China Economic Review 30 (2014) 520–529

Contents lists available at ScienceDirect

China Economic Review

Who posts performance bonds and why? Evidence from China's CEOs☆

Alex BRYSON [a,b], John FORTH [a], Minghai ZHOU [c,*]

[a] National Institute of Economic and Social Research, United Kingdom
[b] Centre for Economic Performance, London School of Economics and Political Science, United Kingdom
[c] University of Nottingham Ningbo China, China

ARTICLE INFO

Article history:
Received 26 September 2012
Received in revised form 2 March 2014
Accepted 2 March 2014
Available online 12 March 2014

JEL classification:
G34
J31
J33
M12
M52
O16
P31

Keywords:
Performance bonds
Security deposits
Executive compensation
State-ownership
Agency theory

ABSTRACT

Despite their theoretical value in tackling principal–agent problems at low cost to firms there is almost no empirical literature on the prevalence and correlates of performance bonds posted by corporate executives. We show that they are an important feature in today's CEO labour market in China: around one-tenth of corporations deploy performance bonds and they are equivalent to around 14% of CEO cash compensation. Consistent with principal–agent theory bonds are negatively associated with firm sales volatility. The complementarity between bonds and other incentive mechanisms such as bonuses and stock holding is consistent with optimal reward structures for multi-tasking agents. Those CEOs posting bonds are higher in the Communist Party ranks, were promoted via tournaments, and run larger firms, findings consistent with using bonds as an incentive to attract and retain the most able workers. Although state-owned enterprises are just as likely as privately owned ones to use bonds in CEO contracts, some of the theoretical predictions which assume profit-maximising firms do not hold where the state has an ownership stake.

1. Introduction

The prototypical solution to the principal–agent problem is a performance bond. This bond or security deposit is an "up front" payment by a CEO to the firm, which is recoverable, with interest, conditional on good behaviour. It discourages malfeasance because the CEO puts personal wealth in jeopardy, knowing that there is some probability that the bond will not be repaid if she engages in unwanted behaviour. In principle bonds should be attractive to firms because the diminishing marginal utility of money makes the monetary reward required to induce good behaviour larger than the monetary penalty needed to discourage bad behaviour.

☆ Acknowledgements: We thank Risto Herrala, Tor Eriksson, Niels Westergaard-Nielsen, and the participants at the 2012 Chinese Economists Society Conference in Kaifeng, the 2012 EALE Conference in Bonn, and a NIESR seminar for the comments and the ESRC (grant RES-538-25-0029) and the NSFC (grant 71161130175) for the funding.
* Corresponding author at: University of Nottingham Ningbo China, 199 Taikang East Road, Ningbo, 315100, China.
E-mail addresses: a.bryson@niesr.ac.uk (A. Bryson), j.forth@niesr.ac.uk (J. Forth), Minghai.Zhou@nottingham.edu.cn (M. Zhou).

http://dx.doi.org/10.1016/j.chieco.2014.03.001

Nevertheless, the principal–agent literature has largely ignored bonds, instead focusing almost exclusively on monetary rewards for good performance. Almost nothing is known about the incidence of performance bonds, the circumstances in which they are paid, the sorts of executives who pay bonds, how bonds relate to other aspects of executive compensation, and their implications for workers and firms. We are able to fill this gap in the literature using unique data on Chinese corporations which contains information on whether performance bonds are paid and the size of those bonds.

It turns out that performance bonds are relatively common, covering just over one-in-ten CEOs working in Chinese firms. In 2003, when our survey data were collected, their mean (median) value was equivalent to 215 (71) per cent of the mean (median) wage of workers, or 14 (6) per cent of the cash compensation received by the CEO of a listed corporation. They are therefore an important but hitherto overlooked component of the way in which CEOs in China are paid. We show that their correlates are consistent with propositions from principal–agent and incentive theories, especially in private sector firms.

In Section 2 we present the theory and sparse empirical evidence on the use of performance bonds. Section 3 identifies the hypotheses we test and Section 4 describes the data. Section 5 outlines our theoretical approach. Section 6 presents results and Section 7 concludes.

2. Theory and empirical evidence

Principals can choose to incentivise agents by penalising unwanted behaviour or rewarding desirable behaviour. The bulk of the recent theoretical and empirical literature has focused on the optimal means of rewarding desirable behaviour. In the case of corporate executives this has entailed careful examination of the role of stock holding, stock options, the elasticity of bonuses with respect to firm performance, and tournament prizes (Murphy, 1999). The explicit penalisation of unwanted behaviour is manifest through the dismissal threat and the threat of merger or acquisition which often puts incumbents' jobs in jeopardy. Early agency theorists proposed a third option for penalising agents, namely a performance bond (or security deposit). Principals may require agents to put personal wealth in jeopardy, up front, as a bond which is returned, with interest, if the norm of good behaviour is attained, or seized and the worker fired if not. One of the earliest models was Becker and Stigler's (1974) model in which bonds were proposed as a means of protecting against bribing law enforcers.

Early agency theorists suggested that penalties were efficient incentives because the marginal utility of money means that the monetary reward required to induce good behaviour is larger than the monetary reward required to discourage bad behaviour (Mirrlees, 1976). Furthermore a bond may have a greater incentive effect than a reward of similar size if, as predicted in prospect theory, agents may attach greater weight to the potential downside of loss than the upside of a similar gain (Kahneman & Tversky, 1979).

Bonds may also be valued by firms if, like performance pay, they induce worker self-selection (Oyer & Schaefer, 2011: 1973). In a world where workers differ in their reliability, those posting a bond are signalling their reliability, which will be prized by the firm (Parsons, 1986: 800–802). Incentive contracts also induce workers to sort on ability (Prendergast, 1999: 14–15; Lazear, 1986). Empirical research suggests worker sorting on ability accounts for over half of the productivity gains arising from piece rate working (Lazear, 2000). It is also possible that more able workers will accept performance bonds if they are more confident in meeting their contractual requirements.

