Managerial Incentives and the Choice between Public and Bank Debt

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Abstract

I propose a simple model with complete and perfect information that analyzes the relation between managerial incentive compensation and the firm's choice between public and bank debt. My analysis of firm-level data over the period 1992-2005 offers considerable support to the predictions of the model. I find a positive relation between the level of incentive compensation and the preference for bank debt, which is consistent with the prediction that managers whose compensation is tied to firm performance choose bank over public debt as a commitment mechanism to reduce the cost of debt. Further, I find that public lenders price the incentive alignment between manager and shareholders by increasing the cost of debt, while the overall cost of bank loans does not depend on the manager's incentive compensation. Finally, I find that banks are more likely to include a collateral provision in the debt contract if the manager's compensation is tied to firm performance.

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Bank loans and public bonds are today the main source of external financing for U.S. corporations. According to the Flow of Funds Accounts of the United States, at the end of 2007 the net flow from non-financial non-farm corporate bonds and bank loans was $551.3 billion. Due to the relevance of debt as a financing source for U.S. corporations, it is important to understand the determinants of the firm choice among alternative types of debt. In this paper, I contribute with both theory and evidence. I develop a simple theoretical model of the role of managerial incentives on the choice between public and bank debt, and present empirical evidence that the manager's incentive compensation is a determinant of the firm financing choices.

In this paper, I propose that the level of equity-based compensation of managers is an important determinant of a firm's choice between public and bank debt, and develop a simple dynamic model with complete and perfect information where shareholders cannot directly control the firm financing and investing decisions, but rely on managers' choices. Managers' compensation is tied to stock performance, which aligns managers' and shareholders' preferences, but also provides the incentive to benefit shareholders at the expense of lenders by substituting safe assets with risky ones. Lenders cannot observe managers' investing choices, but anticipate the asset substitution incentives and demand a higher return, thereby imposing a cost on the firm. Banks, as opposed to public lenders, can monitor managers' investing choices, prohibit managers from investing in risky projects, and punish the firm if they detect a violation of this provision. The probability of detection and the extent of the punishment limit managers' incentives to engage in asset substitution activities. Rational lenders anticipate that the incentives for asset substitution are weaker with bank monitoring, and require a lower return.

The model provides several empirically testable predictions. The main prediction of the model is that managers with equity-based compensation submit to bank monitoring as a commitment mechanism to reduce borrowing costs. Second, since public lenders anticipate and price managers' asset substitution incentives, the model predicts a positive relation between incentive compensation and interest rate on public bonds. On the other hand, since banks can monitor managers, the model predicts no relation between incentive compensation and the cost of bank loans. Finally, the model predicts that banks include a collateral provision in the debt contract as a risk-reducing feature to limit the asset substitution incentives of a manager with high incentive compensation.

I investigate the relation between managerial incentive compensation and choice between public and bank debt by using firm-level data on 631 bank loans and 1,567 straight bonds over the period 1992-2005. I measure the incentive alignment between manager and shareholders by the sensitivity of the manager's pay to changes in the stock price (Core and Guay, 2002). I find significant evidence that Pay-Performance-Sensitivity (*PPS*) positively affects the manager's preference for bank debt. I then investigate the effect of incentive compensation on borrowing costs, and find strong evidence that *PPS* positively affects the offering yield on public bonds. I also find that there is no relation between *PPS* and the overall cost of bank loans. Both these findings are consistent with the model's predictions. Finally, I study the relation between incentive alignment between manager and shareholders and the inclusion of a collateral provision in the debt contract. Consistent with the model's prediction, I find that *PPS* positively affects the likelihood that the loan is collateralized.

The intuition underlying the relation between asset substitution and incentive compensation comes from studies (see, e.g., Jensen and Meckling, 1976; Galai and Masulis, 1976; Myers and Majluf, 1984; Parrino and Weisbach, 1999) that show that shareholders of a levered firm have incentives to substitute safe assets with risky ones to expropriate lenders. Additionally, Amihud and Lev (1981) show that the preferences of the person in charge of the firm financing and investing decisions, the manager, are not necessarily aligned with the preferences of the firm owners. There are recent empirical papers (see, e.g., Datta, Iskandar-Datta, and Raman, 2001; Ryan and Wiggins, 2001) that find evidence consistent with the intuition that the asset substitution problem is more severe when the manager's compensation is tied to firm performance.

My paper is directly related to empirical and theoretical studies on the effect of incentive compensation on the choice of the firm financing sources (see, e.g., Hoshi, Kashyap, and Scharfstein, 1993; Zwiebel, 1996; Almazan and Suarez, 2003; Denis and Mihov, 2003; Khurana, Nejadmalayeri, and Pereira, 2005). I present evidence that manager's incentive compensation is a significant determinant of the choice of the firm financing sources, and provide an alternative explanation for the link between compensation and preference toward bank debt. In Hoshi, Kashyap, and Scharfstein (1993) and Almazan and Suarez (2003) the relation between incentive compensation and financing decisions is driven by the manager's incentives to extract private benefits at the expense of the shareholders; the role of bank monitoring and incentive compensation is to protect shareholders' interests by forcing the manager to avoid pet projects. In my model, incentive compensation provides the manager with the incentive to engage in asset substitution activities at the expense of the lenders, and bank monitoring is a commitment mechanism to limit the manager incentives for asset substitution activities and reduce the firm borrowing costs. The predictions on the relation between incentive compensation and borrowing costs differentiate my model from the previous models.

Theoretical (see, e.g., Leland and Pyle, 1977; Diamond, 1984; Fama, 1985; Berlin and Loeys, 1988; Chemmanur and Fulghieri, 1994; Yosha, 1995) and empirical papers (see, e.g., Houston and James, 1996; Johnson, 1997 and 1998; Cantillo and Wright, 2000; Hadlock and James, 2002; Santos and Winton, 2008) investigate the role of banks as information producers. My paper relates more to the literature that examines the role of banks as ex-post monitors of the firm actions (see, e.g., Mayers, 1977; Diamond, 1991; Rajan, 1992). There is considerable empirical research that presents evidence on the banks' ability to reduce ex-post information asymmetries through monitoring (see, e.g., Krishnaswami, Spindt, and Subramaniam, 1999; Yang, 2006), and of the monitoring ability of banks with respect to public debt (see, e.g., Best and Zhang, 1993; Datta, Iskandar-Datta and Patel, 1999).

Empirical studies (see, e.g., Dennis, Nandy, and Sharpe, 2000; John, Lynch, and Puri, 2003; Gottesman and Roberts, 2004; Booth and Booth, 2006) examine the impact of borrower and bank characteristics and loan features on loan pricing. Other papers (see, e.g., Bhojraj and Sengupta, 2003; Cremers, Nair, and Wei, 2004; Klock, Mansi, and Maxwell, 2005) examine the effect of board composition, presence of institutional investors, and takeover vulnerability on bond yields. Ortiz-Molina

(2006) investigates the relation between incentive compensation and cost of public debt. I contribute to this literature by finding that while the relation between bond yields and incentive compensation is positive and concave, there is no relation between loan spreads and incentive compensation.

Finally, there are theoretical and empirical papers (see, e.g., Berger and Udell, 1990; Berger and Udell, 1995; Carey, Post, and Sharpe, 1998; John, Lynch, and Puri, 2003; Booth and Booth, 2006) that suggest that collateral is a risk-reducing feature that can be included in a debt contract to reduce borrowing costs. My model contributes to this strand of the literature by predicting that lenders include a collateral provision in the debt contract to reduce the asset substitution incentives induced by the manager's compensation. The empirical tests support the model's prediction of a positive relation between collateral and managerial incentive compensation.

1. The model

1.1. Model setup

Two projects are available to the firm, *R* and *S*. *R* yields a terminal cash flow *Z* with probability $p \geq 0.5$, and 0 otherwise. *S* yields a terminal cash flow of *H* with probability $q \geq 0.5$, and 0 otherwise. $Z > H$, but $pZ < qH$. These parametric assumptions imply that project *R* has the highest variance. Both projects require an initial investment of *I* and the discount rate is assumed to be zero: therefore, *R* and *S* have positive net present values: $E(R) = pZ - I > 0$ and $E(S) = qH - I > 0$.

As in Almazan and Suarez (2003), the manager is in charge of the investment and financing decisions, has no wealth, is protected by limited liability, and has zero reservation utility. His compensation consists of a semi-fixed salary that depends on the outcome of the project, and an incentive component given by a fraction $0 < \alpha < 1$ of the firm value. Following John and John (1993), the semi-fixed salary is *W* if the project succeeds and $W - \xi$, with $W - \xi > 0$, if the project fails. ξ can be interpreted as a salary reduction imposed on the manager when the firm is in financial distress. The firm is assumed to have only equity in the balance sheet and an initial value of *E*, with $W < E < I$, so that the manager can receive the fixed salary even if the project fails. The firm can raise *I* by either issuing public bonds or obtaining a bank loan, both in competitive markets. Banks can monitor the manager's project choice at a fixed cost *c*, but public lenders cannot. Bondholders and banks can also require collateral on the firm debt, in which case all collateralized assets transfer to the lenders if the firm defaults. Employers generally have priority over creditors in case of bankruptcy, except when outside creditors have collateralized claims: they have priority over everybody else. Thus, with collateralized debt, even the fixed component of the manager's compensation is at risk.

The parameters of the model (*Z*, *H*, *E*, *I*, *q*, *p*, *c*, *W*, *ξ*, and *α*) and the agents' payoff functions are common knowledge. Project outcome is observable but not verifiable, that is, lenders can observe a success or a failure, but cannot infer the manager's project choice. Thus, it is not possible to write a contract between the lenders and the firm on the outcome of the project.

1.2. Public debt

Suppose that the firm can only raise funds by issuing straight bonds, and that investors cannot monitor the project choice. The timing of the game is as follows. In t=0, lenders decide on the terms of the loan which include the interest rate to charge the firm, and possibly a collateral provision; the contract is signed. In t=1, the manager invests in one of the projects, and his decision is not observable by bondholders. Finally, in t=2, all payoffs are realized.

1.2.1. Public debt: the manager's investment choice

I now use backwards induction to solve for the equilibrium interest rate and project choice, and start with the manager's decision in t=1. The manager knows the interest rate offered by the lenders in t=0, and chooses the project that maximizes his expected (non-negative) profit $E_j^M\left(P_i, r_j\right)$, where P_i, $i=\{S,R\}$, is the project choice, and r_j, $j=\{NC,C\}$, is the interest rate offered by lenders for non-collateralized and collateralized debt, respectively. Given this payoff structure, the manager's choice depends on the interest rate offered by bondholders. Lemma 1 describes the manager's reaction function (all proofs are in the Appendix):

Lemma 1

(i) If public lenders do not require collateral, the manager's reaction function is

$$f_M(r_{NC}) = \begin{cases} R \text{ if } & r > r_{NC}^* \\ S \text{ if } & r < r_{NC}^* \end{cases} \qquad \text{where } r_{NC}^* = \frac{(qH - pZ)}{(q-p)I} + \frac{E-W}{I} + \frac{\xi}{\alpha I} - 1$$

(ii) If public lenders do require collateral, the manager's reaction function is

$$f_M(r_C) = \begin{cases} R \text{ if } & r > r_C^* \\ S \text{ if } & r < r_C^* \end{cases} \qquad \text{where } r_C^* = \frac{(qH - pZ)}{(q-p)I} + \frac{E-W}{I} + \frac{W}{\alpha I} - 1$$

To focus on non-trivial results, assume that $r_C^*(\alpha = 1) < 0$, which implies that with perfect alignment with shareholders the manager always invests in the risky project. Lemma 1 states that if the interest rate charged by bondholders is above the threshold r_j^*, the manager invests in the risky project *R*; otherwise, he invests in the safe project *S*.

