policy implications for governments' anti-corruption endeavors.

While our research is primarily on the micro-dynamics of corruption under regulatory decentralization, it complements the previous work on the effects of partial privatization in China (Allen et al., 2005; Estrin et al., 2009; Fan et al., 2007; Sun and Tong, 2003; Wei et al., 2005). In China, the privatization reform of former state-owned enterprises (SOEs) in the early 1990s was only partial, in the sense that the government still maintains substantial ownership of SOEs after listing. Many previous studies document that the highly concentrated ownership structure of listed SOEs and the associated corporate governance problems, as well as the strong political connection with government, help explain firms' performance (Berkman et al., 2010; Chen et al., 2008, 2009). In contrast, we investigate the way in which government regulations shape partially privatized firms' investment and financing behavior from the bribery perspective.

[1] We find that the average reported direct costs of rights offerings are only 2.948% of the total proceeds raised during our sample period. In the robustness test, we also confirm that abnormal fees in the reported costs of rights offerings are unrelated to the major determinants of bribe payments.

[2] Implicit costs are different from indirect costs. In our context, implicit costs are the costs arising from firms' bribery practices in rights offerings, while indirect costs arise from information asymmetry or agency problems in rights offerings.

The remainder of this paper is organized as follows. Section 2 reviews the history of rights offering regulations in China, and proposes hypotheses to be tested. Section 3 describes the research methodology. Section 4 discusses the data. Section 5 analyzes the empirical results. Section 6 provides robustness tests, while Section 7 concludes the paper.

2. Review of rights offering regulations in China and hypothesis development

The establishment of Chinese stock markets in 1990 represents an important step in promoting the privatization reform of China's SOEs.[3] To ensure that the government maintained dominant control over SOEs after privatization, the number of shares issued in a firm's initial public offering (IPO) was strictly restricted. As a result, most of China's listed SOEs were not able to raise sufficient capital through IPOs in the early 1990s (Chen and Yuan, 2004; Yu et al., 2006). In subsequent years, worsening macro-business conditions in China further boosted the need for equity financing in China's listed firms. Moreover, given the lack of a sound corporate governance mechanism and the existence of serious agency problems, executives of China's listed firms felt no pressure to pay cash dividends to shareholders, and thereby the cost of equity financing was substantially lower than the cost of debt financing. For these reasons, China's listed firms were prone to excessive equity financing. However, rights offerings were virtually the only avenue for additional equity financing for China's listed firms in 1990s. Not surprisingly, more than half of the listed SOEs engaged in rights issues within 3 years after their IPOs (Yu et al., 2006).

To curb listed firms' excessive equity financing behavior, in 1993 the China Securities Regulatory Commission (the CSRC) developed a formal, nationwide regulatory system for rights offerings, and a number of amendments to the system were made in the subsequent years. In general, the evolution of this regulatory system can be divided into two stages, namely, prior to and after 2001.

2.1. Decentralized regulatory system for rights offerings

Prior to 2001, the system was a decentralized regulatory system, which worked as follows. The central government authority (the CSRC) specified the minimum conditions that listed firms had to meet for rights offerings. At the same time, to mitigate the problem of information asymmetry in implementing the policies of the regulatory system, the central government allocated to each local government both the maximum number of firms that could make right offerings and the maximum number of shares that could be issued through rights offerings. Based on the quotas and requirements for rights offerings, each local government assessed and screened all firms under its jurisdiction that applied for rights issues, and recommended the firms that should be granted the privilege of rights offerings. Finally, based on the recommendations from local governments and the rights offerings quotas allocated to a particular region, the central government formally approved the recommended firms' rights offering applications in the region.

Such a decentralized regulatory system has benefits as well as costs. On one hand, it provides an effective screening process that helps direct rights offering capital to better performing companies (Chen and Yuan, 2004), as local governments have more and better information about the listed firms located in their respective regions. On the other hand, it leads to pervasive bribery activities by listed firms, which is confirmed by the survey results in Xie and Lu (2003) and Hu (2008). This is not surprising, as the implementation of such a system requires the use of local officials (bureaucrats) to assess and select firms for rights offerings, creating corruption opportunities for these local officials (Acemoglu and Verdier, 2000). Importantly, the strong propensity for equity financing results in a strong incentive for listed firms to bribe local officials in competition for the limited quotas of rights offerings in their regions.

One interesting question is how the interactions of listed firms and local officials impact both the magnitude of corruption and variation in bribe payments under this decentralized regulatory system for rights offerings. Svensson (2003) attributes the variation in the incidence of corruption across firms to the differences in public officials' control rights across sectors. In particular, the likelihood of paying bribes tends to be high in a sector where firms are under strict bureaucratic control. We extend the control rights hypothesis to the context of decentralization, and intend to show that control rights can also explain the variation in bribe payments across graft-paying firms facing similar regulations. While all firms face the same set of regulations under decentralization, local officials' power to extract bribes varies across regions. A higher degree of local government intervention in the economy in a region implies that local officials have a higher level of control power over local firms, which in turn means that graft-taking officials in this region are more likely to demand a high bribe. We propose the following hypothesis.

Hypothesis 1. Under the decentralized regulatory system for rights offerings prior to 2001, China's listed firms located in regions with a high degree of local government intervention in the economy tend to have high implicit costs of rights offerings.

The graft-paying firms' characteristics are also related to the amount of bribe payments. In particular, a firm's ability to pay bribes and the opportunity cost of refusing to bribe are expected to be positively related to bribe payments, as per Svensson's (2003) bargaining theory. While a firm's ability to pay bribes can be proxied by its profitability, its refusal power is hard to measure. For this reason, to date almost no studies have attempted to test the relation between firms' bribe payments and the opportunity cost of refusing to pay, except Svensson (2003) and Rand and Tarp (2010), who use alternative returns on capital stock and capital-labor ratios as a measure of firms' refusal power in their tests, respectively. In our context, if a listed firm is not able to raise additional capital through rights offerings, it must seek other sources of financing. Therefore, a firm's opportunity cost of refusing to bribe can be measured by its capability of obtaining funds from sources other than rights offerings, which are bank financing during our sample period.[4] Apparently, alternative sources of financing are readily available to a firm if the local bank financing mechanism is more market-oriented in the region where the firm is located. Consistent with the bargaining hypothesis, we have the following hypothesis.

Hypothesis 2. Under the decentralized regulatory system for rights offerings, China's listed firms located in regions with a highly market-oriented bank financing mechanism tend to have low implicit costs of rights offerings.

Firms' bribe payments depend not only on the local officials' power to demand bribes and the firms' opportunity costs of refusing to pay bribes, but also on the bribery benefits for firms.

[3] See Chen et al. (2008) and Sun and Tong (2003) for more discussion about the privatization reform of SOEs in China.

[4] Note that most China's listed firms are large SOEs and non-SOEs. While firms may also seek nonbank financing sources, bank financing is more prevalent with large firms (Ayyagari et al., 2010). See Bailey et al. (2011) and Allen et al. (2005) for an overview of China's banking system.

Bribe payments represent a cost to firms and must be justified by the marginal benefits derived from bribery. By bribing, a firm enhances its chance of being selected and recommended for rights offerings by local officials. Thus, the maximum amount of bribes a firm is willing to pay is determined by the value added by using these newly raised equity funds through rights offerings. However, the value of these benefits varies across firms, depending on how the firms' executives evaluate the bribery benefit, which in turn is closely related to the severity of firms' corporate governance problems.

To examine this issue, we consider the free cash flow agency problems identified by Jensen (1986). It is well documented in the literature that overinvestment of free cash flows is a manifestation of agency problems in listed firms (Lan and Wang, 2003; Wu and Wang, 2005). The executives of firms with severe Jensen agency problems (Jensen firms) tend to squander resources on projects with a negative net present value, indicating that executives use an effective discount rate that is lower than the shareholders' discount rate to guide investment decisions (Jensen, 1986). Using Canadian data, Chirinko and Schaller (2004) confirm that Jensen agency problems prove to be economically and statistically significant. This is also the case for China's listed firms, as Zhu et al. (2007) find that from 1998 to 2001, more than 50% of China's listed firms tend to abuse and misuse the funds raised through rights offerings. Thus, it is expected that the agency problems in Jensen firms are more pronounced than in non-Jensen firms. Given the lower discount rate used by executives, Jensen firms tend to over-value bribery benefits, and thereby are more likely to pay high bribes compared with other firms.

Hypothesis 3. Under the decentralized regulatory system for rights offerings, China's listed firms with severe Jensen agency problems have high implicit costs of rights offerings.

2.2. Termination of the decentralized regulatory system

In 2001, the CSRC announced termination of the decentralized regulatory system for rights offerings. Therefore, starting from 2001 the process of assessing and screening firms' rights offering applications become more market-oriented. It is noteworthy that after 2001, firms may still bribe public officials, as all rights offerings are still subject to regulatory approval by the central government. However, since local governments are no longer directly involved in the screening and recommendation process for rights offerings after 2001, local officials' room for rent seeking is largely reduced. Thus, termination of the decentralized system may help mitigate the effect of the delegated problems in enforcing regulations. If the authority delegation problem is less pronounced after termination of the decentralized system, then Hypothesis 1 is not expected to hold after 2001.

While termination of the decentralized system for rights offerings may have an impact on the development of market-oriented bank financing mechanisms, the degree of marketization of the local bank financing mechanism still reflects costs of refusing to bribe for firms after 2001. Thus, we still expect Hypothesis 2 to hold after 2001.

In theory, Hypothesis 3 remains true regardless of the regulatory system, as long as firms' Jensen problems are significant. However, the institutional environment in which China's listed firms operates changed dramatically after 2001. This change reduced the size of bribes demanded by public officials as well as firms' incentives to bribe. While the net benefits from bribery are still lower for non-Jensen firms than for Jensen firms, a substantial reduction in bribe payments after 2001 may significantly increase non-Jensen firms' willingness to pay bribes. As long as the net benefits from bribery for non-Jensen firms are also large enough, we might observe an insignificant difference in bribe payments between both Jensen and non-Jensen firms after 2001.