In emerging market economies contracting parties are liable to rely more heavily on trust-based relations for contract enforcement. In China the trusting relations underpinning social and economic transactions are known as *guanxi*. Reliance on *guanxi* to enforce contracts is only possible where economic actors can tap into pre-existing networks, either in the firm (via internal appointments), the Communist Party, the family (via family ownership) or in smaller social circles (eg. smaller firms). Performance bonds can act as a substitute for these arrangements where they are unavailable to the firm. Indeed, according to Fehr and List (2004) threats to penalise shirking via mechanisms such as bonds actually have the potential to engender trust-based relationships. In a laboratory experiment using CEOs as subjects, they find that the contracts liable to generate most trust are those with a clear threat component, but one which the principal chooses not to use. The contracts generating least trust are those in which the principal resorts to the threat: these generate lower trust than contracts in which the threat component is absent. The implication is that there is value in having a bond in place, but only if the bond does not need to be retained.

We are aware of only four studies which present empirical data on the prevalence and correlates of executive performance bonds. All four focus on the market for corporate executives in Chinese state owned enterprises (SoEs) in the 1980s, with three of them using the same data. Groves, Hong, McMillan, and Naughton (1995) describe the emergence of a functioning labour market for executives in the 1980s. At the beginning of the period what the authors call the state's "industrial bureau" operated as principal in a "classic principal–agent relationship" (p. 880), acting essentially as a central human resource management structure for what are characterised as branches of a single enterprise, the state. But in the early 1980s the state introduced reforms "directed at improving the efficiency of enterprises by replacing direct control from above with managerial incentives" (p. 874). This entailed the gradual commercialisation of SoEs and their part privatisation, with key innovations including multi-year managerial contracts and experimentation with the auctioning of managerial contracts. Along with Mengistae and Xu (2004), Groves et al. studied a sample of 769 SoEs in the 1980s and found bonds to be widespread in SoEs in the 1980s. Mengistae and Xu noted that the percentage of SoEs requiring performance bonds averaged 8% over the period 1980–1989, but fluctuated markedly, standing at over one-quarter by the end of this period. These two studies found that bonds were sizeable relative to executives'

annual salaries, with a median value equivalent to roughly three times the average wage in the SoE sector. Groves et al. also noted anecdotal evidence that bonds were "genuinely at risk" (p. 879), thus offering a real threat to underperforming executives.[1]

Bai and Xu (2005) also present evidence on the incidence and role of performance bonds in China's SoEs. Their data comprised a panel of contracts for 300 CEOs in manufacturing enterprises in four provinces in China in the late 1980s. Consistent with the two studies cited above, 16% of their CEOs posted bonds, often several times the value of their annual salaries.

Shirley and Xu (2001) is the only paper which examines the effects of bonds on firm performance. Using the SoE panel data set used by Groves et al. (1995) Shirley and Xu (2001: 190) find that bonds are crucial to the success of multi-incentive performance contracts for CEOs, since they appear to be a precondition for the success of these contracts in increasing firm productivity. They interpret this finding as supporting a key tenet of the principal–agent theory that incentive contracts are most effective when parties to the contract are able to signal their commitment to one another.

These papers are based on data from the 1980s which is confined to SoEs. This is unfortunate given the transformation of the Chinese economy in the meantime, a key feature being the growth of private sector enterprise following the state's massive privatisation programme (Xu, 2011). This privatisation of the economy has not simply led to a 'westernization' of incentive contracts however. In spite of the marketisation of the Chinese economy in recent years there are a number of ways in which the incentive options available to firms in China in the early 2000s differed somewhat from those used in the United States and Europe. CEO compensation in the United States was dominated by stock options. In Europe, a substantial proportion of total compensation was based on Long-term Incentive Plans (LTIPs), although share options have become increasingly important there too (Conyon, Fernandes, Ferreira, Pedro, & Murphy, 2013). In China, on the other hand, firms were unable to offer stock options until 2006 and the trading of stock holdings was tightly restricted until the early 2000s. Thus, cash compensation and bonuses constitute a greater proportion of total compensation in China than they do in the USA and Europe. These distinctive elements of executive compensation mean that it is instructive to consider again the role of bonds in CEO compensation in China.

3. Hypotheses

It is against this backdrop that we test five hypotheses on the correlates of CEO performance bonds in China. Our aim is to establish how significant performance bonds are in China's executive market today, and whether the incidence of bond contracts for executives in China can be explained using insights from principal–agent and incentive theories which dominate the literature on executive contracts in the Western literature. The data we use to test these hypotheses are described in Section 4.

3.1. Bonds complement other managerial incentives

If bonds and incentive payments are simply alternative mechanisms for aligning the interests of agents with those of principals we might expect them to substitute for one another. Groves et al. (1995) argue that when first used in China's SoEs in the 1980s bonds were analogous to stock options in the West "giving (executives) a stake in their firm's performance" (p. 888). They are thus conceived as "substituting for other managerial incentives found in established managerial labor markets" (p. 879) and were particularly valuable in the absence of a mature market in executives which might have enabled selection on merit based on a proven track-record. Groves et al. find that the elasticity of pay to firm performance is lower in SoEs with bonds, a finding they interpret as evidence supporting the proposition that bonds substitute for other incentives. Mengistae and Xu (2004) confirm that pay–performance sensitivity is lower in SOEs requiring CEOs to post performance bonds "suggesting that bonds substituted pay–performance sensitivity as an incentive instrument" (p. 630).

However, in a multi-task environment CEOs may focus effort on rewarded tasks to the detriment of other job tasks (Holmström & Milgrom, 1991). Firms may respond through the use of multiple schemes which can offset one another such that agents align their behaviour more closely with principals' objectives. Bai and Xu (2005) present a theoretical framework in which they conceive of the CEO role as consisting of multiple tasks (those to improve firm performance; those to increase unobserved firm value; and those directed at private gain) which permits incentives to be either complements or substitutes. Using different data to Groves et al. (1995) and Mengistae and Xu (2004) they find that bonds are complementary to other incentives, notably pay sensitivity with respect to profitability and contract length. We test the complementarity between bonds and other managerial incentives in our more up-to-date sample covering SoEs and privately-owned firms.