Lemma 1 shows that the manager sometimes invests in the project with lower net present value and higher volatility. If he invests in the risky project *R*, his profit is *W* with probability *p* and *W*- ξ with probability *(1-p)*. On the other hand, if he invests in the safe project *S*, his profit is *W* with probability *q* and *W*- ξ with probability *(1-q)*. If the fixed component were the only component of the compensation, the manager would maximize the probability of success, and always invest in the safe project *S*.[1] With only an incentive component given by a fraction α of the firm value, the project choice depends on the borrowing rate. If the rate is above the threshold, the manager's payoffs are quite similar in success and failure: if the project succeeds, most of the revenue goes to the lenders through the interest rate; if the project fails, the manager is left with nothing because the firm defaults. Therefore, the manager's optimal choice is to invest in the project with the highest payoff in case of success. If, on the other hand, the interest rate is below the threshold, the manager prefers the project with the highest probability of

[1] The model can capture the situation of a manager that receives only a fixed salary if the parameter α is set to 0. Notice that, if α=0, the thresholds tend to infinity: therefore, the condition to choose *S* is always satisfied.

success.[2] If collateral is included the threshold rate is higher, because when the fixed compensation is at risk the manager has even more incentive to invest in the project with the highest probability of success (the safe project *S*). The manager's final choice depends on the combination of the two components of the compensation. If the manager has greater incentive compensation *α*, the threshold interest rate r_j^* becomes smaller, and the condition to invest in the safe project *S* more difficult to satisfy. In other words, aligned managers have more incentives to invest in the risky project. Comparative statics show that when the initial investment *I* increases, the manager has more incentive to invest in the risky project and try to recover the higher project cost. In addition, if the probability of success of the safe project *q* increases, the safe project becomes more attractive. On the other hand, if the probability of success of the risky project *p* increases, the manager has more incentive to invest in the risky project. Similarly, if the successful outcome of the safe (risky) project *H* (*Z*) increases, the safe (risky) project becomes more attractive.

1.2.2. Public debt: the bondholders' interest rate choice

Since bondholders can also solve the manager's optimization problem, they anticipate the manager's reaction to each interest rate they offer. Competitive bondholders charge an interest rate that, given the manager's reaction function, guarantees them a non-negative expected profit. Thus, bondholders charge the interest rate r_j that solves $E^L[r_j, f_M(r_j)] = 0$. Lenders' expected payoff function changes depending on the manager's anticipated project choice. Lenders know that if they offer $r_j < r_j^*$, the manager invests in the safe project *S*. Thus, they charge the interest rate r_j that solves $E^L(S, r_{NC}) = qI(1 + r_{NC}) + (1 - q)(E + \xi - W) - I = 0$ or $E^L(S, r_C) = qI(1 + r_C) + (1 - q)E - I = 0$. Lenders know that the manager's optimal response to $r_j > r_j^*$ is to invest in the risky project *R*, and they charge the interest rate r_j that solves $E^L(R, r_{NC}) = pI(1 + r_{NC}) + (1 - p)(E + \xi - W) - I = 0$ or $E^L(R, r_C) = pI(1 + r_C) + (1 - p)E - I = 0$.

[2] It can be shown that shareholders' threshold interest rates are lower than the manager's, since shareholders do not receive any fixed compensation: thus, shareholders choose *S* less often.

1.2.3. Public debt: the equilibrium project choice and interest rate

In what follows, I describe the backwards-induction outcomes (P_i, r_j^i) with the help of a proposition. To focus on non-trivial results, I assume that the model parameters satisfy the restriction $W/\xi < (1-p)/(1-q)$. The assumption guarantees that (S, r_C^S) is the optimal solution in some regions.

Proposition 1.

(Expressions for equilibrium α for the three cases are in the Appendix)

(i) *If* $\alpha < \alpha_{NC}^*$ *the backwards-induction outcome is* (S, r_{NC}^S) *; (ii) if* $\alpha_{NC}^* \le \alpha < \alpha_C^*$ *the backwards-induction outcome is* (S, r_C^S) *; and (iii) if* $\alpha \ge \alpha_C^*$ *the backwards-induction outcome is* (R, r_{NC}^R).

Proposition 1 shows that, for small alphas, the manager invests in the safe project *S*, even without a collateral provision. When $\alpha < \alpha_{NC}^*$, only a small fraction of the manager's compensation depends on firm value. Therefore, the manager maximizes the probability of receiving the fixed salary *W* by investing in the project with the highest probability of success. When $\alpha_{NC}^* \le \alpha < \alpha_C^*$, and a more significant fraction of the manager's compensation is tied to firm value, bondholders impose a collateral provision in the contract to provide the manager with the incentive to invest in the safe project. The collateral provision affects the manager's incentives by putting his fixed compensation at risk. Once again, the manager maximizes his payoff by investing in the project with the highest probability of success, *S*. Finally, for $\alpha \ge \alpha_C^*$, the manager's compensation depends relatively more on the incentive component and, thus, the manager has the incentive to invest in the project with the highest outcome, even tough the expected outcome is small. In this case, not even a collateral provision affects the manager's incentives for asset substitution: collateral affects only the fixed component of the compensation, and for a high α, the fixed component is relatively less important.

Simple manipulations of the expressions for the threshold α^* in the Appendix show that the numerator is the difference in the expected fixed compensation obtained by choosing *S* over *R*, while the denominator is the difference in the expected incentive compensation obtained by choosing *R* over *S*. Consider the case of r_C^S as an example. $E_C^M(R, r_C^S) = pW + \alpha(p/q)[qZ + E - qW - I]$ is the manager's expected profit when the interest rate is r_C^S and he invests in project *R*. On the other hand, $E_C^M(S, r_C^S) = qW + \alpha[qH + E - qW - I]$ is the manager's profit when the interest rate is r_C^S and he invests in project *S*. The difference in expected fixed compensation obtained by choosing *S* over *R* is $(q-p)W$, while the difference in expected incentive compensation obtained by choosing *R* over *S* is $(p/q)[qZ + E - qW - I] - [qH + E - qW - I]$. The two expressions represent the numerator and the denominator (times *q*) of α_C^* respectively. If α_C^* is high, the expected advantage of choosing *S* over *R* on the fixed part of the compensation is relatively higher than then expected advantage of choosing *R* over *S* on the incentive component of the compensation. Therefore, it is optimal to invest in the safe project *S*.

1.3. Bank debt

1.3.1. Timing and monitoring technology

Suppose now that firms can only raise *I* from banks who can monitor the manager's project choice.[3] The timing of the game is as follows. In t=0, the bank decides on the interest rate, if a collateral provision should be included in the contract, and signs the contract with the firm manager. In t=1 the manager invests in one of the projects. The bank receives a signal that can be either *S* or *R*. Assume that if the signal is *R*, the bank stops the project, recovers *I*, and punishes the firm by liquidating $E - (W - \xi)$ (*E* if the loan is collateralized); if the signal is *S* nothing changes. Finally, in t=2, all payoffs are realized. The bank pays a fixed cost *c* for the signal. Assume that $P(sig = S \mid proj = S) = 1$ and $P(sig = S \mid proj = R) = \phi$. If the manager invests in the safe project, the signal has a precision of

[3] Altman, Gande, and Saunders (2008) argue that banks' incentives to monitor are likely to be preserved even in the presence of loan syndication and a secondary loan market.

one and is always *S*. If, on the other hand, the manager invests in the risky project, the signal is wrong with probability ϕ. The monitoring technology is common knowledge.

1.3.2. Bank debt: the manager's project choice

As before, I solve this game by backwards induction. In the second stage (t=1) the manager invests in either *S* or *R* depending on the interest rate offered by the bank and on the precision of the signal. Thus, the manager maximizes his expected profit $\overline{E}_j^M\left[P_i, \overline{r}_j, \phi(P_i)\right]$ with respect to project P_i, so that $\overline{E}_j^M\left[P_i, \overline{r}_j, \phi(P_i)\right] \geq 0$. Given this payoff structure, the manager's choice depends on the interest rate offered by the bank, the precision of the signal, and the punishment the firm has to suffer if he is caught investing in the risky project. Lemma 2 describes the manager's reaction function (all proofs are in the Appendix).

Lemma 2

(i) If the bank does not require collateral, the manager's reaction function is

$$g_M(\overline{r}_{NC}) = \begin{cases} R \text{ if } & r > \overline{r}_{NC}^* \\ S \text{ if } & r < \overline{r}_{NC}^* \end{cases} \qquad \text{where } \quad \overline{r}_{NC}^* = \frac{(qH - \phi pZ)}{(q - \phi p)I} + \frac{E - W}{I} + \frac{\xi}{\alpha I} - 1$$

(ii) If the bank does require collateral, the manager's reaction function is

$$g_M(\overline{r}_C) = \begin{cases} R \text{ if } & r > \overline{r}_C^* \\ S \text{ if } & r < \overline{r}_C^* \end{cases} \qquad \text{where } \quad \overline{r}_C^* = \frac{(qH - \phi pZ)}{(q - \phi p)I} + \frac{E - W}{I} + \frac{W}{\alpha I} - 1$$

Lemma 2 states that if the interest rate charged by the bank is above the threshold $\overline{r}_j^*$, the manager invests in the risky project *R*; otherwise, he invests in the safe project *S*. A comparison with the threshold interest rates of the public debt case shows that, for $\phi < 1$, $\overline{r}_j^* > r_j^*$, which implies that with bank debt the condition to invest in the safe project is easier to satisfy. The intuition is that if the signal is to some extent informative (the probability ϕ of receiving the wrong signal is less than 1), the manager's investment in the risky project *R* could be detected, and he could lose the incentive component of the compensation as well as part of his fixed salary (all of it if the loan is collateralized). Thus, monitoring can reduce the manager's incentives to invest in the risky project. As the precision of the signal improves (ϕ diminishes), $\bar{r}_j^*$ increases: the probability of detection increases, and reduces the manager's incentives to invest in the risky project. If $\phi = 1$, then $\bar{r}_{NC}^* = r_{NC}^*$ and $\bar{r}_C^* = r_C^*$: the signal is always wrong, thus there is no monitoring. As in the case of public debt, if managerial incentives are more aligned with the shareholders' (α increases), the condition that makes the safe project the best choice is stronger (the threshold rates become smaller). When the initial investment *I* increases, the manager has more incentive to invest in the risky project to try to recover the higher project cost. If the probability of success of the safe (risky) project increases, the safe (risky) project becomes more attractive; if the successful outcome of the safe (risky) project *H* (*Z*) increases, the manager has more incentives to invest in the safe (risky) project.

1.3.3. Bank debt: the bank's interest rate

Since the bank can also solve the manager's optimization problem, it can anticipate the manager's reaction to each interest rate, and the related signal precision. The competitive bank charges an interest rate that, given the manager's reaction function, guarantees a zero expected profit. Thus, the bank charges the interest rate $\bar{r}_j$ that solves $\bar{E}^L\left[\bar{r}_j, g_M\left(\bar{r}_j\right), \phi\left(g_M\left(\bar{r}_j\right)\right)\right] = 0$.

1.3.4. Bank debt: the equilibrium project choice and interest rate

To focus on non-trivial results, I assume that the model parameters satisfy the restriction $q/\phi p < \left[qZ + E + (1-q)\xi - W - I\right] / \left[qH + E + (1-q)\xi - W - I\right]$, which guarantees that the outcome $(S, \bar{r}_{NC}^S)$ is not always feasible. In other words, for some α the manager, when offered the interest rate $\bar{r}_{NC}^S$, invests in the risky project *R*. I describe the backwards-induction outcomes $(P_i, \bar{r}_j^i)$ in Proposition 2 below.

Proposition 2.

(Expressions for equilibrium α for the three cases are in the Appendix)

(i) If $\alpha < \overline{\alpha}^*_{NC}$ *the backwards-induction outcome is* $(S, \bar{r}^S_{NC})$ *; (ii) if* $\overline{\alpha}^*_{NC} \le \alpha < \overline{\alpha}^*_C$ *the backwards-induction outcome is* $(S, \bar{r}^S_C)$ *;and (iii) if* $\alpha \ge \overline{\alpha}^*_C$ *the backwards-induction outcome is* (R, r^R_{NC}) *if and only if* $q/\phi p \le (qZ + E - qW - I - c)/(qH + E - qW - I - c)$. *If* $\alpha \ge \overline{\alpha}^*_C$ *and* $q/\phi p$ *is greater than the threshold, the backwards induction outcome is* $(S, \bar{r}^S_C)$.