3. Methodology

3.1. Estimating implicit costs of rights offerings

To obtain implicit costs of rights offerings, the actual direct costs of rights offerings for a firm must be estimated first. To this end, following the structural approach of Whited and Wu (2006), we first construct a firm's investment model, in which external equity financing is allowed. As such, the actual costs of rights offerings shape the firm's investment behavior. Then, we derive the investment Euler equation, and estimate the actual direct costs of rights offerings from the Euler equation based on the observed variables in the firm.

Most recent research on firms' investment and financing behavior represents extensions to the neoclassical investment theory within the framework of pecking order or delegation and principal-agent agency models. However, previous empirical studies show that the free cash flow theory is better able to explain China's listed firms' equity financing behavior than the pecking order theory (Xu, 2007). Therefore, we investigate China's firms' investment and financing behavior based on the free cash flow theory. In particular, a firm's optimal investment and financing decisions are determined by maximizing the expected discounted value of future dividends available to shareholders, using the managers' rather than shareholders' discount rate in order to accommodate the free cash flow problems (Chirinko and Schaller, 2004; Stein, 1996)[5]:

$$\max_{\{I_{i,t+\tau}\}_{\tau=0}^{+\infty},\{B_{i,t+\tau}\}_{\tau=0}^{+\infty}} V_{i,t}^{M} = E_{i,t}\sum_{\tau=0}^{+\infty}\beta_{i,[t,t+\tau]}^{M}\left[\Pi(K_{i,t+\tau},\varsigma_{i,t+\tau}) - I_{i,t+\tau} - C(I_{i,t+\tau},K_{i,t+\tau}) + (B_{i,t+\tau} - B_{i,t+\tau-1}) - r_{i,t+\tau}^{DEBT}B_{i,t+\tau-1} - \psi(NE_{i,t+\tau},K_{i,t+\tau})\right] \quad (1)$$

where $\beta_{i,[t,t+\tau]}^{M}$ denotes the managers' discount factor for firm i for the period from time t to $t+\tau$, while $r_{i,t+\tau}^{DEBT}$ is the cost of debt for year $t+\tau$. $\Pi(K_{i,t+\tau},\varsigma_{i,t+\tau})$ represents the firm's profit function, where $K_{i,t+\tau}$ is the capital stock at the beginning of year $t+\tau$, and $\varsigma_{i,t+\tau}$ is a random shock to profit in year $t+\tau$. $I_{i,t+\tau}$ is the investment in year $t+\tau$. $C(I_{i,t+\tau},K_{i,t+\tau})$ is the adjustment cost incurred by investment. $B_{i,t+\tau}$ is the amount of debt issued at time $t+\tau$, which must be repaid at time $t+\tau+1$. $NE_{i,t+\tau}$ is the newly-issued equity at time $t+\tau$, and $\psi(NE_{i,t+\tau},K_{i,t+\tau})$ represents the actual direct costs of rights offerings.[6]

Capital stock at the end of the period is equal to the capital at the beginning of the period plus investment, minus capital depreciation during the period. Thus, if the rate of depreciation is $\delta_{i,t+\tau}$, then we have $K_{i,t+\tau+1} = I_{i,t+\tau} + (1-\delta_{i,t+\tau})K_{i,t+\tau}$. In addition, if after-interest earnings plus newly issued debt are greater than the investment in a particular period, then the difference can be paid out as a dividend to shareholders. If not, then additional shares of new stock must be issued. Consequently, the newly-issued equity is defined as:

[5] While most of China's listed firms suffer serious free cash flow problems, and pay no or low dividends during our sample period, the application of the dividend discount approach is still appropriate. This is because firms are valued from the managers' perspective. This model takes into account the free cash flow problems, given the fact that the managers' discount rate is used. This model is different from the traditional dividend discount model, and is used in many previous studies on China's firms' investment behavior (Liu and Siu, 2011).

[6] Within the framework of pecking order theory, ψ includes both direct costs and adverse selection costs (Li and Zhang, 2009; Liu et al., 2007). However, the adverse selection costs are zero in our model framework.

$$NE_{i,t+\tau}=\begin{cases}0, & I_{i,t+\tau}+C(I_{i,t+\tau},K_{i,t+\tau})+r^{DEBT}_{i,t+\tau}B_{i,t+\tau-1}-(\Pi_{i,t+\tau}(K_{i,t+\tau},\varsigma_{i,t+\tau})+B_{i,t+\tau}-B_{i,t+\tau-1})\leqslant 0\\ NE^{d}_{i,t+\tau}, & I_{i,t+\tau}+C(I_{i,t+\tau},K_{i,t+\tau})+r^{DEBT}_{i,t+\tau}B_{i,t+\tau-1}-(\Pi_{i,t+\tau}(K_{i,t+\tau},\varsigma_{i,t+\tau})+B_{i,t+\tau}-B_{i,t+\tau-1})>0\end{cases} \quad (2)$$

where $NE^{d}_{i,t+\tau}$ is the total proceeds raised including the direct costs of rights offerings:

$$NE^{d}_{i,t+\tau}=I_{i,t+\tau}+C(I_{i,t+\tau},K_{i,t+\tau})+r^{DEBT}_{i,t+\tau}B_{i,t+\tau-1}+\psi(NE^{d}_{i,t+\tau},K_{i,t+\tau})-(\Pi_{i,t+\tau}(K_{i,t+\tau},\varsigma_{i,t+\tau})+B_{i,t+\tau}-B_{i,t+\tau-1})$$

Solving Problem (1) subject to Eq. (2) yields the following investment Euler equation[7]:

$$\frac{1+C'_I(I_{i,t},K_{i,t})}{1-\psi'_{NE}(NE_{i,t},K_{i,t})}=E_{i,t}\left[\beta^{M}_{i,[t,t+1]}\left(\frac{\Pi'_K(K_{i,t+1},\varsigma_{i,t+1})-C'_K(I_{i,t+1},K_{i,t+1})-\psi'_K(NE_{i,t+1},K_{i,t+1})}{1-\psi'_{NE}(NE_{i,t+1},K_{i,t+1})}+\frac{1+C'_I(I_{i,t+1},K_{i,t+1})}{1-\psi'_{NE}(NE_{i,t+1},K_{i,t+1})}(1-\delta_{i,t+1})\right)\right].\quad \forall t=1,2,3,\cdots \quad (3)$$

Similar to the investment Euler equation in Whited and Wu (2006), the economic interpretation of Eq. (3) is as follows. The left side measures various marginal costs of investing today, while the right side represents various expected discounted marginal costs of investing tomorrow. The Equation also includes the trade-off between benefits and costs of investing in each period. Optimal investment determined by Eq. (3) implies that on the margin, the firm must be indifferent between investing today and investing tomorrow. Thus, Eq. (3) establishes the relationship between the actual direct costs of rights offerings and the investment and financing decisions in the firm, and can be used to estimate the actual direct costs of a rights offering. The procedure for estimating the direct costs and implicit costs of rights offerings is described in Appendix A.

3.2. Measuring the degree of local government intervention in the economy

To test Hypothesis 1, we define the dummy variable *Govinter* to measure the degree of local government intervention in the economy, based on the index of marketization of the resource allocation mechanism in various regions in China developed by Fan et al. (2010). This index is well recognized by academics, and is widely used in research (Wang et al., 2008). It is constructed based primarily on the percentage of local government spending in total local gross domestic product (GDP), as this percentage reflects the extent to which resources are allocated through the market-oriented mechanism in a particular region compared to other regions. The score each region achieves is measured on a scale of 0–10 (0 being the least market-oriented and 10 being the most market-oriented). We define the degree of the local government's intervention in the economy as being high if the score of the region is less than the sample mean (*Govinter* = 0), and as being low otherwise (*Govinter* = 1).

3.3. Measuring the degree of marketization of the local bank financing mechanism

To test Hypothesis 2, we define the variable *Bankfin* to measure the degree of marketization of the local bank financing mechanism at time t in the region where firm i is located, based on an index of marketization related to the local bank financing mechanism in various regions in China, which is also developed by Fan et al. (2010). This index reflects the degree of competitiveness in the bank industry and the degree of marketization of bank loan allocation mechanism in a region. More specifically, the index is determined by the ratio of bank deposits received by non-state-owned financial institutions to total bank deposits as well as the ratio of bank loans for non-SOEs to total bank loans in each region. The score that each region achieves is measured on a scale of 0–10 (0 being least market-oriented and 10 being most market-oriented). The degree of marketization of the local bank financing mechanism is considered to be high if the score is higher than the sample mean (*Bankfin* = 1), and is considered to be low otherwise (*Bankfin* = 0).

3.4. Measuring the severity of the Jensen agency problem

To test Hypothesis 3, we define the dummy variable *Jensenfirm* equal to 1 if a firm suffers from serious Jensen-type free cash flow problems (Jensen firms), and 0 otherwise. Jensen firms are identified using Chirinko and Schaller's (2004) procedure. More specifically, we find the firm-year observations for which free cash flow is in the top two-thirds of their industry and those for which sales growth is in the bottom two-thirds of their industry in the last year.[8] Jensen firms are those that fall into the intersection of these two sets.

3.5. Regression model

To examine our research issues, we consider the following regression:

$$Imcost_{i,t}=\beta_1+\beta_2 Factor_{i,t}+\sum_l \eta_l Control^{l}_{i,t}+\sum_j \lambda_j Year^{j}_{i,t}+\sum_k \gamma_k Area^{k}_{i,t}+u_{i,t} \quad (4)$$

where the explained variable $Imcost_{i,t}$ is the ratio of implicit costs to gross proceeds raised in the rights offering for firm i in year t. The explanatory variable $Factor_{i,t}$ represents one of the three determinants of bribe payments considered in this paper, which is the dummy variable $Govinter_{i,t}$, $Bankfin_{i,t}$, or $Jensenfirm_{i,t}$ for Hypothesis 1, Hypothesis 2, or Hypothesis 3, respectively.