3.2. Bond use is positively correlated with CEO control over firm performance

According to the principal–agent theory firms seek to achieve two competing objectives when devising executive compensation packages. First, they wish to incentivise the executive by tying his rewards to the firm's success. Second, because agents are assumed to be risk-averse (whereas the principal is risk neutral), firms offer insurance in the form of a fixed wage component, or a lower pay–performance elasticity (Rosen, 1990). Where firms operate in volatile or unpredictable environments executives are likely to give greater weight to insurance as compared with settings in which firm performance more accurately reflects the CEO's efforts. We

[1] Groves et al. (1995) illustrates how bonds can be perceived in different ways — as a stake in the firm, a market signalling device, or as a potential threat to earnings. Which particular aspect of the bond is emphasized in a particular setting is likely to depend on the context. Our investigation of bond use in China indicates that bond arrangements vary, not only in terms of the size of the deposit but also repayment schedules, and the executives covered. But in all instances the bond seems to retain the "threat" feature relevant to principal–agent theory.

proxy volatility with the coefficient of variance for firm sales in the three years prior to the survey and test whether this is negatively correlated with bonding. We also use firm age as an indicator of lower uncertainty about a firm's future performance, the assumption being the firm and its executives have more information about the firm's market conditions the longer it has been trading. We therefore anticipate a positive correlation between firm age and performance bonds (see Bai & Xu, 2005: 529 for a similar argument in relation to pay–performance sensitivity).

A firm is unlikely to offer – and the executive is unlikely to accept – a contract linking his compensation to firm performance if the CEO lacks the autonomy to make decisions affecting firm performance. Thus we anticipate a positive association between performance bonds and CEO job autonomy.

3.3. Bonds are positively correlated with CEO ability

If performance bonds induce positive self-selection in terms of CEO ability, as discussed earlier, one might expect observable traits which are positively correlated with ability to be more prevalent among those CEOs posting bonds. These include higher education, as indicated by graduate status, and a higher status in the Communist Party. The latter occurs because Party promotions are generally based on merit and ability (Li, Liu, Zhang, & Ma, 2007).

According to Rosen's (1990) marginal productivity theory the market will allocate the most talented executives to higher positions in larger firms because there is complementarity between executive talent and other workers' productivity. In hierarchical structures this talent is "magnified to greater effect by spreading it over longer chains-of-command and larger scales of operations" (Rosen, 1990:7). If we assume that the most talented executives are located in larger firms, and that bonds attract the most talented executives, we should expect a positive correlation between firm size and performance bonds.

3.4. Bonds are negatively correlated with market competition

The consequences of CEO shirking are potentially more serious for firms operating in highly competitive markets since the shortcomings of senior executives will quickly threaten firm survival and CEO dismissal. This reduces the CEO's incentive to shirk without the firm needing to incentivise his performance and monitor his actions (Hart, 1983). We therefore expect bonds to be less prevalent in firms facing intense market competition.

3.5. Bonds will be modest relative to overall CEO compensation

Becker (1968) maintains that the threat effect of any punishment is a function of size of the fine and the probability of detection. In Becker's (1968) set-up (and Fehr & List's, 2004 discussed earlier) the efficacy of bonds depends to a large extent on the probability that the bond is not retained by the principal. Unfortunately there are no data on bond retention in our survey. Indeed, the only data on bond retention by the firm we are aware of relates to Chinese SoEs in the 1980s: Shirley and Xu (2001: 173) say bonds were forfeited in 16% of cases.

There are a set of considerations that lead us to suspect that bonds will be modest in size, relative to CEO cash compensation, in China. First, sizeable bonds may dissuade applicants who could be beneficial to the corporation. For example, able applicants may be credit constrained, preventing them from applying for such posts. From the firm's perspective it may therefore be optimal for bonds to be modest in size to limit any potential adverse selection problem. Second, in emerging market settings such as China risk-averse workers may be concerned about moral hazard leading firms requiring bonds to renege on the agreement (Ritter & Taylor, 1994). Third, where performance monitoring is imperfect, executives are more likely to fear misclassification as a shirker where bonds are sizeable, since misclassification could lead to bond forfeiture (Harris & Raviv, 1979). Fourth if agents attach greater weight to the potential downside of loss than the upside of a similar gain, as predicted in prospect theory, bonds may be small relative to incentive payments for good performance. Finally, large bonds may attract risk-seeking executives, something that may not be optimal from the firm's perspective.[2] We examine the size of bonds relative to CEO compensation.

4. Data

We analyse World Bank Enterprise Data from the 2003 Investment Climate Survey (www.enterprisesurveys.org). This comprises a sample of 2400 enterprises from 18 cities (comprising 150 enterprises from 12 cities, and a further 100 from 6 cities). The survey is completed by the most senior manager at the establishment. In the survey the term "General Manager" is used instead of CEO because the term "Chief Executive Officer" was not in common usage in China at the time.

Collected in 2003, our data refer to a time point well after the initial commercialisation of SoEs in the early 1980s. An efficient labour market in executives is beginning to emerge at this point. Median tenure for CEOs in our data is 5 years and two-thirds of hires are external to the firm. Following large-scale privatisations in the 1980s and 1990s, the principal is no longer the "industrial bureau" portrayed by Groves et al. Although state ownership is still a significant factor for many firms in our data, it is not true for all. The survey covers all sectors of the economy, not just SoEs and, unlike many recent papers on CEO pay in China, it contains, but

[2] Malmendier and Tate (2005) point to the dangers of CEO overconfidence.

is not confined to publicly listed companies. The mean state ownership stake for organizations in the survey was 22%, ranging from 63% in the one-third of organizations which were SoEs, a 20 per cent stake in public listed firms, one-sixth state ownership in cooperatives, and near-zero in privately held firms. Twenty-one per cent of corporations were majority state-owned, 12% were majority foreign-owned, and the remainder were majority domestically-owned.