Proposition 2 is qualitatively similar to Proposition 1. It states that if *α* is low ($\alpha < \overline{\alpha}^*_{NC}$) the manager maximizes the probability of receiving the fixed compensation by investing in the project with the highest probability of success (project *S*). For a higher *α* ($\overline{\alpha}^*_{NC} \le \alpha < \overline{\alpha}^*_C$), the bank has to put the manager's fixed compensation at risk by including a collateral provision to force him to invest in the safe project. Finally, for $\alpha \ge \overline{\alpha}^*_C$, two outcomes are possible: if the precision of the signal $(1-\phi)$ is sufficiently low , it is not possible to induce the manager to invest in the safe project: thus the bank does not require collateral, but charges the firm a higher interest rate, and the backwards-induction outcome is $(R, \bar{r}^R_{NC})$. On the other hand, if the precision of the signal is high enough, the manager invests in the safe project *S* if a collateral provision is included in the contract, and the backwards-induction outcome is still $(S, \bar{r}^S_C)$. It turns out that for a small monitoring cost and $\phi < 1$, $\overline{\alpha}^*_{NC} > \alpha^*_{NC}$ and $\overline{\alpha}^*_C > \alpha^*_C$. The intuition is that monitoring, and the related risk of being caught investing in the risky project, affects the manager's incentives for asset substitution: the manager invests in the safe project more often if monitored by the bank, because he wants to avoid the punishment the firm would incur if the choice of the risky project were detected. [4]

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[4] Notice that the threat of punishment must be credible to affect the manager's incentives. The threat is credible only if a bank that receives the signal *R* has the incentive to punish the firm instead of just hoping for a successful

1.4. The choice between public and bank debt

I now describe the backwards-induction outcomes of the game when the manager can choose the financing source in Proposition 3 (all proofs and expressions of equilibrium α are in the Appendix).

Proposition 3.

When ϕ is less than a threshold ϕ^* then,

(A) (i) if $\alpha < \alpha^*_{NC}$ the backwards-induction outcome is (S, r^S_{NC}) ; (ii) if $\alpha^*_{NC} \le \alpha < \bar{\alpha}^*_{NC}$ the backwards-induction outcome is $(S, \bar{r}^S_{NC})$; and (iii) if $\bar{\alpha}^*_{NC} \le \alpha < \bar{\alpha}^*_C$ the backwards-induction outcome is $(S, \bar{r}^S_C)$.

(B) If $\alpha \ge \bar{\alpha}^*_C$ and $q / \phi p < (qZ + E - qW - I - c)/(qH + E - qW - I - c)$, the backwards-induction outcome is (R, r^R_{NC}). If $\alpha \ge \bar{\alpha}^*_C$ and $q / \phi p$ is greater than the threshold, the backwards induction outcome is $(S, \bar{r}^S_C)$.

Proposition 3 illustrates the main result of the model. For low levels of α the manager invests in the safe project without monitoring or the inclusion of a collateral provision in the contract. This result is driven by the relative importance the manager places on the fixed component of the compensation: for low α the manager maximizes the probability of receiving the fixed compensation in full by choosing the project with the highest probability of success. Because the manager does not need monitoring to avoid asset substitution activities, there is no need to pay the monitoring cost c associated with bank debt: thus, the manager issues public bonds. For $\alpha^*_{NC} \le \alpha < \bar{\alpha}^*_{NC}$ two outcomes are feasible: (S, r^S_C) and $(S, \bar{r}^S_{NC})$. Without bank monitoring the manager invests in the safe project only if a collateral provision is included in the contract, while with bank monitoring the collateral provision is not necessary, because the expected cost of being caught investing in project R is too high. It can be shown that the

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outcome of the risky project. It is straightforward to show that the punishment maximizes the bank expected payoff when the signal is *R*.

manager's expected payoff is higher with bank monitoring: the backwards-induction outcome is $(S, \bar{r}_{NC}^{S})$.[5] If $\bar{\alpha}_{NC}^{*} \leq \alpha < \bar{\alpha}_{C}^{*}$ the two feasible outcomes are (R, r_{NC}^{R}) and $(S, \bar{r}_{C}^{S})$. Without bank monitoring, not even a collateral provision can induce the manager to invest in the safe project. On the other hand, with bank monitoring and a collateral provision, the risks of being caught investing in the risky project and of losing the fixed compensation in case of default induces the manager to invest in the efficient project *S*. For these levels of *α*, the manager's expected payoff is higher with bank monitoring and the backwards-induction outcome is $(S, \bar{r}_{C}^{S})$.

Finally, I investigate the case $\alpha \geq \bar{\alpha}_{C}^{*}$. Suppose first that the probability ϕ that the signal is wrong is high enough that $q/\phi p$ is below the threshold. If that is the case, not even bank monitoring can change the manager's incentives to invest in the risky project, because the probability that the manager is caught violating the covenant that prohibits the firm to invest in the risky project is too low. Thus, two outcomes are feasible: (R, r_{NC}^{R}) and $(R, \bar{r}_{NC}^{R})$. If monitoring cannot affect the manager's asset substitution incentives, there is no need to pay the monitoring cost *c*: thus, the backwards-induction outcome is (R, r_{NC}^{R}) and the manager issues bonds. On the other hand, if the probability ϕ that the signal is wrong is low enough that $q/\phi p$ is greater than the threshold, bank monitoring can affect the manager's incentives: because the probability of being caught and punished is now high, the manager has the incentive to invest in the safe project and avoid the potential punishment. The two feasible outcomes are (R, r_{NC}^{R}) and $(S, \bar{r}_{C}^{S})$: it can be shown that the manager's expected payoff is higher with bank monitoring, so that $(S, \bar{r}_{C}^{S})$ is the backwards-induction outcome. Notice that these results hold for $\phi < \phi^{*}$. If the signal is not precise enough, the advantage of bank debt tends to disappear. If the signal is

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[5] Notice that $r_{C}^{S} < \bar{r}_{NC}^{S}$: the interest rate charged to the firm is lower with public debt; however, the manager prefers to submit to bank monitoring and avoid the collateral provision in order to protect his fixed compensation.

always wrong ($\phi = 1$) there is no difference between bank and public debt other than the monitoring cost: in that case, the manager always prefers public debt.

To summarize, Proposition 3 shows that the relation between α (the interest alignment between manager and shareholders) and the manager preference toward bank debt is positive. Managers whose compensation depends mainly on the fixed component prefer to invest in the project with the highest expected payoff, and need no monitoring; on the other hand, managers with relatively high incentive compensation have the incentive to invest in the project with the highest outcome, but submit to bank monitoring to reduce borrowing costs. Banks can force the manager to invest in the efficient project by monitoring the project choice and punishing the firm if asset substitution is detected. If the bank is not able to monitor the manager's choices closely (ϕ is high), the relation between α and the preference towards bank debt is concave: when monitoring and the inclusion of a collateral provision are not enough to deter the manager from risk-shifting activities, bank debt loses its advantage over public debt. Thus, the manager prefers to save the monitoring cost c by choosing public debt.

1.5. Discussion regarding model assumptions

I make some simplifying assumptions to develop the model: I consider only a non-repeated game with no renegotiation, I model incentive compensation as exogenous, and I analyze firms with no existing debt. In my model, the game ends at period 2 when the payoffs are realized. It is possible, though, to develop a scenario in which the game is repeated multiple times, and firms that invested in the inefficient project in the first stage are refused additional financing. In this scenario, there will be no asset substitution, because the cost of losing all future financing opportunity would be too high. However, with such a model the coordination between banks would be difficult to achieve. Additionally, empirical evidence suggests that managers do engage in asset substitution activities (Parrino and Weisbach, 1999), even more when their compensation is tied to firm performance (see, e.g., Datta, Iskandar-Datta, and Raman, 2001; Ryan and Wiggins, 2001). Renegotiation does not change the result of my model. Depending on the parameters, lenders may provide new financing hoping to recover the money already spent on the firm. However, this new loan/bond must have a higher interest rate, thus exacerbating the manager's incentive to engage in asset substitution activities. Thus, although renegotiation might be possible, it does not affect the relation between incentive compensation and spreads.

In my model, firm owners want the manager to protect their interests and maximize shareholders' value. They achieve this objective by granting the manager incentive compensation. There is no need for them to make the compensation scheme contingent on the manager's financing choices. From an empirical standpoint, it is unusual to observe managerial contracts with rewards that depend directly on the CEO's financing choices. Additionally, I find that my empirical results are robust to endogeneity concerns on the incentive variables. Finally, allowing for existing firm debt does not change the results of the model. Additional claims on the firm profit give the manager even more incentives to invest in the project with the highest outcome (the risky project *R*). Myers and Majluf (1984), however, show that if the firm uses up the ability to issue low risk debt, it eventually incurs in the underinvestment problem. In this paper I do not study the agency problem of underinvestment: my model is focused on managers that have already decided to invest, and must choose between public and bank financing. In this framework, the assumption of no initial leverage is not restrictive.

1.6. Testable hypotheses

My model has empirical implications on the cross-sectional relation between managerial incentive compensation and the probability that a firm chooses a bank loan over public bonds as the financing source. The model predicts that when the manager's compensation is tied to firm performance, the manager submits to bank monitoring. Therefore, I hypothesize a positive and concave relation between the manager's incentive compensation, and the preference for bank debt. I measure the incentive alignment between manager and shareholders by Core and Guay (2002) Pay-Performance-Sensitivity (*PPS*) to account for stock options as well as stock holdings. As an alternative measure, I use *DELTA*, the sensitivity of option value to changes in the underlying stock price.[6]

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[6] Vega, the sensitivity of option value to changes in the volatility, is a direct measure of the effect of stock options on the manager's preferences toward risk: stock options give managers incentives to increase the volatility of the

My model predicts that bondholders anticipate asset substitution activities and price the manager's incentive compensation. The model also predicts that banks reduce the manager's asset substitution incentives ex-ante, and do not need to increase the borrowing costs. Empirically, I expect a positive relation between *PPS* and bond spreads, and no relation between *PPS* and loan spreads. A novel implication of the model is on the cross-sectional relation between the manager's incentive compensation and the inclusion of a collateral provision in the loan contract. The model predicts that banks collateralize the loan more often if the manager's compensation is tied to firm's performance. The intuition is that a collateral provision is a risk-reducing feature of the loan, which can limit the manager's incentives to asset substitution. Empirically, therefore, the probability of including a collateral provision in the debt contract should be positively related to the manager's *PPS*.

2. Data and variable definition

2.1. Data

To test the model's predictions, I use data on bank loans, bond issues, firm characteristics, and executive compensation.[7] I obtain the sample of bank loans made by US banks to US companies for the period 1992-2005 from Dealscan, a database created by Loan Pricing Corporation (LPC). I exclude utilities and financial firms from the sample of borrowers, and I exclude loans that are refinancing agreements. A deal is typically a package of multiple facilities or tranches, each different in terms of pricing, maturity, and amount. Dealscan provides information on loans at facility level: for the main tests I aggregate the information from facilities that belong to the same loan by computing weighted averages of dollar amounts, spreads, and maturities of the loan tranches, where the weights are ratios of tranche amounts to deal amounts. I refer to the Dealscan sample as the private sample.

I obtain data on straight bonds issued by US firms in US markets during the period 1992-2005 from Fixed Investment Securities Database (FISD). I eliminate utilities and financial firms from the

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firm equity. My focus, however, is on the manager's incentive to forgo safe projects for less efficient ones to expropriate lenders. The incentive for such asset substitution activities depends on the interest alignment between manager and shareholders, which is best measured by *PPS* and *DELTA*.

[7] I do not include commercial paper in the sample of public debt: because commercial paper is generally supported by bank facilities, it is not clear if it is bank or public debt.

sample of issuers. I refer to this sample as the public sample. The information on executive compensation is from ExecuComp, and the data on firm characteristics are from Compustat North America. In order to have the information that is available to the lenders at the time of making the loan, I use information from ExecuComp and Compustat from the last available financial statement at the time of the loan/bond issue.

2.2. Variable description

Following Core and Guay (2002), I define Pay-Performance-Sensitivity (*PPS*) as the sensitivity of the CEO's portfolio to firm value, which is the dollar increase in the manager's portfolio for $1,000 increase in firm value. The alternative measure for incentive alignment is *DELTA*, which is the dollar increase in the value of the manager's stock options for a $1 increase in stock price.[8] The variable *%NEW BANK* is the ratio of new bank debt to total new debt, and measures manager's preference for bank debt.