The control variables $Control^{l}_{i,t}$ $(l=1,2,\cdots,9)$ are present to control for the effects of firm-specific characteristics on bribe payments. The first one is the variable $ROE_{i,t}$, the average of the firm's return on equity (ROE) in the 3 years prior to a rights offering. ROE measures the firm's ability to pay bribes. The second variable is $Tax_{i,t}$, the average of the firm's taxes divided by pre-tax profits in the 3 years prior to a rights offering. The third variable is the ownership dummy variable $Own_{i,t}$, which is equal to 1 if the firm is considered state-owned, and 0 otherwise. The estimated coefficient on

[7] Eq. (3) is true for any future time period $[t+\tau,t+\tau+1]$. For notational convenience, τ is dropped in the equation.

[8] In Chirinko and Schaller (2004), investment opportunities are measured by the Brainard–Tobin Q. However, the investment opportunities for Chinese firms are typically measured by the sales growth (Firth et al., 2008).

this variable measures the difference in bribes paid by SOEs and non-SOEs. The fourth control variable is the dummy variable $Own\_Central_{i,t}$, which is equal to 1 if the firm is a centrally owned SOE (SOEs under the supervision and administration of the central government or of the State-owned Assets Supervision and Administration Commission of the State Council), and 0 otherwise. This variable is included to control for the difference in corrupt behavior between centrally and locally owned SOEs, as both types of SOEs are different in terms of size, market share, bargaining power, and political connection with government officials. The fifth variable is $Capemp_{i,t}$, which is defined as the firm's capital stock (RMB 10,000 s) in the previous year divided by the number of employees. It measures the firm's capital intensity. The sixth variable is the firms' size $Scale_{i,t}$, measured by the logarithm of total assets in the previous year. Our seventh variable is the firms' age $Age_{i,t}$, which is defined as the logarithm of the number of years since the firm was founded. The eighth variable is the dummy variable $Manufacture_{i,t}$, which equals 1 if the firm under consideration is in the manufacturing industry, and equals 0 otherwise. Since more than a half of the firms comprising our sample are in manufacturing, we include $Manufacture_{i,t}$ to control for the effect of the industry in which a firm operates. The final control variable is $Quota_{i,t}$, defined as the quota of rights offerings assigned to a local government scaled by the total number of listed firms under its jurisdiction.[9] This variable is intended to control for the distinction in the level of competition for rights offerings across provinces.

In addition to the above-mentioned control variables, we also include the dummy variable $Year_t^j$ to control for the time effect, as well as the dummy variables $Area_i^k$ aimed at controlling for the regional effect. Following the literature, we divide China (mainland) into 8 economic regions, and use 7 region dummy variables in our regression to control for the effects associated with regions in which firms are located.[10]

4. Data

Our sample period extends from January 1997 to December 2004. Data on rights issues prior to 1997 is excluded, as the financial data for the listed companies in Chinese stock markets is incomplete. The data after 2004 is also excluded, because in 2005, China initiated a reform aimed at eliminating non-tradable shares of listed companies by the end of 2006. During this time period, new stock issues were temporarily called off. The rights offering data is from the Wind database. We start with all listed firms with rights offerings in the Chinese A-share stock markets. During our sample period, there were 696 rights offerings made by A-share listed companies. We exclude companies in the financial sector, companies with missing or irregular data, as well as companies that issued B-shares, H-shares, and foreign shares in our sample period.[11] We end up with a total of 497 rights offerings, among which 366 occurred prior to 2001 and 131 occurred in or after 2001.

Panel A of Table 1 reports the number of rights issues across our sample years. As we see, the number increases over time and reaches the maximum in 2000. This is not surprising, as rights offerings are the dominant source of equity financing for China's listed companies during this period, accounting for over 83% of total proceeds raised (Fung et al., 2008). The number of observations declines dramatically after 2001 when the decentralized regulation for rights offerings was terminated, due to the fact that after 2001 listed firms could make general cash offers to investors at large in addition to rights issues.

Panel B of Table 1 presents a breakdown of rights offerings by industry. Note that 55.13% of the observations are in the manufacturing industry, and the rest of the observations are from the other 11 industries. Panel C of Table 1 reports the province distribution of rights offerings in the sample. Our sample observations are spread across all 31 provinces and cities under the central government's direct administration in China. However, the sample distribution by province/city is not even. For example, while there are 47 observations in Guangdong province alone, there are no more than 5 observations in Guizhou, Qinghai, Tibet, and Yunnan due in large part to their less developed economies compared with those of other provinces in China.

Table 1
Year, industry, and province distributions of rights offerings.

Panel A: rights offerings across sample years

Year	Number of rights offerings	Proceeds raised (RMB billion)
1997	36	6.3360
1998	98	20.8644
1999	98	21.9641
2000	134	35.3765
2001	79	25.4748
2002	18	4.1902
2003	19	5.2017
2004	15	3.9170

Panel B: distribution of rights offerings by industry

Industry	Industry code	Observations
Agriculture, forestry, animal husbandry and fishery	A	9
Extractive industries	B	8
Manufacturing	C	274
Electricity, gas and water production and supply	D	20
Construction	E	6
Transportation and warehousing	F	16
Information and technology	G	14
Wholesale and retail	H	57
Real estate	J	47
Social services	K	14
Communication and culture	L	8
Comprehensive	M	24

Panel C: distribution of rights offerings by province

Province	Observations	Province	Observations	Province	Observations
Anhui	17	Heilongjiang	14	Shanghai	36
Beijing	21	Hubei	32	Shaanxi	9
Chongqing	7	Hunan	18	Shanxi	12
Fujian	18	Jiangsu	29	Sichuan	19
Gansu	9	Jiangxi	11	Tianjin	13
Guangdong	47	Jilin	21	Tibet	5
Guangxi	6	Liaoning	17	Xinjiang	14
Guizhou	4	Internal Mongolia	10	Yunnan	5
Hainan	7	Ningxia	7	Zhejiang	30
Hebei	14	Qinghai	4		
Henan	10	Shandong	31		

Panel A of this table reports the total number of rights offerings and the gross proceeds raised in each year during our sample period. Panel B reports the numbers of rights offerings in various industries; the financial industry is not included. Panel C reports the distribution of rights offerings by province in our sample. The total number of observations is 497.

[9] Since the data on rights offering quotas are not available, we use the number of firms that made rights offerings in a region as a proxy for the quota assigned to the region, given the fact that none of the companies that are eligible for rights offerings voluntarily opt out of issuing rights (Chen and Yuan, 2004; Yu et al., 2006).

[10] These regions are northeast, north coast, east coast, south coast, the middle reaches of the Yellow River, the middle reaches of the Yangtze River, northwest, and southwest.

[11] The listed companies in the financial sector are excluded from the sample, because funds in these companies are not primarily used for investments in fixed assets, and thus the investment Euler equation does not properly describe the investment and financing behavior in these companies (Whited and Wu, 2006).

Table 2
Descriptive statistics of explanatory variables and correlations among these variables in the regression model.

Panel A: descriptive statistics of explanatory variables

Variables	Observations	Mean	Median	Standard deviation	Minimum	Maximum
Govinter	497	0.5835	1	0.4935	0	1
Bankfin	497	0.5111	1	0.5004	0	1
Jensenfirm	497	0.4165	0	0.4935	0	1
ROE	497	14.4130	12.7570	5.8255	3.0530	41.0600
Tax	497	0.1694	0.1529	0.0777	0.0013	0.7332
Own	497	0.8330	1	0.3734	0	1
Own_Central	497	0.0905	0	0.2872	0	1
Capemp	497	38.7860	20.2930	103.2359	2.0730	2017.2850
Scale	497	20.6300	20.6000	0.7536	18.9500	22.9900
Age	497	1.6403	1.7035	0.5933	0.0663	2.9977
Manufacture	497	0.5513	1	0.4979	0	1
Quota	497	0.1803	0.1563	0.1050	0.0118	0.5000

Panel B: correlations among explanatory variables

	Govinter	*Bankfin*	*Jensenfirm*	*ROE*	*Tax*	*Own*	*Own_Central*	*Capemp*	*Scale*	*Age*	*Manufacture*	*Quota*
Govinter	1											
Bankfin	0.2351***	1										
Jensenfirm	0.0432	0.0344	1									
ROE	0.0360	0.0503	0.1397***	1								
Tax	0.0162	−0.0415	−0.0133	−0.0342	1							
Own	−0.0828*	−0.0818*	−0.0157	0.0162	0.1092**	1						
Own_Central	−0.1032**	0.0421	0.0179	0.0326	−0.0549	0.1413***	1					
Capemp	0.0314	0.0619	−0.1228***	−0.0821*	−0.0521	−0.1070**	0.0457	1				
Scale	0.0966**	0.0690	−0.1593***	−0.0442	−0.0861*	0.0725	0.0572	0.2190***	1			
Age	0.1687***	0.0860*	−0.1060**	−0.2258***	−0.0719	−0.2249***	−0.0914**	0.1042**	0.1272***	1		
Manufacture	−0.0154	−0.0245	−0.0338	0.0740*	0.0387	−0.0026	−0.0537	−0.1173***	0.0151	−0.1329***	1	
Quota	−0.1472***	−0.1635***	−0.0002	0.2508***	0.0197	0.0848*	−0.0699	−0.1427***	−0.2186***	−0.2896***	0.0653	1

This table presents the summary statistics of the explanatory variables in the regressions, as well as the correlations among these variables. *Govinter* is a dummy variable with a value of 1 if the degree of local government intervention in the economy in a region is low, and 0 otherwise. *Bankfin* is a dummy variable with a value of 1 if the degree of marketization of the local bank financing mechanism in a region is high, and 0 otherwise. *Jensenfirm* is a dummy variable with a value of 1 if a firm is identified as a Jensen-type firm, and 0 otherwise. *ROE* is the average of the firm's returns on equity in the 3 years prior to a rights offering. *Tax* is the average of the firm's taxes scaled by pre-tax profits in the 3 years prior to a rights offering. *Own* is a dummy variable, which is equal to 1 if the firm is considered state-owned, and 0 otherwise. *Own_Central* is a dummy variable, which is equal to 1 if the firm is a centrally owned SOE, and 0 otherwise. *Capemp* is the firm's capital stock (in RMB 10,000 s) per employee in the previous year. *Scale* is the logarithm of total assets in the previous year. *Age* is defined as the logarithm of the number of years since the firm was founded. *Manufacture* is a dummy variable, which equals 1 if the firm under consideration is in the manufacturing sector, and equals 0 otherwise. *Quota* is defined as the quota of rights offerings assigned to a local government scaled by the total number of listed firms under its jurisdiction. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

We obtain data on ownership from the China Center for Economic Research (CCER) database, as well as accounting and market data on listed companies from the Wind database for the same sample period. Firms' accounting data includes inventory, net income, total assets, total liabilities, liquidity assets, taxes, and capital stock at the end of each year for each firm, as well as sales, variable cost, investments, and capital depreciation in each year for each firm. The market data consists of the risk-free rate, market returns, and firms' stock returns.