We discuss key aspects of the data relevant to the testing of the five hypotheses outlined above. A fuller description of data items, together with their means and standard deviations, is presented in Appendix Table A1.

4.1. CEO compensation

We have two dependent variables. The first is whether the CEO posted a security deposit; the second is the amount of any deposit paid. [3] The survey also asks about other aspects of the CEO's compensation package, allowing us to see whether bonds are complements or substitutes for other incentive mechanisms (Hypothesis 1). First, the survey establishes whether the CEO has an incentive plan linking his income to firm performance and, if so, which measures of firm performance are used. Second, where there is an incentive plan the survey establishes the elasticity of the CEO's income with respect to firm performance. Third, it asks whether the CEO holds company stocks. Fourth, it establishes whether the CEO's wage is paid annually and is thus eligible for an annual bonus subject to good performance (the Chinese phrase being "Nian Xin Zhi").[4]

Our empirical approach is to establish the unconditional and conditional correlations between bonds and these other facets of CEO compensation. In addition, from other data sources we know the amount CEOs receive in cash compensation, thus allowing us to test Hypothesis 5 regarding the relative size of the bond.

4.2. CEO control over firm performance

To test Hypothesis 2 we use three data items. To capture sales volatility we use the coefficient of variance in the firm's sales in the previous three years. A second measure of the predictability of the firm's performance is firm age as indicated by the number of years lapsed since it started up. The third measure is the CEO's job autonomy which is an additive scale running from zero to a possible maximum score of 24 (the highest observed score being 21) based on the degree of autonomy – recorded in eight banded percentages from 0–19% to 100% – on three aspects of decision making. These domains are "production decisions (output, quantity, quality, investment and so on)", "investment decisions" and "labour flexibility (hiring, firing, and wages)".

4.3. CEO ability

We use three measures to test the proposition in Hypothesis 3 that performance bonds attract high ability CEOs. The first is the CEO's educational attainment, captured by a dummy variable identifying those with a graduate or post-graduate qualification. The second is Communist Party status. The survey asks "What's the position of the General Manager in the Party?" The five pre-coded answers are Party Secretary, Deputy Party Secretary, Party Committee member/Executive member, Party member, and "not a Party member". The third measure, which is motivated by Rosen's marginal utility theory for CEOs, is the size of the firm as indicated by the number of employees in the firm.

4.4. Product market competition

Our measure of market competition used to test Hypothesis 4 is the total number of competitors faced by the firm in the previous year. The survey asks: "In 2002 [the year prior to the survey] how many competitors did you have within your main business line in the domestic market?" Pre-coded responses identify 1–3, 4–6, 7–15, 16–100 and 100+ competitors. We enter the categorical variable (coded from 1 to 5) as a linear term.

4.5. Control variables

Our models control for a number of other factors that may affect the incidence of performance bonds. All models control for industry (10 dummies) and location (18 city dummies). We identify the previous post held by the CEO. The survey asks: "Before becoming General Manager in this firm, what was his/her position…ordinary employee of the firm, deputy general manager, general manager of other firm, government official, other?" We distinguish between those who had been internally promoted (either ordinary employees or deputy general managers) and the remainder. Internal promotion is a potential indicator of tournament competition for the CEO position within the firm, which is another form of incentive firms use to recruit the most talented for the top position.

The state's ownership stake is an important influence over the degree to which executives' pay is linked to firm performance. Kato and Long (2006: 973) found that pay–performance sensitivities among Chinese publicly listed companies became stronger

[3] The respondent was asked whether the CEO "post(ed) a security deposit? If so what was the amount?".
[4] For an example of such a contract see http://english.peopledaily.com.cn/200308/04/eng20030804_121628.shtml.

as the percentage of stock owned by the state falls. Firth, Fung, and Rui (2006) found larger pay–performance sensitivities in privately-held as opposed to state-held publicly listed firms. Both results are consistent with the proposition that state ownership acts as a potential hindrance to the operation of market forces in the executive labour market. We therefore control for the percentage of the firm owned by the state and run separate analyses for state-owned and other enterprises.

5. Empirical approach

First we present some simple descriptive statistics for the incidence of performance bonds and their size. Then we run probit models estimating whether a CEO posts a performance bond or security deposit.[5]

The probit models contain the variables described in Section 4 and take the following form:

$$PB_{if} = \beta_w Comp_{if} + \beta_y \mathrm{Ind_i} + \beta_z X_f + \varepsilon_{fi} \quad (1)$$

where PB_{if} is a dummy identifying the payment of a performance bond by CEO i in firm f; $Comp_{if}$ is a vector of variables capturing the compensation package paid to CEO i in firm f; $\mathrm{Ind_i}$ is the individual CEO demographic and job attribute; and X_f is thestructural firm attribute such as industry and location; epsilon is the error term and the betas are coefficients to be estimated. In practice, the absence of panel data means that we observe only one CEO per firm and so the i and f are non-separable. We test for the significance of individual variables and assess their quantitative importance using marginal effects.

The coefficient β_w indicates whether performance bonds and other performance incentives tend to coexist. A positive coefficient may indicate that they are typically complementary.[6]

Since the rest of the performance bond literature is confined to SoEs we run separate estimates for wholly state-owned firms, those with some state ownership and those with no state ownership to see whether correlates of performance bonds differ with ownership.

6. Results

Eleven per cent of CEOs in Chinese corporations posted performance bonds in 2003 (Table 1). The figure was 16% in SOEs and 10% in privately-owned firms.

Table 2 contains probit models estimating the probability that a CEO pays a performance bond. Model (1) is our baseline model: by dropping cases with missing data, we lose 37 observations from the total sample of 2400 firms. Model (2) introduces two variables relating to the product market the firm operates in, namely the number of competitors it faces and the coefficient of variance in sales over the previous three years. This results in the loss of a further 89 observations due to missing data. The remaining three models are identical to Model (2), but they are run on three sub-groups, namely firms with no state ownership (Model 3),firms with some state ownership (Model 4) and firms that are wholly state-owned (Model 5). All models are jointly statistically significant and the Pseudo-R^2 is typically in the range 0.16–0.21.