I use Dealscan's overall cost variable as a measure of the cost of bank loans, and label it *SPREAD*.[9] For the public sample, I define *SPREAD* as the spread over a Treasury bond of comparable maturity. *SPREAD* is not directly comparable across firms in the private and public sample, because bank loan rates are floating, while public bond rates are fixed. I use the Cook and Spellman (2007) method to create the fixed equivalent of a floating rate and call the variable *RATE PAID*. For bank loans, I compute *RATE PAID* by adding the then one-month LIBOR and the then prevailing rate for the Treasury bond with the same maturity to *SPREAD*, and subtracting the then three-month Treasury rate. For public bonds, I define *RATE PAID* as the offering yield in basis points. I delete from the sample all observations for which the variable *SPREAD* is missing. The dummy variable *COLLATERAL* takes a value of one if the bond /loan is collateralized, and is zero otherwise. There are 380 and 91 missing values for the variable *COLLATERAL* in the private and public samples, respectively. I exclude the missing observations only where the variable *COLLATERAL* is included in the tests.

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[8] As a robustness check, I also compute Total Delta= [(# of options)/(# of shares outstanding)]*Delta. Results do not change significantly.

[9] Dealscan provides the overall cost of bank loans, including annual and upfront fees, as a spread over LIBOR. If the base rate is not the LIBOR, Dealscan converts the spread over the base rate to spread over LIBOR by adding or subtracting a constant differential that reflects historical differences between the relevant rates.

I use the following control variables in the analysis. The dummy variables *SIZE2* and *SIZE3* for the second and third terciles of firm total assets capture size effects and non linearities in the relation between size and the dependent variables of my study. The variable *PROFITABILITY* is the ratio of operating income before depreciation and total assets, and *LOSS* is a dummy variable that equals one if the firm reported a loss. I use two measures of growth opportunities: ratio of R&D expense and total assets (*R&D*), and book value of debt plus market value of common and preferred stock divided by total assets (*MARKET-TO-BOOK*). I include the age of the firm (*AGE*) to capture reputation effects.

The proxies for the likelihood of financial distress are ratio of liabilities to total debt (*BOOK LEVERAGE*), ratio of operating income before depreciation to interest expense (*INTEREST COVERAGE*), and Altman (1977) *Z-SCORE*, which I compute as $1.2 * \frac{\text{Working Capital}}{\text{Total Assets}} + 1.4 * \frac{\text{Retained Earnings}}{\text{Total Assets}} +$

$+ 3.3 * \frac{\text{EBIT}}{\text{Sales}} + 0.999 * \frac{\text{Sales}}{\text{Total Assets}} + 0.6 * \frac{\text{Market Value of Equity}}{\text{Book Value of Liabilities}}$.

To account for overall firm risk, I include the moving standard deviation of daily returns on a window of 30 days (*RETURNS VOLATILITY*), and the ratio of net plant and equipment to total assets (*TANGIBILITY*).[10] The dummy variable *BLOCK* accounts for the presence of block holders.

All regressions include the variable *MATURITY*, calculated as the maturity of the loan/bond in years, and *DEAL AMOUNT*, computed as total amount of the loan/bond issue in $ million. Finally, I include the variable *INTEREST VOLATILITY*, measured as the monthly average of the 12-month moving standard deviation of daily yields on 10-years U.S. T-bonds. All continuous variables are winsorized at 1%. Regressions include industry dummies based on the first two digits of the NAICS code, and year dummies. The private and public samples have 631 and 1,567 observations respectively. Table 1 presents all variables and their definitions.

3. Univariate analysis

[10] Investments in fixed capital are easily monitored by lenders, and can be used as collateral. Therefore, a firm with tangible assets is perceived as less risky.

Table 2 provides information on the composition of the private sample. The vast majority of bank loans (98%) are syndicated deals, while the most common facility type is the revolver line with a maturity of more than one year (54%), followed by the 364-day facility (33%). General corporate purposes (37%), CP backup and takeover (19% each) are the most common facility purposes.[11] Table 3 provides statistics on the presence of repeated borrowers in the public and private samples. Approximately 34% of the firms in the private sample have multiple bank loans in the sample period, while 64% of the firms in the public sample issued multiple bonds. Panel B of Table 3 reports the number of deals for each company: on average, firms in the private sample obtained 1.58 new bank loans during the sample period, while firms in the public sample issued on average 3.36 new bonds. In the multivariate analysis all standard errors are adjusted for the clustering of observations in firms that have multiple loans or issue multiple bonds.

Panel A of Table 4 presents the comparison of selected debt contract features across the two types of financing, bank loans and public bonds, and panels B, C, and D report the main descriptive statistics for the whole, public and private sample respectively. The main sample consists of 631 bank loans aggregated at deal level, and 1,567 public bonds. The total volumes of bank loans and public bonds are $441,953 and $578,840 million respectively. The average deal amount of a bank loan ($700 million) is significantly greater than that of a bond issue ($369 million). *RATE PAID* and *SPREAD* are both significantly lower for bank loans than for bonds. The shortest maturity for a bank loan is one year, while for a bond is two years. Finally, 38.6% of bank loans are collateralized, while the percentage for public bonds is only 1%, which is consistent with my model's prediction that only banks include a collateral provision in the contract.

Panel A of Table 5 reports the comparison of firm characteristics across private and public borrowers and panels B, C, and D report the main descriptive statistics for the whole, public and private sample respectively. Consistent with the hypothesis that aligned managers prefer bank debt, Table 5 shows that private borrowers have a significantly higher *PPS* than public borrowers, $20.05 against

[11] According to SDC, the purpose of almost all bond issues in the sample period is General Corporate Purposes.

$15.04. The value of *DELTA*, the alternative measure of incentive alignment, is also higher for bank borrowers, but the difference is not significant. The Spearman correlation coefficient between *PPS* and size is negative and significant, and the average size of a private borrower is approximately 45% of the average size of a public borrower. These two facts together suggest a potential selection problem: if small firms do not have access to bond markets, the relation between *PPS* and *%NEW BANK* could be positive because small firms are characterized by high *PPS*. In the multivariate regressions I will control for this potential selection problem, and isolate the non-spurious relation between *PPS* and the choice of bank debt.

Consistent with the intuition that firms that face potentially high asset substitution costs prefer to commit to bank monitoring, private borrowers have a significantly higher *MARKET-TO-BOOK* (2.018 against 1.781) and *R&D* (0.007 against 0.004). Bank borrowers exhibit higher *RETURNS VOLATILITY* (2.363% against 2.103%) and lower *TANGIBILITY* (0.334 vs. 0.385) than their public counterparts. Private borrowers seem to have a better credit quality than public borrowers: they have lower *BOOK LEVERAGE* (0.161 for private borrowers and 0.208 for public borrowers), higher *INTEREST COVERAGE* (22.818 against 10.683), and higher *Z-SCORE* (4.191 vs. 3.151). There are no differences in profitability between the two groups. This finding is not consistent with Denis and Mihov (2003) result that private borrowers have a lower credit quality. Finally, private borrowers are younger than public borrowers (37.6 vs. 41.5 years), which is consistent with Diamond (1991) prediction that young firms choose bank debt to build reputation.

4. Multivariate analysis

4.1.1. The choice between public and bank debt

In the multivariate tests, I first assume that managerial compensation is optimally set before the firm financing decision, and use pooled regressions as my primary estimation method. In Section 4.1.2, I relax this assumption, and show that the results are robust to endogeneity concerns. I also show that my results do not depend on self-selection on firm size or existing bank debt in the firm balance sheet.

Column (1) of Table 6 reports the results of a pooled regression of the percentage of new bank debt *(%NEW BANK*) on incentive and control variables. The most important result is that the coefficient on *PPS* is positive (0.041) and significant (p-value=0.034), while the coefficient on PPS^2 is negative (-0.009) and significant (p-value=0.029). This evidence supports the prediction that the relation between the manager's incentive alignment and the preference toward bank debt is positive and concave. In terms of economic significance, the coefficients on *PPS* and PPS^2 imply that a firm with *PPS* in the 50th percentile issues almost 8.5% more new bank debt than a firm with *PPS* in the 1st percentile. Smaller increments of *PPS* from the 1st to the 10th percentile, or from the 5th to the 25th percentile, also increase the percentage of new issues of bank debt by approximately 4%. Consistent with the hypothesized concavity, an increase in *PPS* from the 50th to the 75th percentile increases *%NEW BANK* by only 0.5%, while an increase from the 75th to the 90th percentile decreases *%NEW BANK* by 1.6%. Thus, if incentive compensation is very high, not even the probability of being caught and punished can deter the manager from engaging in asset substitution activities. If the bank cannot change the manager's incentives ex-ante, there is no reason for the firm to pay the monitoring cost: under these circumstances, the manager issues public bonds. [12]

The coefficients on the two size terciles are both negative and significant, and the coefficient on the third tercile is 30% larger than the coefficient on the second tercile in absolute terms, which shows that the effect of size on the choice of debt is not linear. The coefficient on *PROFITABILITY* is negative and significant, implying that profitable firms have a lower probability of default, which makes bank monitoring less necessary. The age of the firm and the presence of block holders do not seem to have an impact on debt choice.[13]

[12] An alternative explanation is that when incentive compensation is very high, a relevant portion of the manager's wealth is tied to firm value, making the manager more risk averse. Thus, there is no need to force the manager to invest in the safe project.

[13] A block holder could force the manager to invest in risky projects with the threat of termination, even when the manager's interests are not aligned with the shareholders' through incentive compensation. In unreported tests, I check for this effect by including the interaction term *PPS*BLOCK*: the coefficient is not significantly different from zero.

The coefficient on *BOOK LEVERAGE* is negative and significant, while the coefficient on *Z-SCORE* is significantly positive. These findings confirm the finding from Table 5 that borrowers with better credit quality prefer bank debt. The coefficients on *RETURNS VOLATILITY*, *MARKET-TO-BOOK* and *R&D* are not significantly different from zero. The coefficient on *DEAL AMOUNT* is positive and significant, which shows that companies in need of a substantial loan turn to banks. Finally, the coefficient on *MATURITY* is negative and significant, indicating that firms that need a short-term loan choose a bank loan over a bond.

I next consider *DELTA*, the alternative measure on incentive alignment between manager and shareholders, and report the results of a pooled OLS regression of *%NEW BANK* on *DELTA* in Column (2) of Table 6. The coefficient on *DELTA* is positive (0.762) and significant (p-value=0.028). The coefficient on $DELTA^2$ is also positive (0.925) and significant (p-value=0.008). Thus, the preference toward bank debt seems to increase as delta increases. The coefficients on the control variables are comparable to the coefficients from the first regression.

4.1.2. The choice between public and private debt: robustness checks

Denis and Mihov (2003) suggest that existing debt structure could affect the choice of the firm financing source. New bank debt loses its advantage over public bonds if lenders can free ride on pre-existing bank monitoring. If that is the case, there should be no relation between *PPS* (*DELTA*) and *%NEW BANK*. I hand collect information on existing bank debt from Moody's Industrial Manuals for the period 1995-2001. I only include in the analysis debt that is explicitly labeled as bank debt. Columns (3) and (4) in Table 6 report the coefficients of the regression of *%NEW BANK* on *PPS* and *DELTA* with the new variable *%EXISTING BANK DEBT* included as a control variable. The coefficient on *PPS* remains positive and significant, but the coefficient on PPS^2 is not significantly different from zero. The coefficients on *DELTA* and $DELTA^2$ remain positive and significant. These results indicate that the relation between preference for bank debt and managerial incentive compensation is still positive, but not concave. The coefficient on *%EXISTING BANK DEBT* is positive and significant in both regressions, indicating that public lenders do not free ride on pre-existing bank monitoring.

I next consider a scenario, depicted in theoretical papers such as John and John (1993) and Almazan and Suarez (2003), where the relation between managerial incentive compensation and firm debt choices is endogenous. To address the issue, I estimate a two-stage least square regression of *%NEW BANK*, treating *PPS* and *DELTA* as endogenous variables. I use three instruments: lagged compensation, CEO tenure, and sales growth. According to Murphy (1999) incentive compensation depends on firm industry and size: thus, it is likely that a firm past incentive compensation is a determinant of the manager's current incentive compensation. Additionally, past compensation should not be related with the debt choice or the financing cost, because lenders are only interested in the managerial incentives in place at the time of the loan. Palia (2001) and Murphy (1986) argue that the manager's ability is unknown in the beginning of his term and that performance is used to infer information on managerial ability. Thus, in the early years of the manager's tenure, performance has a larger impact on the manager's pay-performance sensitivity. Finally Conyon and Nicolitsas (1998) and Kedia and Mozumdar (2002) find evidence of a positive relation between sales growth and incentive compensation. Following Baum, Schaffer, and Stillman (2003), I check the relevance of the instruments (correlation with the suspected endogenous variable) with partial R^2 and F-test on the joint significance of the instruments in the first stage regression. I also check the validity of the instruments (orthogonality to the error process) with the Hansen J statistic. Table 7 presents the results of the tests. The partial R^2 ranges from 0.305 to 0.532, while the F statistics are all above 56: the instruments seem to be relevant. The p-values on the Hansen J statistics fail to reject the null hypothesis that the instruments are not correlated to the error process. Thus, the instruments are valid. Finally, I test the endogeneity of *PPS* and *DELTA*: the Sargan C statistic fails to reject the null that *PPS* (*DELTA*) and PPS^2 ($DELTA^2$) are exogenous. Thus, my primary estimation method is pooled OLS.