The descriptive statistics of all the variables in Eq. (4) are reported in Panel A of Table 2. Based on the means of the three explanatory variables, we note that 58.35% of regions in China are considered to have a low degree of local government intervention in the economy, 51.11% of regions are considered to have a highly market-oriented local bank financing system, and 41.65% of firms are classified as having severe Jensen agency problems in our sample.

Focusing on the control variables, we have a number of observations. First, the average ROE is positive for all firms, with an average of 14.41% and a minimum value of 3.05%. Second, the average *Tax* is 16.94%, lower than the norm of 33% for all firms during this time period (Wu, 2009b). Third, 83.30% of the listed companies in our sample are SOEs. This reflects the fact that most of listed companies in Chinese stock markets are SOEs as a result of the partial privatization reform on former SOEs starting in the early 1990s. Fourth, the average value of *Capemp* is 38.79. Fifth, the average size of firms, measured as total assets 1 year prior to the rights offering, is more than RMB 900 million (US $108 million), with the maximum size of more than RMB 9 billion (US $1.08 billion). Sixth, the average age of the firms is 5 years, with the youngest firm around 1 year old. Finally, more than 55% of the firms in our sample are in the manufacturing sector, reflecting the fact that the Chinese government had strong policies for promoting the development of heavy industry during this time period.

Panel B of Table 2 reports the correlation coefficients among the explanatory variables. The results show that all these correlation coefficients are lower than 0.3, indicating that there is no severe multicollinearity among the explanatory variables in Regression (4).

5. Empirical results

5.1. Implicit costs of rights offerings

The estimated parameters in Eq. (A.2) are reported in Panel A of Table 3. We find that the estimated value of b_2 as well as the parameters in the adjustment cost function are all significant. The difference between managers' and shareholders' discount rates is negative, which is in line with the finding in Chirinko and Schaller (2004). The *J*-test cannot reject the null hypothesis that the model is correctly specified.

Given these estimated parameters, the ratios of implicit costs of rights offerings to gross proceeds raised in rights offerings are calculated according to the procedure described in Appendix A. We note that in the sample period, on average the implicit costs are 11.92% of the gross proceeds raised with a standard deviation

Table 3
Estimation results of Eq. (A.2) and implicit costs of rights offerings.

Panel A: estimated parameters in Eq. (A.2)

a_1	a_2	a_3	b_2	ξ	ϕ	μ	J test (p-value)
2.2305***	−0.2436**	0.0171***	0.5009***	0.0782	−0.1107	1.0638***	2.8091
(6.0511)	(−2.3371)	(2.6391)	(66.8603)	(0.2320)	(−0.7158)	(80.7973)	(0.8324)

Panel B: average implicit costs of rights offerings before and after (including) 2001

Under decentralized regulation	After the termination of decentralized regulation	Difference
0.1277	0.0963	0.0314***
		(2.6985)

Panel A of this table reports the Generalized Moments of Methods (GMM) estimation results for Eq. (A.2). Panel B reports the average ratios of implicit costs of rights offerings to gross proceeds raised in rights offerings before and after the termination of decentralized regulation in 2001. t-values are in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

of 0.11. This result is striking, as we find that the reported direct costs of rights offerings are generally only 2.95% of the gross proceeds raised. Since each rights offering typically raised a total of more than RMB 200 million (US $24 million), the implicit costs of each rights offering could amount to more than RMB 20 million (US $2.4 million).

Panel B of Table 3 reports the average ratios of implicit costs to gross proceeds raised through rights offerings before and after 2001. Note that the average implicit costs are 12.77% prior to 2001, while they are 9.63% after 2001. The test results indicate that the reduction in implicit costs of rights offerings after 2001 is significant. Our results provide strong evidence that the regulatory decentralization for rights offerings exacerbates corruption, imposing substantive costs on listed firms in China.

5.2. Regression analysis

Table 4 presents the results of 8 regressions based on Eq. (4) for both sub-periods before and after 2001. Models 1, 2, and 3 include each of the three major explanatory variables, respectively, while the general model includes all the three explanatory variables. The results for Model 1 show that the estimated coefficient on *Govinter* is −0.0260 and significant at the 10% level prior to 2001, indicating that when all other variables are held constant, a change from a high degree to a low degree of government intervention will reduce firms' bribe payments during rights offerings by 2.60%. This result provides compelling evidence in favor of Hypothesis 1. To get preferential access to rights offerings, China's listed companies need administrative support and economic resources from local governments, such as the administrative approvals of the local office of financial administration and local SASAC (State-owned Assets Supervision and Administration Commission of the State Council). In addition, to achieve the required thresholds of rights offerings, listed companies need support from local governments to inject high quality assets or to obtain tax relief and fiscal subsidies. If the degree of local government intervention in the economy is high in a region, then the local government has strong power to determine resource allocations among local firms. Public officials in these regions not only determine whether a firm can obtain the rights offering privilege, but also have a particularly great influence on whether the firm can obtain bank loans and other financing resources. This strengthens both local officials' power to extract bribes and listed firms' incentives to pay bribes, which explains why public officials in these regions tend to extract higher bribes in the process of rights offering approvals.

Our results also show that after the decentralized regulatory system for rights offerings was terminated in 2001, the estimated coefficient on *Govinter* is no longer significant, indicating that local governments' control power over listed firms cannot explain the cross-sectional variation in firms' bribes after 2001. This is primarily due to the fact that after 2001, local officials are not directly involved in the process of assessing and selecting firms for rights offerings. Thus, the room for local officials to be corrupt and extract bribes from local firms is reduced. Since the selection process for rights offerings is now more market-oriented and the minimum requirements for rights offerings are reduced after 2001, the need for listed firms to obtain local governments' support in rights offering applications is also reduced.

From the results for Model 2, we find that the estimated coefficients on the variable *Bankfin* for the periods before and after 2001 are both significant at the 1% level, and are −0.0536 and −0.0740, respectively. This result demonstrates that during the periods before 2001 and after 2001, when all other variables are held constant, a change from a less highly market-oriented to a highly market-oriented bank financing mechanism will reduce firms' bribe payments during rights offerings by 5.36% and 7.40%, respectively. Intuitively, in a region with a highly market-oriented bank financing mechanism, firms have greater access to sources of bank financing in addition to rights offerings. In other words, a highly marketized local bank financing mechanism helps firms relax external financing constraints, which strengthens the firms' position of bribery bargaining with local officials. As a result, the firms located in these regions have a lower propensity to pay bribes, as the costs of failing to obtain the privilege of rights offerings are lower. This supports Svensson's (2003) bargaining hypothesis that bribe payments are positively related to the opportunity costs of refusing to pay bribes. Termination of the decentralized regulatory system in 2001 does not seem to change the significance of this relation.

The results for Model 3 in Table 4 show that the estimated coefficient on *Jensenfirm* is 0.0384 and significant under the decentralized regulatory system. The magnitude of this coefficient is economically large, and indicates that when all other variables are held constant, a change from Jensen type to non-Jensen type firms will reduce bribe payments for rights offerings by 3.84%. The main reason for this finding is that Jensen-type firms tend to over-value bribery benefits, given that fact that the executives of Jensen firms are better able to derive private benefits from the use of the equity capital raised in rights offerings. Note that since all China's listed firms suffer from severe and pervasive agency problems, firms have a strong propensity to expropriate resources from shareholders. Our finding suggests that this effect is particularly pronounced for firms with severe free cash flow problems.

However, the insignificance of the estimated coefficient on *Jensenfirm* for the sub-period after 2001 demonstrates that this relation disappears after termination of the decentralized regulatory system for rights offerings. The explanations for this result are as follows. The assessing and selecting process for rights offerings is more market-oriented after the termination of decentralized regulation. This weakens both the power of local officials to demand bribes and the incentives of listed firms to pay bribes, and thus, the minimum amount of bribes demanded

Table 4
Regression results.