Identical estimates are presented in Appendix Table A2, except that it is an ordered probit where the outcome has the four ordered outcomes described in Section 5 above. We discuss the results in terms of the hypotheses described in Section 3.

Hypothesis 1. Bonds complement other managerial incentives

The blocks of three incentive contract variables are jointly highly statistically significant. Having an incentive plan linking CEO income to firm performance significantly increases the likelihood that the CEO will post a performance bond. The marginal effect indicates that the effect is quantitatively large, raising the probability of posting a bond by 9 percentage points. Replacing the single dummy variable for incentive plans with dummies identifying the firm performance metric used for the plan (not shown) we find that the effect is driven by plans which have profitability targets. Incentive plans with sales targets are not significantly associated with posting a bond. This is consistent with bonds being part of an incentive contract rewarding CEOs engaged in multiple tasks.[7]

Where CEOs had incentive plans linking their pay to firm performance the survey asked how much their income would increase with a 1 per cent increase in firm performance, and a separate question asked how much their income would fall with a 1 per cent fall in firm performance. Performance bonds were associated with a higher pay-for-performance sensitivity. A 1 per cent rise in the most important firm performance measure (usually profits or sales) led to a 4.2 per cent rise in CEO pay where the CEO posted a bond, compared to a 3.3 per cent rise where the CEO did not post a bond. Although the effect is not statistically significant at conventional levels ($t = 1.48$), the difference is statistically significant for the second most important measure of firm performance ($t = 1.81$). In the case of a 1 per cent decline in the most important measure of firm performance the consequent declines in CEO income were 5.0% and 3.7% respectively, a difference that is statistically significant at a 93 per cent confidence level.

[5] We also run ordered probits estimating the probability of a CEO paying no bond, a bond with a low value (less than 10,000 yuan), a sizeable bond (at least 10,000 yuan but less than 40,000 yuan) and a large bond (40,000 yuan or more). The results are very similar to those for the probit model. They can be found in the appendix.

[6] We use complementarity in the sense used by Milgrom and Roberts (1995) such that doing more of X increases the returns to doing more of Y. A second, stronger test for complementarity of practices is to establish whether the combination of bonds and other incentive mechanisms has a greater impact on firm performance than deployment of a single incentive scheme. Unfortunately we lack the panel data permitting us to investigate this proposition.

[7] Unlike sales targets, profit targets reward output increases and cost reductions, thus balancing incentives in the way one might anticipate where workers engage in multiple tasks (Holmström and Milgrom, 1991).

Table 1
Incidence of performance bonds by ownership, 2003.

	SOE	Private	All
Any bond	16%	10%	11%
Size of bond (RMB):			
Under 10k	9%	4%	5%
10k–39k	5%	3%	4%
40k or above	2%	3%	3%
Median (RMB)	6000	10,000	10,000
Mean (RMB)	14,615	38,308	30,183
Observations	521	1868	2400

Notes: Figures are authors' calculations from the Investment Climate Survey of World Bank (China 2003).

Holding stock in the company and being paid annually – an arrangement which means the CEO is eligible for an annual bonus subject to good performance – are also positively correlated with posting bonds. In Model 1 of Table 2 they both increase the likelihood of paying a bond by around 3 percentage points.

These correlations are statistically significant in the whole economy model, although the association with annual contracts is only statistically significant at a 90 per cent confidence level. The effects of incentive contracts and stock holding are apparent in all three sub-samples. Taken together, these findings clearly indicate that bonds complement other CEO incentives and that this finding, which Bai and Xu (2005) found for SoEs, is also apparent in the non-state sector of the economy.

Hypothesis 2. Bond use is positively correlated with CEO control over firm performance

The negative coefficient on sales volatility is consistent with the principal–agent theory and the proposition that firms must compromise between offering incentives and insurance. So too is the positive coefficient on firm age. However, it is notable that these effects are only statistically significant in firms with no state ownership (Model 3). Indeed the sales volatility coefficient is "wrongly" signed – although not statistically significant – in firms with state ownership. It seems, therefore, that unpredictability in the product market environment – something one might expect to limit the use of performance bonds for CEOs – only does so where the principals in the firm are market-oriented.

However, the negative correlation between CEO autonomy in the job and posting bonds is not consistent with the principal–agent theory. This finding, which is only statistically significant where there is no state ownership, might suggest that firms are

Table 2
Probit estimates of the probability that a CEO posts a performance bond.

Dependent variable: Whether CEO posts a performance bond	[1] Margins	[2] Margins	[3] Margins	[4] Margins	[5] Margins
CEO compensation:					
Incentive plan linking pay to performance	0.094*** [7.02]	0.093*** [6.88]	0.084*** [5.84]	0.139*** [4.08]	0.164*** [4.17]
Owns company stock	0.032** [2.24]	0.032** [2.16]	0.026* [1.84]	0.128*** [2.58]	0.195*** [2.84]
Paid under annual salary system	0.029* [1.85]	0.023 [1.43]	0.025 [1.51]	0.014 [0.32]	0.003 [0.05]
CEO characteristics:					
Internal promotion	0.033*** [2.61]	0.033** [2.56]	0.015 [1.08]	0.073** [2.30]	0.060 [1.60]
Has graduate degree	−0.010 [−0.57]	−0.013 [−0.70]	−0.011 [−0.55]	−0.041 [−0.80]	−0.037 [−0.64]
Communist Party membership: Non-member	Ref.	Ref.	Ref.	Ref.	Ref.
Party secretary	0.090*** [4.74]	0.094*** [4.87]	0.083*** [4.32]	0.052 [0.82]	0.025 [0.31]
Deputy Party secretary	0.118*** [4.66]	0.116*** [4.47]	0.093*** [3.07]	0.113 [1.60]	0.090 [1.01]
Executive or committee member	0.064*** [2.91]	0.066*** [2.92]	0.074*** [3.13]	−0.026 [−0.39]	−0.043 [−0.50]
Party member	0.054*** [2.83]	0.054*** [2.82]	0.047** [2.52]	0.014 [0.22]	0.015 [0.17]
Autonomy scale	−0.002** [−2.07]	−0.002 [−1.54]	−0.003** [−2.38]	0.000 [0.15]	−0.001 [−0.33]
Firm characteristics:					
State-owned percentage	−0.000 [−0.50]	−0.000 [−0.64]		0.001 [1.08]	
Size (1000 employees)	0.004** [2.10]	0.003* [1.65]	0.009 [1.59]	0.003 [0.96]	0.004 [1.50]
Age (years)	0.002*** [3.84]	0.002*** [3.54]	0.002*** [3.73]	0.001 [1.18]	0.001 [0.86]
Number of competitors in main business line		−0.010** [−2.15]	−0.010** [−1.97]	−0.009 [−0.75]	−0.010 [−0.72]
Coefficient of variance in firm's sales, last 3 years		−0.052** [−2.15]	−0.072*** [−2.59]	0.019 [0.34]	0.095 [1.50]
Pseudo-R2	0.168	0.176	0.208	0.164	0.155
Obs.	2363	2274	1727	530	413