A concern in the tests presented so far is a potential sample self-selection on firm size: small firms, usually characterized by higher *PPS*, may not have access to bond markets. This fact could explain the positive relation between *%NEW BANK* and *PPS*. A similar concern is that large firms, characterized by low *PPS*, may have to issue public bonds to raise sizable sums.[14] This selection could also explain the positive relation between *PPS* and *%NEW BANK*. To reduce the bias from both sources, I truncate the main sample at 10% on both sides on firm size. Columns (1) and (2) in Table 8 present the results of the regression on this sub sample. The coefficient on *PPS* and PPS^2 are now not significantly different from zero. However, the coefficient on *DELTA* and $DELTA^2$ are still positive and significant.[15]

Myers (1977) and Barnea, Haugen, and Senbet (1980) suggest that debt maturity can be used to alleviate the agency problems of underinvestment and asset substitution. In my framework, short-term debt can mitigate the asset substitution cost imposed by a manager who shares owners' interests through incentive compensation. Long-term debt is mainly available in the form of public bonds: thus, a manager with low incentive compensation that prefers long tem debt to avoid costly liquidation may have no choice but to issue corporate bonds. On the other hand, short-term debt is mainly available through bank loans: a manager with high incentive compensation, who thus prefers short-term debt to alleviate the agency problem of asset substitution, may have to choose bank debt. If this is the case, the positive relation between incentive compensation and preference toward bank debt could be due to the relation between incentive compensation and maturity. To address this issue, I estimate the model on a sub sample truncated on maturity at 10% on both sides. Columns (3) and (4) of Table 8 present the regression coefficients. The coefficients on *PPS* and *DELTA* are still positive and significant, the coefficient on PPS^2 is negative and significant, and the coefficient on $DELTA^2$ is positive and significant.[16]

Finally, columns (5) and (6) of Table 8 report the coefficients of the regression from a sub sample truncated at 10 % on both size and maturity. The coefficients on *PPS* and PPS^2 are now not significantly different from zero, but the coefficients on *DELTA* and $DELTA^2$ are both positive and significant. These

[14] Loan syndication enables banks to offer loans that are comparable in size with bond issues. In this sample, the mean deal amount is actually greater for bank loans than public bonds. Thus, this second type of selection is less of a concern.

[15] In unreported tests, I eliminate from the main sample bank borrowers that are smaller than the smallest public borrower, and public borrowers that are bigger than the biggest bank borrower. Results do not change significantly.

[16] In unreported tests, I estimate the model on a sub sample created by eliminating from the original sample bank loans with a maturity shorter than the shortest maturity of a public bond, and public bonds with a maturity longer than the longest maturity of a bank loan. Coefficients do not change significantly.

results indicate that selection on maturity and size does not fully explain the positive relation between incentive compensation and preference toward bank debt.

In Table 9, I include *SPREAD* as a determinant of the firm financing source. Panel B of Table 9 shows statistics and p-values of the endogeneity test, as well as the test on the relevance and validity of the instruments. I use a dummy variable identifying dividend payers and *INTEREST VOLATILITY* as instruments for *SPREAD*. Partial R^2, F-, and Hansen J statistics show that the instruments are correlated with *SPREAD* and orthogonal to the error process. The C-statistic confirms the endogeneity of *SPREAD*. Panel A reports the coefficients of a 2SLS regression of *%NEW BANK*. The coefficient on *PPS* is still positive and significant and the coefficient on PPS^2 is negative and significant. In column (2), the coefficient on *DELTA* and $DELTA^2$ remain positive and significant. The coefficient on *SPREAD* is never significant. Notice that all coefficients are similar to the coefficients from the main regression: that is, adding *SPREAD* did not change the results.[17]

To summarize, the coefficient on the main incentive alignment variable, *PPS*, is positive and significant even after including existing debt structure in the model, and controlling for the self-selection induced by size and maturity. The evidence from tables 6, 8, and 9 supports the hypothesis that a manager whose interests are aligned with the shareholders' through incentive compensation shows a preference for bank debt over public bonds as the firm's financing source.

4.2.1. Incentive alignment and the costs of debt

I next examine the relation between managerial incentive compensation and cost of public and bank debt by estimating a multivariate regression of *SPREAD* on *PPS*, *DELTA*, and the control variables. In the main test, I assume that incentive compensation is exogenous and use pooled OLS. Later I relax this assumption, and show that my results are robust to endogeneity concerns.

[17] In unreported regressions, I also test the endogeneity of the maturity of the loan. Following Dennis, Nandy, and Sharpe (2000) I use the ratio of taxes and total assets, and asset maturity as instruments for maturity. The C-statistic fails to reject the null hypothesis that debt maturity is exogenous.

I first focus on public borrowers. Column (1) of Table 10 shows the coefficients of a pooled regression of *SPREAD* on *PPS* and the control variables on the sample of public borrowers. The main finding is that the coefficient on *PPS* is positive (6.991) and significant (p-value=0.025). This finding is consistent with the intuition that public lenders account for the asset substitution incentives of a manager with high *PPS* by charging the firm a higher spread. In economic terms, borrowing costs of a firm with *PPS* in the 75th percentile are approximately 12 bps higher than borrowing costs of a firm with *PPS* in the 25th percentile. This number is consistent with Ortiz-Molina (2006) finding that a comparable increase in the number of stock and stock options increases the borrowing costs by 8 bps.

Large firms are more scrutinized by analysts and thus the information asymmetry, and the related risk, is lower. Consistent with this conjecture, the two size variables are negatively related to *SPREAD*. However, the coefficient on the second size tercile is 43% smaller than the coefficient on the third size tercile in absolute terms, which suggests that the effect of information asymmetry reduction on the bond spread is not linear. The variable *AGE* is negatively related to *SPREAD*, indicating that firm reputation can reduce the cost of debt. The coefficient on *PROFITABILITY* is also negative and significant, suggesting that a profitable firm is more likely to be able to pay back the lenders, and is thus perceived as less risky. Consistent with the intuition that a firm with greater opportunities for asset substitution activities has a higher cost of debt, the coefficient on *R&D* is positive and significant. However, the coefficient on *MARKET-TO-BOOK* is significantly negative, which may indicate that *MARKET-TO-BOOK* is measuring profitability more than growth opportunities.

The coefficients on *BOOK LEVERAGE* and *Z-SCORE* are both significant and confirm the intuition that firms in financial distress face a high cost of debt. This result is consistent with Merton (1974) model for pricing default risk on corporate debt, which suggests that cost of debt is positively related to firm leverage and to the variance of the underlying assets of the borrower (here measured by the *Z-SCORE*). Finally, the coefficients on *MATURITY* and *COLLATERAL* are positive and significant. The coefficient on *COLLATERAL* is consistent with Berger and Udell (1990), and indicates that risky borrowers are required to pledge collateral and pay higher spreads.

Column (2) of Table 10 shows the coefficients of the regression of *SPREAD* on *DELTA*. The coefficient on *DELTA* is positive (50.225) and significant (p-value=0.059). Coefficients on the control variables are qualitatively and quantitatively similar to the coefficients in column (1). In economic terms, the coefficients imply that, holding everything else constant, borrowing costs of a firm with *DELTA* in the 75th percentile are 10.7 bps higher than borrowing costs of a firm with *DELTA* in the 25th percentile.

Columns (2) and (3) of Table 10 present the result of the regression of *SPREAD* on the managerial incentive compensation variables on the sample of bank borrowers. As predicted by the model, there is no relation between incentive compensation and the cost of bank loans.[18] This finding suggests that banks are not worried about the asset substitution behavior induced by incentive compensation, possibly because they can reduce the manager incentives to asset substitution through monitoring.

4.2.2. Incentive alignment and the costs of debt: robustness checks

I next consider a scenario where CEO's incentive compensation is endogenous. As Ortiz-Molina (2006) points out, there may be a risk factor correlated with incentive compensation and cost of debt. Alternatively, firm risk may affect the structure of the CEO compensation package. To address the issue, I estimate the model with a two-stage least square regression of *SPREAD*, treating the incentive variables as endogenous. I use lagged incentive compensation and CEO tenure as instruments for *PPS* and *DELTA*. The economic rationale of using past *PPS* and *DELTA* as instruments for current incentive compensation is that past incentive compensation should not be related to *SPREAD*, because lenders are only interested in the CEO's incentive structure at the time the loan is negotiated. Palia (2001) suggests CEO experience as instrument for pay-performance-sensitivity.[19] As before, I test the relevance and validity of the instruments: Table 11 reports the results of the tests for both the public and private sample. The partial R^2 always falls within 0.226 and 0.658, while the F statistics are all above 14. Additionally, the Hansen J

[18] For this test, I delete all the observation where the variable *COLLATERAL* is missing. In unreported tests, I set *COLLATERAL* to 0 whenever the variable is missing. That allows me to increase the sample size to 631 observations. The coefficients do not change significantly. Most importantly, the coefficients on the incentive compensation variables are still not significant.
[19] See Section 4.1.2.

statistic fails to reject the null that the instruments are orthogonal to the error process. I can conclude that the instruments are relevant and valid. Finally, the C statistic fails to reject the null that *PPS* and *DELTA* are exogenous in all cases. Thus, I use pooled OLS as primary estimation method.

The results for private borrowers may be affected by the choice to aggregate tranches that belong to the same deal, and to calculated weighted spreads and maturities. In unreported tests, I re-estimate the coefficients of the regressions using sub samples with revolvers only, largest tranches, and whole deals only.[20] The results of the regressions on these bank loans sub samples do not change and there is no significant relation between *PPS* (*DELTA*) and *SPREAD*.[21]

In summary, the results from Table 10 support the model prediction that the relation between cost of debt and incentive compensation is positive in the public sample, and not significant in the bank sample. This finding is consistent with the intuition that public lenders account for the manager's incentives to invest in risky assets by looking at his compensation package, and charge a higher spread to be compensated for the expected asset substitution. The results are also consistent with my model's prediction that banks can limit the manager's incentives to asset substitution trough monitoring, thus eliminating the need to charge the firm a higher interest rate.

4.3. Incentive alignment and collateral

The model predicts a positive relation between incentive compensation and the probability that a collateral provision is included in the debt contract. I test these predictions with a logistic regression of the dummy variable *COLLATERAL* on incentive and control variables. Only 1% of public borrowers (15 out of 1,476) collateralized their bond issue in my sample and, therefore, I test the hypothesis on the private sample only.

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[20] I have only 59 observations for term loans, thus I cannot perform any test on that sub sample.

[21] Another possible source of bias in the regression is the selection of the variable *COLLATERAL*: because selection is unobserved, the effect of *COLLATERAL* on *SPREAD* could be confounded by the unknown factors affecting the collateralization decision. I use a treatment effect model à la Heckmann to correct for the selection bias. In the public sample, the coefficient on the Inverse Mills Ratio (IMR) is significant, indicating that the treatment effect model should be used. However, the coefficients are qualitatively and quantitatively similar to the OLS coefficients. For the private sample, the coefficient on the IML is not significant, and OLS can be safely used.

Table 12 shows the coefficients of a logistic regression of *COLLATERAL* on *PPS* and *DELTA*. The main result in Column (1) is that there is a positive (0.283) and significant (p-value=0.077) relation between *PPS* and the probability that a collateral provision is included in the debt contract. This finding supports the hypothesis that lenders use the collateral provision to limit manager's incentives for asset substitution. The coefficients on the size terciles are negative and significant indicating that large firms are less risky for lenders because there is less information asymmetry. The coefficients on *BOOK LEVERAGE*, *RETURNS VOLATILITY*, and *TANGIBILITY* indicate that firms with lower credit quality or high overall risk have to pledge collateral. Finally, the coefficient on *MATURITY* indicates that loans with longer maturity require the collateral provision. In economic terms, the coefficients from column (1) imply that a firm with *PPS* in the 75th percentile is 2.3 times more likely to collateralize the loan than a firm with *PPS* in the 25th percentile.