Variables	Under decentralized regulation				After the termination of decentralized regulation			
	Model 1	Model 2	Model 3	General model	Model 1	Model 2	Model 3	General model
Govinter	−0.0260*			−0.0275**	−0.0179			−0.0085
	(−1.87)			(−2.05)	(−0.82)			(−0.39)
Bankfin		−0.0536***		−0.0537***		−0.0740***		−0.0730***
		(−3.70)		(−3.77)		(−2.91)		(−2.80)
Jensenfirm			0.0384***	0.0394***			0.0128	0.0153
			(3.27)	(3.43)			(0.79)	(0.96)
ROE	0.0053***	0.0050***	0.0050***	0.0048***	0.0109***	0.0124***	0.0101***	0.0116***
	(5.13)	(4.88)	(4.81)	(4.79)	(3.89)	(4.50)	(3.46)	(4.04)
Tax	−0.0022	−0.0069	−0.0096	0.0159	−0.0777	−0.1605	−0.0773	−0.1541
	(−0.03)	(−0.09)	(−0.13)	(0.22)	(−0.70)	(−1.45)	(−0.70)	(−1.38)
Own	0.0025	0.0014	0.0043	0.0013	−0.0624***	−0.0623***	−0.0593***	−0.0619***
	(0.14)	(0.08)	(0.25)	(0.08)	(−3.30)	(−3.43)	(−3.15)	(−3.36)
Own_Central	0.0055	0.0148	0.0119	0.0123	−0.0100	−0.0077	−0.0074	−0.0126
	(0.25)	(0.69)	(0.56)	(0.58)	(−0.42)	(−0.35)	(−0.32)	(−0.54)
Capemp	−0.0004***	−0.0004***	−0.0004**	−0.0003**	−0.0001	−0.0001	−0.0001	−0.0001
	(−2.73)	(−2.63)	(−2.39)	(−2.40)	(−1.52)	(−1.58)	(−1.31)	(−1.44)
Scale	−0.0446***	−0.0442***	−0.0427***	−0.0407***	−0.0266**	−0.0253**	−0.0247**	−0.0241**
	(−5.05)	(−5.08)	(−4.87)	(−4.74)	(−2.48)	(−2.45)	(−2.30)	(−2.30)
Age	0.0178	0.0176	0.0184*	0.0236**	0.0147	0.0166	0.0146	0.0180
	(1.58)	(1.60)	(1.66)	(2.16)	(1.07)	(1.25)	(1.06)	(1.34)
Manufacture	−0.0308**	−0.0277**	−0.0312***	−0.0245**	−0.0488***	−0.0513***	−0.0483***	−0.0495***
	(−2.54)	(−2.32)	(−2.61)	(−2.08)	(−3.22)	(−3.50)	(−3.18)	(−3.34)
Quota	−0.0482	−0.0973	−0.0174	−0.0601	0.2481	0.2408	0.2316	0.2393
	(−0.70)	(−1.41)	(−0.25)	(−0.88)	(1.08)	(1.08)	(1.01)	(1.07)
Constant	0.9503***	0.9543***	0.8716***	0.8566***	0.5178**	0.5107**	0.4858**	0.4857**
	(5.21)	(5.31)	(4.78)	(4.80)	(2.22)	(2.26)	(2.06)	(2.12)
Year control	Y	Y	Y	Y	Y	Y	Y	Y
Area control	Y	Y	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.1435	0.1678	0.1607	0.1991	0.4324	0.4697	0.4322	0.4649
F statistics	4.0581	4.6806	4.4956	5.1243	5.9527	6.7582	5.9485	6.1347
Observations	366	366	366	366	131	131	131	131

This table presents the estimated coefficients in the base models. The dependent variable is the ratio of total implicit costs of a rights offering to the gross proceeds raised through the rights offering. *Govinter* is a dummy variable with a value of 1 if the degree of local government intervention in the economy in a region is low, and 0 otherwise. *Bankfin* is a dummy variable with a value of 1 if the degree of marketization of the local bank financing mechanism in a region is high, and 0 otherwise. *Jensenfirm* is a dummy variable with a value of 1 if a firm is identified as a Jensen firm, and 0 otherwise. *ROE* is the average of the firm's returns on equity in the three years prior to a rights offering. *Tax* is the average of the firm's taxes scaled by pre-tax profits in the 3 years prior to a rights offering. *Own* is a dummy variable, which is equal to 1 if the firm is considered state-owned, and 0 otherwise. *Own_Central* is a dummy variable, which is equal to 1 if the firm is considered a centrally owned SOE, and 0 otherwise. *Capemp* is the firm's capital stock (in RMB 10,000 s) per employee in the previous year. *Scale* is the logarithm of total assets in the previous year. *Age* is defined as the logarithm of the number of years since the firm was founded. *Manufacture* is a dummy variable, which equals 1 if the firm under consideration is in the manufacturing sector, and equals 0 otherwise. *Quota* is defined as the quota of rights offerings assigned to a local government scaled by the total number of listed firms in its jurisdiction. *t*-values are in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

by corrupt officials is substantially reduced after the termination of decentralized regulation. In particular, if the minimum bribe payment is much lower than the value of the bribery benefits viewed by both Jensen and non-Jensen firms, then Jensen and non-Jensen firms might be both equally willing to bribe, leading to no significant difference in their bribe payments. To illustrate this point, suppose that the privilege of raising RMB 10 million funds through rights issues is worth RMB 1.5 million for a Jensen firm, while it is worth only RMB 1 million for a non-Jensen firm. For firms to gain the recommendation for rights issues, corrupt officials demand payment of a minimum bribe of RMB 1.2 million prior to 2001. In this case, the Jensen firm would bribe, whereas the non-Jensen firm would not be willing to pay the bribe under decentralization. If the minimum bribe payment demanded by corrupt officials is reduced to RMB 0.8 million after 2001, then both the Jensen and non-Jensen firms would be willing to bribe. Our results imply that the decentralized regulatory system exacerbates corruption, making the effects of firms' Jensen agency problems more pronounced under decentralization. The estimation results for the general model that includes all the three major explanatory variables further confirm our findings based on each of the three models.

We also find some significant results for the control variables in the regressions. As expected, the implicit costs of rights offerings for firms are positively associated with the average return on equity in the 3 years prior to rights offerings, since the estimated coefficient on *ROE* is positive and significant at the 1% level. This is true even after termination of the decentralized regulation for rights offerings. Note that public officials can demand a higher bribe from highly profitable firms than from less profitable firms, as highly profitable firms are better able to pay the bribe (Svensson, 2003). Our results are also in line with the findings in many previous studies (Clarke and Xu, 2004; Rand and Tarp, 2010; Wu, 2009b).

The coefficients on the variable *Tax* are insignificant for both the sub-periods before and after 2001, implying that tax burden does not impact implicit costs of rights offerings for all firms. This might be because the average tax rate for the sample companies is only 16.94%, substantially lower than the norm of 33% for Chinese firms during the same time period. Thus, most sample companies enjoy preferential tax treatment (Wu, 2009a). In fact, of all sample companies, only 3% have a tax rate of equal to or higher than 33%.

The coefficient on the variable *Own* is positive and insignificant prior to 2001. This result is surprising. It is expected that non-SOEs tend to pay higher bribes than SOEs, since non-SOEs are vulnerable to bribery demands (Clarke and Xu, 2004; Fan et al., 2009). In particular, China's SOEs have stronger political connections with government officials than non-SOEs, since the executives of SOEs are directly appointed by government authorities, and some SOEs' executives were themselves politicians before taking the top executive positions in SOEs. These close political connections as well as the dominant role of SOEs in the Chinese economy enable SOEs to receive favorable treatments in the rights offering approval

process (Zhu and Lu, 2011), leading to a low incentive for China's SOEs to pay bribes. However, we note that this strong discrimination against non-SOEs under decentralized regulation may discourage non-SOEs to bribe (Tullock, 1989), as corruption does not help non-SOEs enhance their actual chances of gaining the privilege of rights offerings. This helps explain the lack of significance of the coefficient on *Own* for the sub-period prior to 2001. On the other hand, the estimated coefficient on *Own* is negative and significant after 2001, indicating that non-SOEs indeed pay higher bribes than SOEs. While the discrimination against non-SOEs in the approval process still exists after 2001, it becomes less pronounced since the new market-oriented regulation is better able to ensure firms with strong performance to be selected for rights offerings (Zhu and Lu, 2012).

The estimated coefficient on *Own_Central* is not significant regardless of the sub-period, indicating that bribes paid by centrally owned SOEs are not significantly different from those paid by locally owned SOEs. This seemingly surprising finding is due to two possible reasons. One is that the number of centrally owned SOEs in our sample is only 9% of the total observations. The other reason is that the centrally owned SOEs that participate in the competition for rights offerings are those with relatively few sources of alternative financing, and thus still have a strong incentive to bribe.

The estimated coefficient on *Capemp* is negative and significant prior to 2001, indicating that capital-intensive firms are less willing to bribe than are other firms in order to obtain the privilege of rights offerings. There are two possible reasons for this result. First, in developing countries, large and capital-intensive firms typically have strong political connections with governments, and thus are better able to obtain bank loans (Calomiris and Haber, 2011). Second, capital-intensive firms suffer less from financing constraints, given their relatively high collateral value (Hottenrott and Peters, 2012). However, the coefficient on *Capemp* is no longer significant after 2001, meaning that firms with high and low capital intensity are equally willing to bribe after 2001. This is primarily due to the fact that after 2001, the incentive of paying high bribes is substantially reduced for all firms, particularly for those with low capital intensity.

Our results also show that company size significantly and negatively impacts implicit costs of rights offerings, indicating that small firms in China pay higher bribes than do large firms. This is true for both sub-periods before and after 2001, though the size and significance for the coefficient are reduced after 2001. This is primarily because large firms are more established and connected with public officials than are small firms, and thus have stronger power to refuse public officials' demands for bribe payments (Svensson, 2003; Wu, 2009b). Another reason for this finding is that China's small firms are subject to stricter financing constraints, and typically have fewer sources of financing available compared with large firms. This is still the case even if the capital markets in the regions where the small firms are located are highly developed. Therefore, it is particularly crucial for small firms to gain approval of rights offering proposals, which gives small firms a stronger incentive to bribe public officials. A third possible reason is that bribes are measured by the implicit costs as a proportion of the gross proceeds raised through rights offerings. This may result in a higher bribe measure for small firms than for large firms, since the total proceeds raised in a rights offering are usually lower for small firms.

Our results indicate that in China old firms tend to pay higher bribes than young firms under decentralized regulation, since the coefficient on the variable *Age* is positive and significant for the sub-period prior to 2001 (Model 3 and the general model). However, this effect is not significant after 2001, although the estimated coefficient is still positive. Our finding suggests that under decentralization, China's old firms are better able to seek and capture bribery opportunities than are young firms, due to their large network of relationships with government authorities. This effect is not pronounced after 2001, as all firms have a lower incentive to bribe under the new regulatory system for rights offerings.

We find the coefficient on *Manufacture* is negative and significant for both sub-periods of our sample. This suggests that manufacturing firms typically pay lower bribes than other firms. Since the manufacturing sector plays an important role in China's GDP growth, the Chinese government has strong polices for promoting heavy industry development. Consequently, firms that operate in the manufacturing sector are treated more favorably in the approval process of rights offerings, and have a strong bargaining power for bribe payments.