Notes: Estimates are authors' calculations based on the Investment Climate Survey of World Bank (China 2003).
Model 1: Baseline model. All models incorporate industry and city dummies.
Model 2: M1 + product market characteristics.
Models 3–5: M2 for sub-groups where state ownership is zero (M3), partial (M4) and complete (M5).
z-Statistics in brackets.
*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

able to use their bargaining power to insist on stiff sanctions for poorly performing CEOs, even in circumstances where the CEO may have limited ability to influence firm performance. Alternatively, limited CEO autonomy and the requirement to post a bond may both indicate mistrust in the CEO on the part of the firm, something we do not observe.

Hypothesis 3. Bonds are positively correlated with CEO ability

The evidence regarding the links between bonds and CEO ability is mixed. There is no correlation with educational attainment. The association with firm size is positive and statistically significant, as we might have anticipated if, as Rosen argues, the most talented CEOs run the largest firms, but the coefficient is relatively small and is only statistically significant in Models (1) and (2) which call on the full sample of all firms. As anticipated, there is a positive association between bonds and the CEO's position in the Communist Party hierarchy. This association is only statistically significant in firms with no state ownership, suggesting that it is only private sector firms who are willing or able to use CEO Communist Party status as an indicator of CEO quality.[8] There is also a positive association between paying a bond and being recruited from within the firm. If internal promotion is an indicator of tournament-like competitions for the CEO job, this may also be consistent with bonds being used to recruit the most able candidates. An alternative interpretation, which is more consistent with Hypothesis 3, is that CEOs accept bonded positions if they know the firm well and can thus predict its future performance with some confidence.

Hypothesis 4. Bonds are negatively correlated with market competition

As anticipated, bonds are less prevalent in firms facing intense market competition, as indicated by the number of competitors the firm faces. The effect is only statistically significant in firms with no state ownership.[9]

Hypothesis 5. Bonds will be modest relative to overall CEO compensation

The performance bonds' mean (median) value is equivalent to 215 (71) per cent of the mean (median) wage of workers at the time of the survey, or 14 (6) per cent of the cash compensation received by the CEO of a listed corporation (Table 1).[10] These values are perhaps larger than we suggested might be the case in Hypothesis 5.

7. Conclusions

Performance bonds are prominent in the theoretical literature where they are considered an efficient way of tackling principal–agent problems by ensuring that the threat of personal financial loss can align agent's interests with those of the principal, and can aid in the selection of the right managerial talent. Until now, the only empirical evidence on their use comes from studies of China's state owned enterprises in the 1980s. For the first time this paper considers the role of performance bonds, or security deposits, using representative enterprise data for a whole economy. We have shown that they were still widely used in Chinese corporations at the beginning of the 21st Century. Indeed, they are just as likely to be used in private sector firms as they are in the state-owned enterprises where they were most common in the 1980s, consistent with bonds diffusing across firms as would other successful mechanisms for incentivising executives.

The security deposits required by firms were moderately large relative to CEOs' annual cash compensation, averaging around 6% of CEO compensation. But it is arguable that they are not so large as to discourage potentially able but budget-constrained applicants from taking up CEO posts. Contrary to claims in the early empirical literature, we find that performance bonds are complementary to other means of incentivizing CEOs: those who post bonds are also more likely to have their pay linked to firm performance, the sensitivity of their pay to performance is greater, and they are more likely to be eligible for annual bonus payments. Larger bonds are also associated with CEO stockholding. The complementarity between bonds and other incentive mechanisms such as bonuses and stock holding is consistent with optimal reward structures for multi-tasking agents.

Consistent with the principal–agent theory bonds are negatively associated with firm sales volatility. Those CEOs posting bonds are higher in the Communist Party ranks, were promoted from within – perhaps via tournaments – and run larger firms, findings consistent with the use of bonds as incentives to attract and retain the most able workers. However, although state-owned enterprises are just as likely as privately owned ones to use bonds in CEO contracts, some of these theoretical predictions which assume profit-maximising firms do not hold where the state has an ownership stake, pointing to the value of distinguishing between firms according to their ownership.

[8] Another possibility is that CEOs with a party background are perceived by private firms as more “bureaucratic” and, as such, may be more amenable to adopting a profit maximising orientation if they have to post a bond. We thank Simon Kirby for this suggestion.

[9] Groves et al. (1995) argue that bonds were more likely to be used in poorer performing enterprises. Shirley and Xu (2001: 186–187) find support for this proposition among SoEs in the 1980s. To test this proposition we added lagged performance values to the right hand side of our equations. First we incorporated measures of added value per employee — the level in 1999 and change in value added over the period 2002–1999. These variables were not statistically significant. Then we estimated similar equations replacing added value with the return on capital in 2000 and change in the return on capital between 2002 and 2000. These variables were positive and, in some equations, statistically significant. So, if anything, we see bond usage in firms with improving rates of return on capital. Whether this is as a result of bonds, or whether this is a precondition leading to bond use is hard to say since we do not know when bonds were first introduced.