Column (2) reports the coefficient of the logistic regression of *COLLATERAL* on *DELTA*. The coefficient on *DELTA* is positive (3.862) and significant (p-value=0.044). The effect of *DELTA* on the collateralization decision is quite significant: the coefficient implies that a firm with *DELTA* in the 75th percentile is 10 times more likely to include a collateral provision in the loan contract than a firm with *DELTA* in the 25th percentile. In column (3) I set the variable *COLLATERAL* to zero whenever the observation is missing. This allows me to increase the sample size to 631. The results are similar, although now the coefficient on *PPS* is not significant.

These findings are consistent with the intuition that banks can include a collateral provision in the contract to reduce the incentives to asset substitution of an aligned manager. My results seem to indicate that public lenders price the manager's incentives to asset substitution, while banks limit those incentives by monitoring the firm and by sometimes requiring collateral.[22] These findings are consistent with monitoring and collateral being complementary mechanisms to limit managerial incentives for asset substitution activities.

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[22] Anecdotal evidence shows that firms sometime pledge their receivables as collateral. Because the value of receivables depends directly on the firm operations, lenders will have even more incentive to monitor the firm and the value of the collateral.

5. Conclusion

The primary motivation of my study is to examine how the manager's incentive compensation affects the firm choice between public and bank debt. In my model, shareholders cannot directly control the firm financing and investing decisions, but rely on managers' choices. Tying the manager's compensation to firm performance aligns manager and shareholders' interests, but it also provides the manager with incentives to substitute safe assets with risky ones. Rational lenders anticipate and price the asset substitution incentives embedded in the manager's compensation. The article main finding is that managers with high incentive compensation reduce the borrowing costs due to their asset substitution incentives by submitting to bank monitoring. The model also predicts that while public lenders price the manager's asset substitution incentives by requiring a higher interest, banks limit the manager's incentives ex-ante by monitoring his actions, and do not require a higher interest rate. Finally, I find that banks also include a collateral provision in the contract to reduce the asset substitution incentives of a manager with high incentive compensation.

I empirically investigate the predictions of my model with a sample of 2,198 new debt financings over the period 1992-2005. I show that Pay-Performance-Sensitivity and *DELTA* positively affect the choice of bank debt. The positive relation between my measures of incentive alignment and the preference for bank debt obtains after controlling for existing bank debt and self-selection on firm size and debt maturity. I then investigate the impact of managerial incentive compensation on lenders' pricing decisions, distinguishing between public lenders and banks. I show that *PPS* and *DELTA* positively affect the yield of public bonds, while there is no relation between *PPS* (*DELTA*) and the overall cost of bank loans. Finally, I examine the role of incentive compensation in the collateralization decision, and show that *PPS* and *DELTA* positively relate to the probability that a collateral provision is included in the debt contract. Overall, my empirical findings support the model's predictions.

APPENDIX

Proof of Lemma 1. The manager invests in the safe project only if investing in *S* maximizes his expected profit. Thus, the manager solves the following equation for the interest rate *r*:

$$E_{NC}^{M}(S,r) = W - (1-q)\xi + \alpha q[E + H - W - I(1+r)] > E_{NC}^{M}(R,r) = W - (1-p)\xi + \alpha p[E + Z - W - I(1+r)]$$

If the bond is collateralized, the manager solves

$$E_{C}^{M}(S,r) = qW + \alpha q[E + H - W - I(1+r)] > E_{C}^{M}(R,r) = pW + \alpha p[E + Z - W - I(1+r)]$$

Solving the inequalities for *r* leads to *Lemma 1*. Q.E.D.

Proof of Proposition 1. This proof has two parts: first, I analyze all the feasible outcomes given the manager's reaction function; then, I study which outcome prevails for each level of incentive compensation *α*.

Part 1: Feasible Outcomes

a) $r_{NC} < r_{NC}^{*}$ ($r_C < r_C^{*}$)

Lenders know that if $r_{NC} < r_{NC}^{*}$ ($r_C < r_C^{*}$) the manager invests in project *S*. Competitive bondholders charge the interest rate that guarantees a zero expected profit; thus, bondholders charge the interest rate *r* that solves the equation $E^{L}(S, r_{NC}) = qI(1+r_{NC}) + (1-q)(E+\xi-W) - I = 0$, or $E^{L}(S, r_C) = qI(1+r_C) + (1-q)E - I = 0$ with collateral. The solutions for the case with and without collateral are $r_{NC}^{S} = [I-(1-q)(E+\xi-W)]/qI - 1$ and $r_C^{S} = [I-(1-q)E]/qI - 1$ respectively. To be feasible, the interest rate must be incentive compatible, and must guarantee the manager a non-negative profit. r_{NC}^{S} is incentive compatible only if $r_{NC}^{S} < r_{NC}^{*}$. Solving the inequality for the level of incentive compensation *α* gives the condition for r_{NC}^{S} to be incentive compatible: there is a threshold $\alpha_{NC}^{*} > 0$ such that if $\alpha < \alpha_{NC}^{*}$, $r_{NC}^{S} < r_{NC}^{*}$, with

$$\alpha_{NC}^{*} = \frac{q(q-p)\xi}{p[qZ + E + (1-q)\xi - W - I] - q[qH + E + (1-q)\xi - W - I]}$$

Similarly, with collateral there is a threshold $\alpha_C^* > 0$ such that if $\alpha < \alpha_C^*$, $r_C^S < r_C^*$, where α_C^* is

$$\alpha_C^* = \frac{q(q-p)W}{p[qZ + E - qW - I] - q[qH + E - qW - I]}$$

Only when α is below the threshold α_{NC}^* the manager, offered the interest rate r_{NC}^S, invests in the safe project *S*, and has an expected positive payoff of $E_{NC}^M(S, r_{NC}^S) = W - (1-q)\xi + \alpha[qH + E + (1-q)\xi - W - I]$. With collateral, the manager invests in the safe project *S* when offered r_C^S only when α is below the threshold α_C^*, in which case his expected positive payoff is $E_C^M(S, r_C^S) = qW + \alpha[qH + E - qW - I]$. If α is greater than the threshold α_{NC}^* (α_C^*), then r_{NC}^S (r_C^S) is not feasible: the manager facing the rate r_{NC}^S (r_C^S) invests in the risky project *R*, and bondholders' expected profit is negative. Thus, for α greater than the threshold, no lender offers r_{NC}^S.

b) $r_{NC} > r_{NC}^*$ ($r_C > r_C^*$)

Lenders know that if $r_{NC} > r_{NC}^*$ ($r_C > r_C^*$) the manager invests in project *R*. Competitive bondholders charge the interest rate that guarantees a zero expected profit; thus, bondholders charge the interest rate *r* that solves $E^L(R, r_{NC}) = pI(1 + r_{NC}) + (1-p)(E + \xi - W) - I = 0$, or $E^L(R, r_C) = pI(1 + r_C) + (1-p)E - I = 0$ with collateral. The solutions for the case with and without collateral are $r_{NC}^R = [I - (1-p)(E + \xi - W)]/pI - 1$ and $r_C^R = [I - (1-p)E]/pI - 1$ respectively. To be feasible, the interest rate must be incentive compatible, and must guarantee the manager a non-negative profit. r_{NC}^R is incentive compatible only if $r_{NC}^R > r_{NC}^*$. Solving the inequality for the level of incentive compensation α gives the condition for r_{NC}^R to be incentive compatible: there is a threshold $\alpha_{NC}^{**} > 0$ such that if $\alpha > \alpha_{NC}^{**}$, $r_{NC}^R > r_{NC}^*$, where α_{NC}^{**} is

$$\alpha_{NC}^{**} = \frac{p(q-p)\xi}{p[pZ + E + (1-p)\xi - W - I] - q[pH + E + (1-p)\xi - W - I]}$$

Similarly, with collateral there is a threshold $\alpha_C^{**} > 0$ such that if $\alpha > \alpha_C^{**}$, $r_C > r_C^*$, where α_C^{**} is

$$\alpha_C^{**} = \frac{p(q-p)W}{p[pZ+E-pW-I]-q[pH+E-pW-I]}$$

Only when α is above the threshold α_{NC}^{**} the manager, offered the interest rate r_{NC}^R, invests in the risky project, and has an expected payoff of $E_{NC}^M(R, r_{NC}^R) = W-(1-p)\xi + \alpha[pZ+E+(1-p)\xi - W - I] > 0$. Similarly, with collateral only when α is above the threshold α_C^{**} the manager, offered the interest rate r_C^R, invests in the risky project, and has an expected positive payoff of $E_C^M(R, r_C^R) = pW + \alpha[pZ+E-pW-I]$. If α is below the threshold, r_{NC}^R (r_C^R) is not incentive compatible: the manager, offered r_{NC}^R (r_C^R), invests in the safe project *S*, and bondholders have a positive expected profit. However, because public lenders are competitive, another group of investors offers the lower rate r_{NC}^S (r_C^S): the manager accepts the offer, and invests in project *S*, because $E_{NC}^M(S, r_{NC}^S) > E_{NC}^M(R, r_{NC}^R)$. Thus, if α is lower than the threshold, no lender offers r_{NC}^R.

Part 2: Final Outcomes

It can be readily shown that $\alpha_{NC}^{**} < \alpha_{NC}^{*} < \alpha_C^{*}$. For simplicity, I assume that $\alpha_{NC}^{**} < \alpha_C^{**} < \alpha_{NC}^{*} < \alpha_C^{*}$. If $\alpha_{NC}^{**} < \alpha_{NC}^{*} < \alpha_C^{**} < \alpha_C^{*}$ the final result does not change. If $\alpha < \alpha_{NC}^{**}$, only two interest rates are feasible, r_{NC}^S and r_C^S. Simple calculations show that $E_{NC}^M(S, r_{NC}^S) > E_C^M(S, r_C^S)$: thus, for $\alpha < \alpha_{NC}^{**}$, the backwards-induction outcome is (S, r_{NC}^S). For $\alpha_{NC}^{**} \le \alpha < \alpha_C^{**}$, the feasible interest rates are r_{NC}^S, r_C^S, and r_{NC}^R. Because $E_{NC}^M(S, r_{NC}^S) > E_C^M(S, r_C^S)$, the relevant comparison is between $E_{NC}^M(S, r_{NC}^S)$ and $E_{NC}^M(R, r_{NC}^R)$. It can be shown that $E_{NC}^M(S, r_{NC}^S) > E_{NC}^M(R, r_{NC}^R)$: thus, for $\alpha_{NC}^{**} \le \alpha < \alpha_C^{**}$, the backwards-induction outcome is (S, r_{NC}^S). For $\alpha_C^{**} \le \alpha < \alpha_{NC}^{*}$, the feasible interest rates are r_{NC}^S, r_C^S, r_{NC}^R, and r_C^R. It can be shown that $E_{NC}^M(R, r_{NC}^R) > E_C^M(R, r_C^R)$. Because $E_{NC}^M(S, r_{NC}^S) > E_C^M(S, r_C^S)$, the relevant comparison is again between $E_{NC}^M(S, r_{NC}^S)$ and $E_{NC}^M(R, r_{NC}^R)$: thus, for $\alpha_C^{**} \le \alpha < \alpha_{NC}^{*}$, the backwards-induction outcome is (S, r_{NC}^S). If $\alpha_{NC}^{*} \le \alpha < \alpha_C^{*}$, the feasible interest rates are r_C^S, r_C^R and r_{NC}^R. Because $E_{NC}^M(R, r_{NC}^R) > E_C^M(R, r_C^R)$, the relevant comparison is between $E_C^M(S, r_C^S)$ and $E_{NC}^M(R, r_{NC}^R)$. Given the model parametric assumptions, it can be shown that $E_C^M(S, r_C^S) > E_{NC}^M(R, r_{NC}^R)$: thus, for $\alpha_{NC}^{*} \le \alpha < \alpha_C^{*}$, the backwards-induction outcome is (S, r_C^S). Finally, for $\alpha \ge \alpha_C^{*}$, the only feasible interest rates are r_{NC}^R

and r_C^R. Because $E_{NC}^M(R, r_{NC}^R) > E_C^M(R, r_C^R)$, the backwards induction outcome for this case is (R, r_{NC}^R). Q.E.D.