Finally, we find that the coefficient on *Quota* is also insignificant for both sub-periods of our sample. A high value of *Quota* in a region corresponds to a low level of competition for rights offerings, which in turn induces firms located in the region to pay low bribes. Therefore, *Quota* is expected to be negatively related to bribe payments. However, our result shows that this is not the case. One possible reason is that in many regions the high *Quota* value is due to the particularly low total number of listed firms, which is most likely the result of the underdeveloped local economy. For instance, in 2000, 3 out of 7 listed firms in Tibet were approved for issuing rights, while only 12 out of 117 listed firms in Shanghai obtained approval. Firms located in the regions with a high *Quota* value are expected to pay low bribes; meanwhile, these firms may be also willing to pay high bribes given the low degree of marketization in the local economy. These two effects offset each other, resulting in the insignificant effect of *Quota* on bribes.

6. Robustness tests

6.1. Robustness tests for the measure of bribe payments

Our major findings depend greatly on whether the estimated implicit costs can accurately measure the bribe payments for rights offerings. This section provides various robustness tests for the measure of bribe payments. In this exercise, we consider the general regression model in which all the three major explanatory variables are included.

6.1.1. Robustness tests for the method of estimating implicit costs of rights offerings

One implicit assumption in our bribe payment estimation is that the reported direct costs of rights issues do not contain bribe payments. However, the underwriting fees may contain abnormal fees, which could be part of the bribe payments. To address this concern, we adopt the method used in Dunbar (2000) to estimate the abnormal fees in underwriting frees. More specifically, we consider the following regression:

$$Spread_{i,t} = \alpha_1 + \alpha_2 Proceeds_{i,t} + \alpha_3 \ln Proceeds_{i,t} + u_{i,t} \quad (5)$$

where $Spread_{i,t}$ is the underwriting fees reported in the prospectus of a rights offering for firm i at time t, and $Proceeds_{i,t}$ is the gross proceeds raised from the rights offering.

We run this regression, using the data on the reported underwriting fees as well as the gross proceeds obtained from the Wind database. Our regression results confirm Dunbar's (2000) finding that the two independent variables explain a significant proportion of the variation in the reported underwriting fees for rights offerings.[12] Our proxy of the abnormal fees in the reported underwriting fees is the residual from this regression.

[12] The results are not reported to save space, but are available upon request.

Table 5
Robustness tests for the measure of bribe payments.

Robustness tests for the estimation method of implicit costs of rights offerings					Abnormal management expenses as a measure of bribes		
	Abnormal frees in underwriting fees		A general specification of direct costs				
Variables	Prior to 2001	After 2001	Prior to 2001	After 2001	Variables	Prior to 2001	After 2001
Govinter	−0.0004	0.0026	−0.0293**	−0.0078	*Rights*	0.0125***	0.0646*
	(−0.33)	(0.85)	(−2.07)	(−0.35)		(3.11)	(1.71)
Bankfin	−0.0003	−0.0025	−0.0568***	−0.0778***	*Rights* × *Govinter*	−0.0093**	−0.0311
	(−0.22)	(−0.69)	(−3.78)	(−2.89)		(−2.49)	(−0.80)
Jensenfirm	0.0009	−0.0000	0.0408***	0.0150	*Rights* × *Bankfin*	−0.0082**	−0.0208
	(0.95)	(−0.01)	(3.36)	(0.92)		(−2.22)	(−0.47)
ROE	−0.0002**	−0.0007*	0.0050***	0.0120***	*Rights* × *Jensenfirm*	0.0092**	−0.0329
	(−2.37)	(−1.67)	(4.67)	(4.04)		(2.48)	(−0.84)
Tax	0.0007	0.0362**	0.0207	−0.1547	*ROE*	−0.0002	0.0000
	(0.13)	(2.36)	(0.27)	(−1.34)		(−1.25)	(0.20)
Own	−0.0002	0.0010	0.0027	−0.0618***	*Tax*	0.0290**	0.0062
	(−0.16)	(0.39)	(0.15)	(−3.25)		(2.14)	(0.12)
Own_Central	−0.0002	−0.0017	0.0116	−0.0131	*Capemp*	−0.0000	0.0000
	(−0.14)	(−0.52)	(0.52)	(−0.54)		(−0.49)	(0.24)
Capemp	0.0000	0.0000	−0.0004**	−0.0001	*Scale*	−0.0012	0.0005
	(0.14)	(0.29)	(−2.35)	(−1.41)		(−0.80)	(0.08)
Scale	0.0005	0.0032**	−0.0416***	−0.0241**	*Age*	0.0039*	−0.0084
	(0.66)	(2.21)	(−4.59)	(−2.23)		(1.77)	(−0.65)
Age	−0.0010	0.0013	0.0244**	0.0187	*Lev*	0.0059	0.0063
	(−1.10)	(0.70)	(2.11)	(1.35)		(0.82)	(0.27)
Manufacture	0.0001	0.0018	−0.0252**	−0.0511***	*Own*	0.0024	−0.0012
	(0.08)	(0.90)	(−2.03)	(−3.33)		(0.71)	(−0.08)
Quota	0.0100*	0.0227	−0.0598	0.2449	*Own_Central*	−0.0018	0.0030
	(1.80)	(0.74)	(−0.83)	(1.06)		(−0.44)	(0.18)
Constant	−0.0036	−0.0565*	0.8682***	0.4810**	*Largest*	−0.0032	0.0310
	(−0.25)	(−1.80)	(4.61)	(2.04)		(−0.43)	(0.81)
Year control	Y	Y	Y	Y	*Mhold*	0.0067	−0.0006
Area control	Y	Y	Y	Y		(0.47)	(−0.23)
Adjusted R^2	0.2010	0.4041	0.1910	0.4531	*Board*	0.0100**	0.0000
F statistics	5.1734	5.0076	4.9164	5.8964		(2.46)	(0.00)
Observations	366	131	366	131	*Indep*	−0.0023	0.0731
						(−0.11)	(1.46)
					Manufacture	0.0003	0.0037
						(0.15)	(0.29)
					GDPgrowth	−0.0002**	0.0004
						(−2.26)	(0.52)
					Constant	−0.0025	−0.0496
						(−0.09)	(−0.32)
					Year control	Y	Y
					Province control	Y	Y
					Adjusted R^2	0.0668	0.0605
					F statistics	2.5068	2.5241
					Observations	1074	1207

This table presents the estimation results for the regression model in which the dependent variable is abnormal fees in the underwriting fees, for the regression when the direct costs of rights offerings are estimated based on a general specification, as well as for the model in which abnormal management expenses are used as an alternative measure of bribe payments. The after 2001 sub−period includes 2001. *Govinter* is a dummy variable with a value of 1 if the degree of local government intervention in the economy in a region is low, and 0 otherwise. *Bankfin* is a dummy variable with a value of 1 if degree of competitiveness in the financial industry in a region is high, and 0 otherwise. *Jensenfirm* is a dummy variable with a value of 1 if a firm is identified as a Jensen firm, and 0 otherwise. *ROE* is the average of the firm's returns on equity in the three years prior to a rights offering. *Tax* is the average of the firm's taxes scaled by pre-tax profits in the 3 years prior to a rights offering. *Own* is a dummy variable, which is equal to 1 if the firm is considered state-owned, and 0 otherwise. *Own_Central* is a dummy variable, which is equal to 1 if the firm is considered a centrally owned SOE, and 0 otherwise. *Capemp* is the firm's capital stock (in RMB 10,000 s) per employee in the previous year. *Scale* is the logarithm of total assets in the previous year. *Age* is defined as the logarithm of the number of years since the firm was founded. *Manufacture* is a dummy variable, which equals 1 if the firm under consideration is in the manufacturing industry, and equals 0 otherwise. *Quota* is defined as the quota of rights offerings assigned to a local government scaled by the total number of listed firms in its jurisdiction. *Rights* is a dummy variable, which is equal to 1 if the firm issues rights in a given year, and 0 otherwise. *Lev* is defined as the ratio of debt to assets for the firm. *Largest* is the proportion of total shares held by the largest shareholder in the firm. *Mhold* is the proportion of total shares held by corporate executives. *Board* is the logarithm of the number of board members in the firm. *Indep* is the proportion of outside independent directors on the board of directors. *GDPgrowth* is the GDP growth rate in a given province. *t*-values are in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

We then turn to an examination of whether the independent variables in Eq. (4) have a significant explanatory power for the abnormal fees estimated from Eq. (5). Intuitively, if the abnormal fees are uncorrelated with the major explanatory variables in our model, they are unlikely to be part of the bribe payments. The results in Table 5 indicate that the coefficients on *Govinter*, *Bankfin*, and *Jensenfirm* are indeed insignificant, regardless of the sub-period under consideration. Thus, our results remain robust when we consider the possible abnormal fees in the reported issuing costs.

The specification for the direct cost of rights offerings may also impact the accuracy of the estimated implicit costs. To test the robustness of our results, we consider a general specification form, and re-estimate the implicit costs of rights offerings. More specifically, following Li and Zhang (2009), the direct costs function is given by

$$\psi(NE_{i,t}, K_{i,t}) = (b_2/2)(NE_{i,t}/K_{i,t})^2 K_{i,t} + (b_3/2)(NE_{i,t}/K_{i,t})^3 K_{i,t}. \quad (6)$$

Finally, we re-run the regression and report the results in Table 5. These results are in line with those reported in Table 4, indicating that our findings are not affected by the specification of direct costs of rights offerings in the estimation procedure.

Table 6
Regression results when alternative measures of the explanatory variables are used in the model.