[10] Average worker wages are taken from China's Statistical Yearbook. The cash compensation of CEOs is taken from CSMAR accounting data for publicly listed companies. In obtaining these comparisons we remove one outlier value for the bond in the World Bank data which is nine times larger than the next highest value.

As the Chinese economy develops it is possible that bonds will be phased out if firms are able to rely on the market to provide clear signals about managerial talent and if the economy adopts global norms of CEO payment via stock options and long-term incentive plans. It is equally possible that bonds will continue to play an important role in the executive labour market in China for two reasons. First, it seems that bond usage is no longer confined to the SoEs where they were originally adopted, suggesting that this is a practice that is proving valuable in a variety of settings. Second, and allied to this, the trust-based relationships encapsulated in the Chinese concept of *guanxi*, often used to underpin transactions in traditional Chinese settings, are liable to come under greater pressure with the switch to a modern industrial economy and dominance of market-based relationships. Performance bonds may help substitute for the absence of *guanxi* in the future.

Appendix A

Appendix Table A1
Descriptive statistics.

Variable	Mean	Std. Dev.	Min	Max	Obs
Dependent variable					
Whether CEO posts a performance bond	0.115	0.319	0	1	2363
Size of the performance bond (under 10,000; 10,000 to 40,000; 40,000 above)	0.201	0.628	0	3	2350
CEO compensation:					
Incentive plan linking pay to performance	0.279	0.449	0	1	2363
Owns company stock	0.296	0.457	0	1	2363
Paid under annual salary system	0.193	0.395	0	1	2363
Internal promotion	0.355	0.479	0	1	2363
CEO characteristics:					
Has graduate degree	0.830	0.375	0	1	2363
Communist Party membership: Non-member	0.326	0.469	0	1	2363
Party secretary	0.223	0.416	0	1	2363
Deputy Party secretary	0.066	0.249	0	1	2363
Executive or committee member	0.125	0.331	0	1	2363
Party member	0.244	0.429	0	1	2363
Autonomy scale	16.312	5.133	0	21	2363
Firm characteristics:					
State-owned percentage	21.599	39.985	0	100	2363
Size ('000s of employees)	0.545	2.830	1	70	2363
Age (years)	14.901	14.341	2	52	2363
Number of competitors in main business line	3.819	1.357	1	5	2291
Coefficient of variance in firm's sales, last 3 years	0.327	0.288	0	2	2343
Dummy variables					
Industry sector: Clothing	0.148	0.355	0	1	2363
Food	0.028	0.164	0	1	2363
Metals and machinery	0.067	0.250	0	1	2363
Electronics	0.221	0.415	0	1	2363
Chemicals and pharmaceuticals	0.040	0.196	0	1	2363
IT services	0.085	0.280	0	1	2363
Telecommunications	0.003	0.054	0	1	2363
Accounting and finance	0.066	0.248	0	1	2363
Advertising and marketing	0.064	0.245	0	1	2363
Other services	0.113	0.316	0	1	2363
Auto and auto components	0.166	0.372	0	1	2363
City: Benxi	0.042	0.200	0	1	2363
Changchun	0.063	0.243	0	1	2363
Changsha	0.063	0.243	0	1	2363
Chongqing	0.063	0.244	0	1	2363
Dalian	0.042	0.200	0	1	2363
Guiyang	0.058	0.235	0	1	2363
Haerbin	0.063	0.244	0	1	2363
Hangzhou	0.042	0.201	0	1	2363
Jiangmen	0.041	0.199	0	1	2363
Kunming	0.060	0.237	0	1	2363
Lanzhou	0.063	0.243	0	1	2363
Nanchang	0.061	0.240	0	1	2363
Nanning	0.062	0.242	0	1	2363
Shenzhen	0.042	0.201	0	1	2363
Wenzhou	0.042	0.200	0	1	2363
Wuhan	0.063	0.244	0	1	2363
Xian	0.063	0.244	0	1	2363
Zhengzhou	0.063	0.244	0	1	2363

Notes: Figures are authors' calculations from the Investment Climate Survey of World Bank (China 2003).

Table A2
Ordered probit estimates of the size of the performance bond.

Dependent variable: Size of the performance bond (ordered)	[1] Coeff.	[2] Coeff.	[3] Coeff.	[4] Coeff.	[5] Coeff.
CEO compensation:					
Incentive plan linking pay to performance	0.587*** [7.20]	0.584*** [7.05]	0.616*** [6.05]	0.602*** [3.73]	0.682*** [3.82]
Owns company stock	0.273*** [3.16]	0.267*** [3.04]	0.250** [2.48]	0.654*** [2.90]	0.957*** [3.23]
Paid under annual salary system	0.176* [1.84]	0.164* [1.68]	0.202* [1.73]	0.074 [0.37]	0.061 [0.27]
CEO characteristics:					
Internal promotion	0.206*** [2.67]	0.221*** [2.81]	0.159 [1.62]	0.299** [2.05]	0.202 [1.24]
Has graduate degree	−0.083 [−0.76]	−0.081 [−0.73]	−0.077 [−0.58]	−0.199 [−0.84]	−0.185 [−0.74]
Communist Party membership: Non-member	Ref.	Ref.	Ref.	Ref.	Ref.
Party secretary	0.542*** [4.75]	0.549*** [4.74]	0.570*** [4.27]	0.176 [0.61]	0.126 [0.36]
Deputy Party secretary	0.637*** [4.11]	0.606*** [3.80]	0.579*** [2.70]	0.361 [1.12]	0.380 [0.99]
Executive or committee member	0.311** [2.31]	0.294** [2.13]	0.414** [2.49]	−0.214 [−0.71]	−0.238 [−0.65]
Party member	0.274** [2.41]	0.260** [2.24]	0.266** [2.01]	−0.048 [−0.16]	0.006 [0.02]
Autonomy scale	−0.011 [−1.55]	−0.007 [−0.98]	−0.017* [−1.86]	0.007 [0.55]	0.007 [0.53]
Firm characteristics:					
State-owned percentage	−0.001 [−0.53]	−0.000 [−0.48]		0.002 [0.66]	
Size (1000 employees)	0.017 [1.62]	0.015 [1.40]	0.034 [1.04]	0.010 [0.90]	0.017 [1.40]
Age (years)	0.009*** [3.37]	0.008*** [2.96]	0.012*** [3.26]	0.005 [1.05]	0.005 [0.87]
Number of competitors in main business line		−0.061** [−2.12]	−0.069* [−1.92]	−0.042 [−0.78]	−0.054 [−0.90]
Coefficient of variance in firm's sales, last 3 years		−0.315** [−2.12]	−0.536*** [−2.71]	0.206 [0.83]	0.595** [2.20]
Pseudo-R2	0.114	0.119	0.143	0.125	0.129
Obs.	2350	2263	1720	543	423