Proof of Lemma 2. The manager invests in the safe project only if investing in *S* maximizes his expected profit. Thus, the manager solves the following equation for the interest rate *r*:

$$\overline{E}_{NC}^M(S,\overline{r}) = W - (1-q)\xi + \alpha q[E + H - W - I(1+r)] > \overline{E}_{NC}^M(R,\overline{r}) = W - (1-\phi p)\xi + \alpha\phi p[E + Z - W - I(1+r)]$$

With collateral, the manager solves

$$\overline{E}_C^M(S,\overline{r}) = qW + \alpha q[E + H - W - I(1+r)] > \overline{E}_C^M(R,\overline{r}) = \phi p W + \alpha\phi p[E + Z - W - I(1+r)]$$

Solving the inequalities for *r* leads to *Lemma 2*. Q.E.D.

Proof of Proposition 2. This proof has two parts: first, I analyze all the feasible outcomes given the manager's reaction function; then I study which outcome prevails for different levels of incentive compensation *α*.

Part 1: Feasible Outcomes

a) $\overline{r}_{NC} < \overline{r}_{NC}^*$ ($\overline{r}_C < \overline{r}_C^*$)

The bank knows that, if $\overline{r}_{NC} < \overline{r}_{NC}^*$ ($\overline{r}_C < \overline{r}_C^*$), the manager invests in project *S*, and the signal is *S* with probability 1. Competitive banks charge the interest rate that guarantees a zero expected profit; thus, banks charge the interest rate *r* that solves $\overline{E}^L(S,\overline{r}_{NC}) = qI(1+\overline{r}_{NC}) + (1-q)(E + \xi - W) - I - c = 0$, or $\overline{E}^L(S,\overline{r}_C) = qI(1+\overline{r}_C) + (1-q)E - I - c = 0$ with collateral. The solutions for the case with and without collateral are $\overline{r}_{NC}^S = [I + c - (1-q)(E + \xi - W)]/qI - 1$ and $\overline{r}_C^S = [I + c - (1-q)E]/qI - 1$ respectively. To be feasible, the interest rate must be incentive compatible and must guarantee the manager a non-negative profit. $\overline{r}_{NC}^S$ is incentive compatible only if $\overline{r}_{NC} < \overline{r}_{NC}^*$. Solving the inequality for the level of incentive compensation *α* gives the condition for $\overline{r}_{NC}^S$ to be incentive compatible: there is a threshold $\overline{\alpha}_{NC}^*$ such that if $\alpha < \overline{\alpha}_{NC}^*$, $\overline{r}_{NC} < \overline{r}_{NC}^*$ with

$$\overline{\alpha}_{NC}^{*}=\frac{q(q-\phi p)\xi}{\phi p[qZ+E+(1-q)\xi-W-I-c]-q[qH+E+(1-q)\xi-W-I-c]}$$

Similarly, with collateral there is a threshold $\overline{\alpha}_{C}^{*}$ such that if $\alpha<\overline{\alpha}_{C}^{*}$, $\overline{r}_{C}<\overline{r}_{C}^{*}$, where $\overline{\alpha}_{C}^{*}$ is

$$\overline{\alpha}_{C}^{*}=\frac{q(q-\phi p)W}{\phi p[qZ+E-qW-I-c]-q[qH+E-qW-I-c]}$$

Only when *α* is below the threshold $\overline{\alpha}_{NC}^{*}$ the manager, offered the interest rate $\overline{r}_{NC}^{S}$, invests in the safe project. His expected payoff is $\overline{E}_{NC}^{M}(S,\overline{r}_{NC}^{S})=W-(1-q)\xi+\alpha[qH+E+(1-q)\xi-W-I-c]>0$. With collateral, the manager invests in the safe project *S* when offered $\overline{r}_{C}^{S}$ only when *α* is below the threshold $\overline{\alpha}_{C}^{*}$, in which case his expected payoff is $\overline{E}_{C}^{M}(S,\overline{r}_{C}^{S})=qW+\alpha[qH+E-qW-I-c]>0$. If *α* is above the threshold $\overline{\alpha}_{NC}^{*}$ ($\overline{\alpha}_{C}^{*}$), $\overline{r}_{NC}^{S}$ ($\overline{r}_{C}^{S}$) is not feasible: the manager facing a rate of $\overline{r}_{NC}^{S}$ ($\overline{r}_{C}^{S}$) invests in the risky project, and the bank expected profit is negative. Thus, for *α* greater than the threshold, no bank offers $\overline{r}_{NC}^{S}$ ($\overline{r}_{C}^{S}$).

b) $\overline{r}_{NC}>\overline{r}_{NC}^{*}$ ($\overline{r}_{C}>\overline{r}_{C}^{*}$)

The bank knows that, if $\overline{r}_{NC}>\overline{r}_{NC}^{*}$ ($\overline{r}_{C}>\overline{r}_{C}^{*}$), the manager invests in project *R*, and the signal is *S* with probability ϕ and *R* with probability $(1-\phi)$. Competitive banks charge the interest rate that guarantees a zero expected profit; thus, banks charge the interest rate *r* that solves the equation $\overline{E}^{L}(R,\overline{r}_{NC})=\phi[pI(1+\overline{r}_{NC})+(1-p)(E+\xi-W)-I-c]+(1-\phi)(E-W+\xi-c)=0$ or, with collateral, $E^{L}(R,\overline{r}_{C})=\phi[pI(1+\overline{r}_{C})+(1-p)E-I-c]+(1-\phi)(E-c)=0$. The solutions for the case with and without collateral are $\overline{r}_{NC}^{R}=[\phi I+c-(1-\phi p)(E+\xi-W)]/\phi pI-1$ and $\overline{r}_{C}^{R}=[\phi I+c-(1-\phi p)E]/\phi pI-1$ respectively. To be feasible, the interest rate must be incentive compatible and must guarantee the manager a non-negative profit. $\overline{r}_{NC}^{R}$ is incentive compatible only if $\overline{r}_{NC}>\overline{r}_{NC}^{*}$. Solving the inequality for the level of incentive compensation *α* gives the condition for $\overline{r}_{NC}^{R}$ to be incentive compatible: there is a threshold $\overline{\alpha}_{NC}^{**}$ such that if $\alpha>\overline{\alpha}_{NC}^{**}$, $\overline{r}_{NC}>\overline{r}_{NC}^{*}$ where $\overline{\alpha}_{NC}^{**}$ is

$$\overline{\alpha}_{NC}^{**} = \frac{\phi p(q-\phi p)\xi}{\phi p[\phi pZ + E + (1-\phi p)\xi - W - \phi I - c] - q[\phi pH + E + (1-\phi p)\xi - W - \phi I - c]}$$

Similarly, with collateral there is a threshold $\overline{\alpha}_C^{**}$ such that if $\alpha > \overline{\alpha}_C^{**}$, $\overline{r}_C > \overline{r}_C^*$ where $\overline{\alpha}_C^{**}$ is

$$\overline{\alpha}_C^{**} = \frac{\phi p(q-\phi p)W}{\phi p[\phi pZ + E - \phi pW - \phi I - c] - q[\phi pH + E - \phi pW - \phi I - c]}$$

Only when α is above the threshold $\overline{\alpha}_{NC}^{**}$ the manager, offered the interest rate $\overline{r}_{NC}^R$, invests in the risky project. His expected payoff is $\overline{E}_{NC}^M(R,\overline{r}_{NC}^R) = W - (1-\phi p)\xi + \alpha[\phi pZ + E + (1-\phi p)\xi - W - \phi I - c] > 0$. Similarly, with collateral only when α is above the threshold $\overline{\alpha}_C^{**}$ the manager, offered the interest rate $\overline{r}_C^R$, invests in the risky project R, and has an expected payoff of $\overline{E}_C^M(R,\overline{r}_C^R) = \phi pW + \alpha[\phi pZ + E - \phi pW - \phi I - c] > 0$. If α is below the threshold, $\overline{r}_{NC}^R$ ($\overline{r}_C^R$) is not feasible. The manager invests in the safe project and the bank has a positive expected profit. However, because banks are competitive, another bank offers the lower rate $\overline{r}_{NC}^S$ ($\overline{r}_C^S$), and the manager accepts the offer and invests in project S, because $\overline{E}_{NC}^M(S,\overline{r}_{NC}^S) > \overline{E}_{NC}^M(R,\overline{r}_{NC}^R)$ Thus, if α is below the threshold, no bank offers $\overline{r}_{NC}^R$.

Part 2: Final Outcomes

It can be readily shown that $\overline{\alpha}_{NC}^{**} < \overline{\alpha}_{NC}^{*} < \overline{\alpha}_C^{*}$. For simplicity I assume that $\overline{\alpha}_{NC}^{**} < \overline{\alpha}_C^{**} < \overline{\alpha}_{NC}^{*} < \overline{\alpha}_C^{*}$. If $\overline{\alpha}_{NC}^{**} < \overline{\alpha}_{NC}^{*} < \overline{\alpha}_C^{**} < \overline{\alpha}_C^{*}$ the final result does not change. If $\alpha < \overline{\alpha}_{NC}^{**}$, only two interest rates are feasible, $\overline{r}_{NC}^S$ and $\overline{r}_C^S$. Simple calculations show that $\overline{E}_{NC}^M(S,\overline{r}_{NC}^S) > \overline{E}_C^M(S,\overline{r}_C^S)$: thus, for $\alpha < \overline{\alpha}_{NC}^{**}$, the backwards-induction outcome is $(S,\overline{r}_{NC}^S)$. For $\overline{\alpha}_{NC}^{**} \le \alpha < \overline{\alpha}_C^{**}$, the feasible interest rates are $\overline{r}_{NC}^S$, $\overline{r}_C^S$, and $\overline{r}_{NC}^R$. Because $\overline{E}_{NC}^M(S,\overline{r}_{NC}^S) > \overline{E}_C^M(S,\overline{r}_C^S)$, the relevant comparison is between $\overline{E}_{NC}^M(S,\overline{r}_{NC}^S)$ and $\overline{E}_{NC}^M(R,\overline{r}_{NC}^R)$. It can be shown that $\overline{E}_{NC}^M(S,\overline{r}_{NC}^S) > \overline{E}_C^M(R,\overline{r}_{NC}^R)$: thus, for $\overline{\alpha}_{NC}^{**} \le \alpha < \overline{\alpha}_C^{**}$, the backwards-induction outcome is $(S,\overline{r}_{NC}^S)$. For $\overline{\alpha}_C^{**} \le \alpha < \overline{\alpha}_{NC}^{*}$, the feasible interest rates are $\overline{r}_{NC}^S$, $\overline{r}_C^S$, $\overline{r}_{NC}^R$, and $\overline{r}_C^R$. It can be shown that $\overline{E}_{NC}^M(R,\overline{r}_{NC}^R) > \overline{E}_C^M(R,\overline{r}_C^R)$. Because $\overline{E}_{NC}^M(S,\overline{r}_{NC}^S) > \overline{E}_C^M(S,\overline{r}_C^S)$, the relevant comparison is again between $\overline{E}_{NC}^M(S,\overline{r}_{NC}^S)$ and $\overline{E}_{NC}^M(R,\overline{r}_{NC}^R)$: thus, for $\overline{\alpha}_C^{**} \le \alpha < \overline{\alpha}_{NC}^{*}$, the backwards-induction outcome is $\left(S,\bar{r}_{NC}^{S}\right)$. If $\bar{\alpha}_{NC}^{*} \leq \alpha < \bar{\alpha}_{C}^{*}$, the feasible interest rates are $\bar{r}_{C}^{S}, \bar{r}_{C}^{R}$ and $\bar{r}_{NC}^{R}$. Because $\bar{E}_{NC}^{M}(R,\bar{r}_{NC}^{R}) > \bar{E}_{C}^{M}(R,\bar{r}_{C}^{R})$, the relevant comparison is between $\bar{E}_{C}^{M}(S,\bar{r}_{C}^{S})$ and $\bar{E}_{NC}^{M}(R,\bar{r}_{NC}^{R})$. Given the parametric assumptions of the model, it can be shown that $\bar{E}_{C}^{M}(S,\bar{r}_{C}^{S}) > \bar{E}_{NC}^{M}(R,\bar{r}_{NC}^{R})$: for $\bar{\alpha}_{NC}^{*} \leq \alpha < \bar{\alpha}_{C}^{*}$ the backwards-induction outcome is $\left(S,\bar{r}_{C}^{S}\right)$. Finally, for $\alpha \geq \bar{\alpha}_{C}^{*}$, it can be shown that, if $q/\phi p < (qZ + E - qW - I - c)/(qH + E - qW - I - c)$, the interest rate $\bar{r}_{C}^{S}$ is not feasible. Thus, the only feasible interest rates are $\bar{r}_{NC}^{R}$ and $\bar{r}_{C}^{R}$. Because $\bar{E}_{NC}^{M}(R,\bar{r}_{NC}^{R}) > \bar{E}_{C}^{M}(R,\bar{r}_{C}^{R})$, the backwards induction outcome is $\left(R,\bar{r}_{NC}^{R}\right)$. If, on the other hand, $q/\phi p > (qZ + E - qW - I - c)/(qH + E - qW - I - c)$, $\bar{r}_{C}^{S}$ is still feasible, in which case the available interest rates are still $\bar{r}_{C}^{S}, \bar{r}_{C}^{R}$, and $\bar{r}_{NC}^{R}$, and the backwards-induction outcome is $\left(S,\bar{r}_{C}^{S}\right)$. Q.E.D.