Panel A: results for Models 1–3

Variables	Under decentralized regulation			After the termination of decentralized regulation		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Govinter_R	−0.0255*			0.0036		
	(−1.69)			(0.12)		
Bankfin_R		−0.0325**			−0.0412*	
		(−2.16)			(−1.83)	
Jensenfirm_R			0.0486***			−0.0067
			(3.09)			(−0.45)
ROE	0.0055***	0.0053***	0.0053***	0.0107***	0.0119***	0.0107***
	(5.25)	(5.13)	(5.11)	(3.77)	(4.21)	(3.81)
Tax	−0.0073	−0.0154	−0.0026	−0.0791	−0.1063	−0.0760
	(−0.10)	(−0.21)	(−0.03)	(−0.71)	(−0.96)	(−0.68)
Own	0.0040	0.0024	0.0045	−0.0608***	−0.0599***	−0.0604***
	(0.23)	(0.14)	(0.27)	(−3.19)	(−3.23)	(−3.21)
Own_Central	0.0125	0.0136	−0.0012	−0.0055	−0.0075	−0.0050
	(0.57)	(0.63)	(−0.06)	(−0.24)	(−0.33)	(−0.22)
Capemp	−0.0004***	−0.0004***	−0.0004***	−0.0001	−0.0001	−0.0001
	(−2.61)	(−2.68)	(−2.75)	(−1.45)	(−1.51)	(−1.44)
Scale	−0.0451***	−0.0465***	−0.0433***	−0.0258**	−0.0260**	−0.0262**
	(−5.10)	(−5.27)	(−4.93)	(−2.41)	(−2.47)	(−2.45)
Age	0.0178	0.0173	0.0094	0.0138	0.0166	0.0132
	(1.58)	(1.55)	(0.84)	(1.01)	(1.22)	(0.96)
Manufacture	−0.0330***	−0.0291**	−0.0311***	−0.0493***	−0.0505***	−0.0508***
	(−2.73)	(−2.40)	(−2.60)	(−3.22)	(−3.37)	(−3.29)
Quota	−0.0322	−0.0877	−0.0461	0.2429	0.2599	0.2326
	(−0.46)	(−1.24)	(−0.68)	(1.03)	(1.14)	(1.01)
Constant	0.9565***	0.9918***	0.9087***	0.5067**	0.5082**	0.5211**
	(5.24)	(5.43)	(5.01)	(2.15)	(2.20)	(2.21)
Year control	Y	Y	Y	Y	Y	Y
Area control	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.1419	0.1463	0.1580	0.4291	0.4459	0.4301
F statistics	4.0172	4.1277	4.4257	5.8854	6.2311	5.9048
Observations	366	366	366	131	131	131

Panel B: results for the general model

Variables	Under decentralized regulation			After the termination of decentralized regulation		
	H1	H2	H3	H1	H2	H3
Govinter_R	−0.0181			0.0051		
	(−1.22)			(0.18)		
Bankfin_R		−0.0283*			−0.0407*	
		(−1.90)			(−1.79)	
Jensenfirm_R			0.0425***			−0.0112
			(2.74)			(−0.77)
Govinter		−0.0259*	−0.0250*		−0.0153	−0.0053
		(−1.90)	(−1.85)		(−0.69)	(−0.24)
Bankfin	−0.0511***		−0.0495***	−0.0749***		−0.0750***
	(−3.53)		(−3.44)	(−2.93)		(−2.85)
Jensenfirm	0.0388***	0.0382***		0.0148	0.0162	
	(3.36)	(3.27)		(0.94)	(1.00)	
ROE	0.0050***	0.0051***	0.0051***	0.0116***	0.0111***	0.0123***
	(4.82)	(5.02)	(5.08)	(3.95)	(3.78)	(4.43)
Tax	0.0066	0.0061	0.0188	−0.1555	−0.0993	−0.1529
	(0.09)	(0.08)	(0.26)	(−1.39)	(−0.89)	(−1.37)
Own	0.0028	0.0025	0.0016	−0.0615***	−0.0602***	−0.0628***
	(0.17)	(0.15)	(0.10)	(−3.32)	(−3.20)	(−3.41)
Own_Central	0.0184	0.0108	0.0004	−0.0107	−0.0143	−0.0088
	(0.87)	(0.50)	(0.02)	(−0.47)	(−0.60)	(−0.38)
Capemp	−0.0003**	−0.0004**	−0.0004***	−0.0001	−0.0001	−0.0001
	(−2.29)	(−2.46)	(−2.76)	(−1.41)	(−1.40)	(−1.57)
Scale	−0.0414***	−0.0430***	−0.0418***	−0.0237**	−0.0250**	−0.0258**
	(−4.81)	(−4.93)	(−4.85)	(−2.25)	(−2.34)	(−2.48)
Age	0.0226**	0.0228**	0.0148	0.0176	0.0184	0.0160
	(2.05)	(2.05)	(1.33)	(1.32)	(1.34)	(1.19)
Manufacture	−0.0269**	−0.0265**	−0.0251**	−0.0497***	−0.0484***	−0.0533***
	(−2.28)	(−2.21)	(−2.12)	(−3.33)	(−3.20)	(−3.54)
Quota	−0.0480	−0.0469	−0.0870	0.2424	0.2618	0.2363
	(−0.69)	(−0.66)	(−1.28)	(1.06)	(1.15)	(1.05)
Constant	0.8656***	0.8931***	0.9034***	0.4785**	0.4846**	0.5318**
	(4.84)	(4.91)	(5.07)	(2.08)	(2.08)	(2.33)

Table 6 (*continued*)

Panel B: results for the general model						
Variables	Under decentralized regulation			After the termination of decentralized regulation		
	H1	H2	H3	H1	H2	H3
Year control	Y	Y	Y	Y	Y	Y
Area control	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.1928	0.1745	0.1893	0.4643	0.4426	0.4633
F statistics	4.9629	4.5076	4.8746	6.1223	5.6917	6.1007
Observations	366	366	366	131	131	131

This table presents the estimated coefficients for the model in which the major explanatory variables are measured using different methods. *Govinter_R* is an alternative measure for the degree of local government intervention in the economy based on the average time that firms in a region spend dealing with government officials for business-related issues. It is a dummy variable with a value of 1 if the degree is low, and 0 otherwise. *Bankfin_R* is an alternative measure for the local bank financing mechanism, a dummy variable with a value of 1 if the degree of competitiveness in the financial industry in a region is high, and 0 otherwise. *Jensenfirm_R* is an alternative measure of the severity of a firm's Jensen agency problem. It is a dummy variable with a value of 1 if the proportion of executives' shareholdings in total shares in a firm is equal to 0, and 0 otherwise. *ROE* is the average of the firm's returns on equity in the 3 years prior to a rights offering. *Tax* is the average of the firm's taxes scaled by pre-tax profits in the 3 years prior to a rights offering. *Own* is a dummy variable, which is equal to 1 if the firm is considered state-owned, and 0 otherwise. *Own_Central* is a dummy variable, which is equal to 1 if the firm is considered a centrally owned SOE, and 0 otherwise. *Capemp* is the firm's capital stock (in RMB 10,000 s) per employee in the previous year. *Scale* is the logarithm of total assets in the previous year. *Age* is defined as the logarithm of the number of years since the firm was founded. *Manufacture* is a dummy variable, which equals 1 if the firm under consideration is in the manufacturing industry, and equals 0 otherwise. *Quota* is defined as the quota of rights offerings assigned to a local government scaled by the total number of listed firms in its jurisdiction. *t*-values are in parentheses. H1, H2, and H3 stand for Hypotheses 1, 2, and 3, respectively. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

6.1.2. An alternative measure of bribe payments

Cai et al. (2011) document that Chinese firms usually use the entertainment and travel costs (ETCs) under the management expense accounting category to reimburse expenditures used to bribe government officials. Luo et al. (2011) further point out that abnormal management expenses (AMEs) reflect the perquisites that corporate executives command, and are partly used to facilitate corporate public relationship and partly used by management themselves.

Following the literature, in this section, we use AMEs as an alternative measure of bribe payments to examine whether our findings are robust to other measures of bribe payments. This is because Chinese listed firms generally disclose overall management expenses rather than the detailed information about ETCs. In particular, we use the following model to estimate AMEs:

$$Mexpense_{i,t} = \alpha_0 + \alpha_1 \Delta Sale_{i,t} + \alpha_2 PPE_{i,t} + \alpha_3 Inv_{i,t} + \alpha_4 LnEmployee_{i,t} + u_{i,t} \quad (7)$$

where $Mexpense_{i,t}$, $\Delta Sale_{i,t}$, $PPE_{i,t}$, and $Inv_{i,t}$ are, respectively, the management expenses, increases in sales, net fixed assets, and inventories for firm *i* in year *t*, scaled by one-year lagged total assets for the firm. $LnEmployee_{i,t}$ is the logarithm of the number of employees for firm *i* in year *t*. Our proxy for AMEs is the residual from this regression.

Given that AMEs proxy the aggregate bribe payments and may also include management's perquisites (Luo et al., 2011), AMEs are not a direct measure of the bribes paid by listed firms for rights offerings. To detect the effects of our major variables on the bribe payments for rights offerings, we run the following regression:

$$AME_{i,t} = \beta_0 + \beta_1 Rights_{i,t} + \beta_2 Rights_{i,t} \times Govinter_{i,t} + \beta_3 Rights_{i,t} \times Bankfin_{i,t} + \beta_4 Rights_{i,t} \times Jensenfirm_{i,t} + \sum_l \eta_l Control^l_{i,t} + \sum_j \lambda_j Year^j_{i,t} + \sum_k \gamma_k Province^k_{i,t} + u_{i,t} \quad (8)$$

where $Rights_{i,t}$ is a dummy variable, which is equal to 1 if firm *i* issues rights in year *t*, and 0 otherwise. In addition to $ROE_{i,t}$, $Tax_{i,t}$, $Capemp_{i,t}$, $Scale_{i,t}$, $Age_{i,t}$, $Own_{i,t}$, $Own\_Central_{i,t}$, and $Manufacture_{i,t}$ considered in Eq. (4), we also consider 6 other control variables (Cai et al., 2011; Luo et al., 2011), which are defined as follows. $Lev_{i,t}$ is defined as the ratio of debt to assets for firm *i* in year *t*-1. $Largest_{i,t}$ is the proportion of total shares held by the largest shareholder in the firm. $Mhold_{i,t}$ is the proportion of total shares held by corporate executives in the firm. $Board_{i,t}$ is the logarithm of the number of board members in the firm. $Indep_{i,t}$ is the proportion of outside independent directors on the board of directors in the firm. $GDPgrowth_{i,t}$ is the GDP growth rate in the province where firm *i* is located.