Notes: Estimates are authors' calculations based on Investment Climate Survey of World Bank (China 2003).
Model 1: Baseline model. All models incorporate industry and city dummies.
Model 2: M1 + product market characteristics.
Models 3–5: M2 for sub-groups where state ownership is zero (M3), partial (M4) and complete (M5).
z-Statistics in brackets.
*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

References

Bai, C. -E., & Xu, L. C. (2005). Incentives for CEOs with multitasks: Evidence from Chinese state-owned enterprises. *Journal of Comparative Economics*, *33*, 517–539.
Becker, G. S. (1968). Crime and punishment: An economic approach. *Journal of Political Economy*, *76*(2), 169–217.
Becker, G. S., & Stigler, G. J. (1974). Law enforcement, malfeasance, and compensation of enforcers. *The Journal of Legal Studies*, *3*(1), 1–18.
Conyon, M. J., Fernandes, N., Ferreira, M. A., Pedro, M., & Murphy, K. J. (2013). The executive compensation controversy: A transatlantic analysis. In T. Boeri, C. Lucifora, & K. Murphy (Eds.), *Productivity, profits and pay*. Oxford University Press.
Fehr, E., & List, J. A. (2004). The hidden costs and returns of incentives — Trust and trustworthiness among CEOs. *Journal of the European Economic Association*, *2*(5), 743–771.
Firth, M., Fung, P. M. Y., & Rui, O. M. (2006). Corporate performance and CEO compensation in China. *Journal of Corporate Finance*, *12*, 693–714.
Groves, T., Hong, Y., McMillan, J., & Naughton, B. (1995). China's evolving managerial labor market. *Journal of Political Economy*, *103*(4), 873–892.
Harris, M., & Raviv, A. (1979). Optimal incentive contracts with imperfect competition. *Journal of Economic Theory*, *20*, 231–259.
Hart, O. (1983). The market as an incentive mechanism. *Bell Journal of Economics*, *14*, 366–382.
Holmström, B., & Milgrom, P. (1991). Multi-task principal–agent analyses: Incentive contracts, asset ownership, and job design. *Journal of Law, Economics, and Organization*, *7*, 24–52.
Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, *XLVII*, 263–291.
Kato, T., & Long, C. (2006). Executive compensation, firm performance and corporate governance in China: Evidence from firms listed in the Shanghai and Shenzhen stock exchanges. *Economic Development and Cultural Change*, *54*, 945–983.
Lazear, E. (1986). Salaries and piece rates. *Journal of Business*, *59*(3), 405–431.
Lazear, E. (2000). Performance pay and productivity. *American Economic Review*, *90*, 1346–1361.
Li, H., Liu, P. W., Zhang, J., & Ma, N. (2007). Economic returns to communist party membership: Evidence from urban Chinese twins. *The Economic Journal*, *117*, 1504–1520.
Malmendier, U., & Tate, G. (2005). CEO overconfidence and corporate investment. *The Journal of Finance*, *60*(6), 2661–2700.
Mengistae, T., & Xu, L. (2004). Agency theory and executive compensation: The case of Chinese state-owned enterprises. *Journal of Labor Economics*, *22*(3), 615–637.
Milgrom, P., & Roberts, J. (1995). Complementarities and fit strategy, structure and organizational change in manufacturing. *Journal of Accounting and Economics*, *19*(2–3), 179–208.
Mirrlees, J. A. (1976). The optimal structure of incentives and authority within an organization. *Bell Journal of Economics*, *7*, 105–131.
Murphy, K. J. (1999). Executive compensation. Chapter Thirty Eight. In O. Ashenfelter, & D. Card (Eds.), *Handbook of labor economics*, *Vol. 3*, Elsevier.
Oyer, P., & Schaefer, S. (2011). Personnel economics: Hiring and incentives. Chapter 20. In O. Ashenfelter, & D. Card (Eds.), *Handbook of labor economics*, *Vol. 4b*, Elsevier.
Parsons, D. O. (1986). The employment relationship: Job attachment, work effort and the nature of contracts. Chapter 14 in XXX. *Handbook of labor economics*, *Vol. 2*, Elsevier Science.
Prendergast, C. (1999). The provision of incentives in firms. *Journal of Economic Literature*, *XXXV11*, 7–63.
Ritter, J. A., & Taylor, L. A. (1994). Workers as creditors: Efficiency wages and performance bonds. *American Economic Review*, *84*(3), 694–704.
Rosen, S. (1990). *Contracts and the market for executives*. NBER working paper #3542.
Shirley, M., & Xu, L. C. (2001, April). The empirical effects of performance contracts: Evidence from China. *Journal of Law, Economics, and Organization*, *17*, 168–200.
Xu, C. (2011). The fundamental institutions of China's reforms and development. *Journal of Economic Literature*, *49*(4), 1076–1151.