The data for our sample period are obtained from Wind and CCER databases. We find that the AME estimates are indeed higher for firms with rights offerings than for those firms without rights offerings, which confirms our conjecture. The estimation results of Eq. (8) are also reported in Table 5. The estimated coefficients on *Rights* are significantly positive for both sub-periods before and after 2001, indicating that firms bribe officials to gain recommendations or approvals for their rights offering applications. Our three hypotheses still hold under the decentralized regulatory system, as we note that coefficients on the three cross-product terms are all significant with the expected sign before 2001. The estimated coefficients on the cross-product terms for the sub-period after 2001 also confirm our previous findings, except that the coefficient on *Rights* × *Bankfin* is now insignificant.

6.2. Measurement errors in key explanatory variables

The ways in which the three explanatory variables are measured might also bias our results. To examine this issue, we use an alternative measure for each of these three factors and re-run the regressions. For this purpose, we use the local government intervention index developed by Fan et al. (2010) to measure the degree of local government intervention in the economy. This index is constructed based on the average time that firms in a region spend dealing with government officials for all business-related issues. The score for each region is standardized from 0 to 10, with 0 being the longest time and 10 being the shortest. If a province's score is lower than the sample mean, then the degree of local government intervention in the economy is considered high and the variable *Govinter_R* is set equal to 0. If otherwise, then *Govinter_R* is set equal to 1. For the degree of marketization of the local bank financing mechanism, we use the competitiveness index for the financial industry developed by Fan et al. (2010) as an alternative measure. According to Fan et al. (2010), the competiveness in the financial industry in a region is measured by the ratio of the total deposits in non-state-owned financial institutions to the total deposits in all financial institutions in the region. A high/low ratio corresponds to a high/low degree of competitiveness in the financial industry in a region. A score on a scale of 0–10 (0 being the least competitive, and 10 being the most competitive) is assigned to a region based on its ratio relative to the ratios in other regions.

If the score is higher than the sample mean, then the local financial industry is considered highly competitive in the region, and we set the variable *Bankfin_R* equal to 1. If otherwise, then *Bankfin_R* is set equal to 0. Finally, we use the proportion of executives' shareholdings in total shares as an alternative measure of the degree of severity of a firm's corporate agency problems. This data is from CCER. If the proportion is equal to 0, then the firm's agency problems are severe and *Jensenfirm_R* is defined as 1; otherwise it is 0. The results in Table 6 show that our conclusions still hold qualitatively even if these alternative measures for our explanatory variables are used in the analysis.[13]

7. Conclusions

Most previous studies on corruption use either country-level perception-based corruption indices or firm-level survey-based corruption data. However, the use of country-level data cannot reveal micro-determinants of corruption due to its aggregate nature, and is limited in its ability to explain the within-country variation in corruption across individual agents under the same regulations. Due to the fact that survey questions are usually asked in a standard manner, the firm-level survey-based corruption data does not contain detailed information about the components of bribe payments, and thus, this type of data can only measure firm specific aggregate corruption (Sequeira, 2012). The aggregate nature of corruption data explains why the main focus of the previous research on decentralization and corruption is on how political or fiscal decentralization impacts bribe extraction by corrupt local officials as a result of the interactions between the central government and local governments. In contrast, this paper adopts a structural method to estimate firms' bribe payments for rights offerings under the decentralized regulatory system for rights offerings implemented prior to 2001 in China, and investigates how and why bribe payments vary as a result of the interactions between listed firms and local officials under decentralization. Our research represents an attempt to derive and analyze non-aggregate corruption data, and can help us better understand the micro-dynamics of corruption.

Our study adds to the debate on decentralization and corruption by showing that regulatory decentralization exacerbates corruption. However, bribe payments vary across firms, depending on the characteristics of listed firms, as well as various regional institutional and economic environmental factors. More specifically, we document that firms located in regions where the degree of local government intervention in the economy is high pay higher bribes. This is because local officials are more likely to demand higher bribes if a local government has greater control power over the firms under its jurisdiction. We also find that firms' bribe payments are negatively related to the degree of marketization of the local bank financing mechanism. There are more sources of financing available for firms located in regions where the local bank financing mechanism is more market-oriented, and thus, these firms' opportunity costs of not being recommended and approved for rights offerings are low. Moreover, we find that firms with serious Jensen agency problems pay higher bribes than do other firms, as Jensen firms over-value the benefits from bribery.

After the termination of decentralized regulation in 2001, the room for local officials to extract bribes and the incentives for listed firms to bribe are both reduced. Our results show that after 2001 China's listed firms' bribe payments are reduced and the variation in bribe payments can no longer be explained by the degree of local government intervention and the degree of severity of firms' Jensen-type agency problems.

[13] The only exception is that prior to 2001 the estimated coefficient for *Govinter_R* is insignificant in the general model.

Our findings shed light on how the delegation of public authority and corporate governance problems exacerbate firms' corrupt behavior under regulatory decentralization, and these have clear policy implications for governments' anti-corruption endeavors. First, reducing the degree of local governments' intervention in the economy and improving the degree of marketization of resource allocations help decrease local officials' abilities to extract bribes from firms. Second, improving the market environment and facilitating firms' access to financial resources help lower firms' opportunity costs of refusing to bribe, thereby reducing corruption. Third, improving corporate governance and alleviating agency problems in firms also help firms properly assess the benefits and costs of bribing, reducing firms' incentives to bribe public officials.

One limitation of our study is that the corruption measure is indirect. The accuracy of bribe payments estimated using the model-based method depends on the features of the structural model and the model assumptions. While an alternative model specification and an alternative measure for bribe payments are used to test the robustness of our findings, estimation errors remain a concern. Future research should focus on methodological development in the measurement of non-aggregate corruption and the possible biases associated with each method.

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Appendix A. The procedure for estimating implicit costs of rights offerings

First, we parameterize Eq. (3). To parameterize the marginal product of capital, we follow Whited and Wu (2006) and assume that firms set output price as a constant mark-up, μ, over marginal cost. Constant returns to scale imply that the marginal product of capital can be specified as $\Pi'_K(K_{i,t}, \varsigma_{i,t}) = (Y_{i,t} - \mu COST_{i,t})/K_{i,t}$, where $Y_{i,t}$ is output, and $COST_{i,t}$ is variable costs ("costs of goods sold" plus "selling, general, and administrative expenses").

New investment incurs costs of adjusting firms' capital stock, such as fees for installing new equipment and training workers. To parameterize the adjustment cost function $C(I_{i,t}, K_{i,t})$, we follow Whited and Wu (2006), and use a function form that is linearly homogeneous in investment and capital but allows for nonlinearities in the marginal adjustment cost function. Namely, $C(I_{i,t}, K_{i,t}) = (a_1 + (a_2/2)(I_{i,t}/K_{i,t})^2 + (a_3/3)(I_{i,t}/K_{i,t})^3)K_{i,t}$, where a_1, a_2, and a_3 are the parameters to be estimated. The adjustment cost function is increasing and convex in $I_{i,t}$, is decreasing in $K_{i,t}$, and exhibits constant returns to scale.

Following Chirinko and Schaller (2004), the managers' discount factor is specified as $\beta^M_{i,[t,t+1]} = 1/\left[(1 + r^S_{i,[t,t+1]})(1 + \xi + \Gamma_{i,t}\varphi)\right]$, where $\Gamma_{i,t}$ is an indicator variable equal to 1 if a firm is classified as having serious Jensen agency problems (Jensen firm), and 0 otherwise. $r^S_{i,[t,t+1]}$ is the shareholders' discount rate estimated using Chirinko and Schaller's (2004) method, and $\varphi < 0$ is the difference between managers' and shareholders' discount rates. ξ captures

all other factors that may impact the discount factor. For instance, the discount rates for tradable and non-tradable shares in China's listed firms can differ. With ξ, we can estimate the overall discount rate for both tradable and non-tradable shares.

To raise external equity funds, firms incur quadratic direct costs, which are specified as (Li and Zhang, 2009; Liu et al., 2007):

$$\psi(NE_{i,t}, K_{i,t}) = \frac{b_2}{2}\left(\frac{NE_{i,t}}{K_{i,t}}\right)^2 K_{i,t} \tag{A.1}$$

where $b_2 > 0$ measures the degree of firms' financial constraints. Firms with a higher/lower b_2 are more/less financial constrained. The financing cost function is increasing and convex in $NE_{i,t}$, and is decreasing in $K_{i,t}$.

Second, based on the specifications in the first step, we rearrange Eq. (3) and replace the expectations operator with an expectation error $e_{i,t+1}$. This gives us the following equation:

$$\begin{aligned}&\frac{1}{(1+r^S_{i,[t,t+1]})(1+\xi+\Gamma_{i,t}\varphi)(1-b_2 NEK_{i,t+1})}\left\{\frac{Y_{i,t+1}-\mu COST_{i,t+1}}{K_{i,t+1}} - a_1 + \frac{a_2}{2}(IK_{i,t+1})^2\right.\\&\left.+\frac{2a_3}{3}(IK_{i,t+1})^3 + \frac{b_2}{2}(NEK_{i,t+1})^2 + (1-\delta_{i,t+1})\left[1 + a_2 IK_{i,t+1} + a_3(IK_{i,t+1})^2\right]\right\}\\&-\left[1 + a_2 IK_{i,t} + a_3(IK_{i,t})^2\right]\frac{1}{1-b_2 NEK_{i,t}} = \eta_i + e_{i,t+1}\end{aligned} \tag{A.2}$$

where η_i is the fixed effect. In addition, $IK_{i,t} = I_{i,t}/K_{i,t}$, and $NEK_{i,t} = NE_{i,t}/K_{i,t}$.

Third, we use the generalized method of moments to estimate Eq. (A.2), because Eq. (A.2) contains contemporaneous and future variables that may be correlated with the error term.[14] Finally, we plug the estimated parameters into Eq. (A.1) to estimate the actual direct costs of a rights offering. The implicit costs of the rights offering are obtained by subtracting the reported direct costs from the estimated actual direct costs.

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[14] The instruments include all of the 2-year lagged variables in the Euler equation, a constant, as well as the following 2-year lagged variables scaled by total assets at the beginning of year t – 2: inventory, total liabilities, total short-term assets, net earnings, and taxes (Liu and Siu, 2011).