Proof of Proposition 3.

It can be easily shown that, if $q/\phi p < (qZ + E - qW - I - c)/(qH + E - qW - I - c)$ and $\phi < \phi^{*}$, where

$$\phi^{*} = \frac{q\{\zeta\{p[qZ + E - qW - I] - q[qH + E - qW - I]\} + (q-p)W[qH + E + (1-q)\zeta - W - I - c]\}}{p\{\zeta\{p[qZ + E - qW - I] - q[qH + E - qW - I]\} + (q-p)W[qZ + E + (1-q)\zeta - W - I - c]\}}$$

then $\alpha_{NC}^{*} < \alpha_{C}^{*} < \bar{\alpha}_{NC}^{*} < \bar{\alpha}_{C}^{*}$. To prove Proposition 3, I compare the manager's payoffs for each backwards-induction outcome. If $\alpha < \alpha_{NC}^{*}$, the feasible outcomes are (S, r_{NC}^{S}) with public debt and $(S,\bar{r}_{NC}^{S})$ with bank debt. Thus I compare the manager's expected payoffs:

$$W - (1-q)\xi + \alpha[qH + E + (1-q)\xi - W - I] > W - (1-q)\xi + \alpha[qH + E + (1-q)\xi - W - I - c]$$

Then, for $\alpha < \alpha_{NC}^{*}$, $E_{NC}^{M}(S, r_{NC}^{S}) > \bar{E}_{NC}^{M}(S,\bar{r}_{NC}^{S})$ and the final outcome is (S, r_{NC}^{S}). If $\alpha_{NC}^{*} \leq \alpha < \alpha_{C}^{*}$ the feasible outcomes are (S, r_{C}^{S}) with public debt and $(S,\bar{r}_{NC}^{S})$ with bank debt. Thus I compare the manager's expected payoffs:

$$qW + \alpha[qH + E - qW - I] < W - (1-q)\xi + \alpha[qH + E + (1-q)\xi - W - I - c]$$

The inequality is true for small c. Thus, for $\alpha_{NC}^{*} \le \alpha < \alpha_{C}^{*}$, $E_{NC}^{M}(S, r_{C}^{S}) < \overline{E}_{NC}^{M}(S, \overline{r}_{NC}^{S})$, and the final outcome is $(S, \overline{r}_{NC}^{S})$. If $\alpha_{C}^{*} \le \alpha < \overline{\alpha}_{NC}^{*}$ the feasible outcomes are (R, r_{NC}^{R}) with public debt and $(S, \overline{r}_{NC}^{S})$ with bank debt. I compare the manager's expected payoffs:

$$W - (1-p)\xi + \alpha\left[pZ + E + (1-p)\xi - W - I\right] < W - (1-q)\xi + \alpha\left[qH + E + (1-q)\xi - W - I - c\right]$$

The inequality is true for small c. Thus, for $\alpha_{C}^{*} \le \alpha < \overline{\alpha}_{NC}^{*}$, $E_{NC}^{M}(R, r_{NC}^{R}) < \overline{E}_{NC}^{M}(S, \overline{r}_{NC}^{S})$, and the final outcome is again $(S, \overline{r}_{NC}^{S})$. If $\overline{\alpha}_{NC}^{*} \le \alpha < \overline{\alpha}_{C}^{*}$ the feasible outcomes are (R, r_{NC}^{R}) with public debt and $(S, \overline{r}_{C}^{S})$ with bank debt. I compare the manager's expected payoffs:

$$W - (1-p)\xi + \alpha\left[pZ + E + (1-p)\xi - W - I\right] < qW + \alpha\left[qH + E - qW - I - c\right]$$

The inequality is true for small c. Thus, for $\overline{\alpha}_{NC}^{*} \le \alpha < \overline{\alpha}_{C}^{*}$, $E_{NC}^{M}(R, r_{NC}^{R}) < \overline{E}_{C}^{M}(S, \overline{r}_{C}^{S})$, and the final outcome is $(S, \overline{r}_{C}^{S})$. Finally, for $\alpha \ge \overline{\alpha}_{C}^{*}$ the feasible outcomes are (R, r_{NC}^{R}) with public debt and $(R, \overline{r}_{NC}^{R})$ with bank debt. I compare the manager's expected payoffs:

$$W - (1-p)\xi + \alpha\left[pZ + E + (1-p)\xi - W - I\right] > W - (1-\phi p)\xi + \alpha\left[\phi pZ + E + (1-\phi p)\xi - W - \phi I - c\right]$$

The inequality is always true. Thus, for $\alpha \ge \overline{\alpha}_{C}^{*}$, $E_{NC}^{M}(R, r_{NC}^{R}) > \overline{E}_{C}^{M}(R, \overline{r}_{NC}^{R})$ and (R, r_{NC}^{R}) is the final outcome. Outcome (R, r_{NC}^{R}) is feasible only if the probability of detecting a violation of the loan covenant is low, and the condition on $q/\phi p$ is satisfied. If the signal is very precise ($q/\phi p$ is above the threshold), then $\overline{\alpha}_{C}^{*} < \alpha_{NC}^{*} < \alpha_{C}^{*} < \overline{\alpha}_{NC}^{*}$, the outcome $(S, \overline{r}_{C}^{S})$ is always feasible, and the comparison is again between $(S, \overline{r}_{C}^{S})$ and (R, r_{NC}^{R}). If that is the case, the final outcome for $\alpha \ge \overline{\alpha}_{NC}^{*}$ is $(S, \overline{r}_{C}^{S})$.

What happens if $\phi > \phi^{*}$? If the signal is not very precise, the difference between bank and public debt tends to disappear. Initially, if $\phi > \phi^{*}$, $\alpha_{NC}^{*} < \overline{\alpha}_{NC}^{*} < \alpha_{C}^{*} < \overline{\alpha}_{C}^{*}$. Compared to the previous case, for $\alpha_{NC}^{*} < \overline{\alpha}_{NC}^{*} < \alpha_{C}^{*}$, the optimal solution is $(S, \overline{r}_{NC}^{S})$; for $\overline{\alpha}_{NC}^{*} < \alpha_{C}^{*} < \overline{\alpha}_{C}^{*}$ the solution is (S, r_{C}^{S}). Clearly bank debt is now less effective in detecting asset substitution. When $\phi = 1$, the signal is always wrong, and there is no advantage in using bank debt. Q.E.D.

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Table 1

Variable definitions

DEPENDENT VARIABLES

%NEW BANK: bank loans as a percentage of total new debt (public and bank debt).

RATE PAID: fixed equivalent of a floating rate. For bank loans, it is computed as SPREAD plus the then one-month LIBOR and the then prevailing rate for the Treasury bond with the same maturity of the loan, minus the then three-month Treasury rate; for public bonds, RATE PAID is the bond offering yield. It is measured in basis points.

SPREAD: for bank loans, it is the cost for the borrower of each dollar withdrawn as a spread on the LIBOR/prime base rate; for public bonds, it is the spread on the comparable Treasury bond. The spread is measured in basis points. For bank loans with multiple facilities, SPREAD is calculated as a weighted average of the SPREAD of each facility. The weights are the ratio of each facility dollar amount and the total deal dollar amount.

COLLATERAL: dummy variable equal to 1 if the bond/loan is collateralized, 0 otherwise.

MANAGERIAL INCENTIVES

PPS: Pay-Performance-Sensitivity. PPS is the sensitivity of the CEO's portfolio to firm value, and is computed as the dollar increase in the value of the manager's equity portfolio for a $1,000 increase in firm value. It is calculated as:

$$PPS = \left(\frac{\#\text{ of shares sheld}}{\#\text{ of shares outstanding}} + \frac{\#\text{ of options on firm common stock held}}{\#\text{ of shares outstanding}} * \text{delta} \right) * 1{,}000$$

DELTA: dollar change in option value for a $1 increase in stock price. Following Core and Guay (2002) it is computed as:

$$DELTA = e^{-dT} N[Z]$$

$$Z = \left[\ln(S / X) + T(r - d + \sigma^2 / 2)\right] / \sigma T^{(1/2)}$$

where N is the cumulative probability function for the normal distribution, S is the stock price, X is the exercise price, σ is the expected stock-return volatility over the life of the option, r is the natural logarithm of the risk-free interest rate, T is the time to maturity of the option in years, and d is the natural logarithm of expected dividend yield over the life of the option.

LOAN AND BOND CHARACTERISTICS

DEAL AMOUNT: deal amount in $ million.

MATURITY: maturity of the bond/loan in years. For bank loans with multiple facilities, the maturity is calculated as a weighted average of the maturities of each facility. The weights are the ratio of each facility dollar amount and the total deal dollar amount.

FIRM CHARACTERISTICS

AGE: number of years since inclusion in Compustat North America.

BLOCK: dummy variable equal to 1 if at least one shareholder holds 5% or more of the shares outstanding, 0 otherwise.

INTEREST COVERAGE: operating income before depreciation to interest expense.

LOSS: dummy variable equal to 1 if operating income before depreciation is negative, 0 otherwise.

BOOK LEVERAGE: total liabilities divided by total assets.

MARKET-TO-BOOK: book value of debt plus market value of common and preferred stock divided by total assets.

PROFITABILITY: operating income before depreciation to total assets.

RETURNS VOLATILITY: moving standard deviation of daily returns on a window of 30 days.

R&D: R&D expense to total assets.

TANGIBILITY: net property, plant and equipment to total assets.

SIZE: firm total assets in $ million.

Z-SCORE: Calculated as $1.2 * \frac{\text{Working Capital}}{\text{Total Assets}} + 1.4 * \frac{\text{Retained Earnings}}{\text{Total Assets}} + 3.3 * \frac{\text{EBIT}}{\text{Sales}} +$

$$+ 0.999 * \frac{\text{Sales}}{\text{Total Assets}} + 0.6 * \frac{\text{Market Value of Equity}}{\text{Book Value of Liabilities}}.$$

%EXISTING PRIVATE DEBT: existing bank debt to total assets.

MACRO VARIABLES

INTEREST VOLATILITY: Monthly average of the 12-month moving standard deviation of daily yields on 10-years U.S. T-bonds.

Table 2

Characteristics of loan facilities

The Table reports deal types, facility types, and facility purposes for the private sample. The private sample consists of 631 U.S. dollar-denominated bank loans to U.S. non financial corporations between 1992 and 2005. Panel A presents the distribution of deal types; Panel B shows the distribution of facility types (tranche-level analysis); Panel C shows the distribution of facility purposes (tranche-level analysis).

Panel A - Deal Type			**Panel B - Facility Type**			**Panel C - Facility Purpose**		
Deal Type	**Frequency**	**Percentage**	**Facility type**	**Frequency**	**Percentage**	**Facility Purpose**	**Frequency**	**Percentage**
Bilateral	1	0.12	364-Day Facility	271	33.46	Acquisition line	33	4.07
N/A	2	0.25	Bridge Loan	3	0.37	CP backup	160	19.75
Sole Lender	16	1.98	Demand Loan	1	0.12	Capital expenditure	1	0.12
Syndication	789	97.65	Other Loan	1	0.12	Corporate purposes	298	36.79
			Revolver/Line < 1 Yr.	22	2.72	Debt Repayment	13	1.60
			Revolver/Line >= 1 Yr.	437	53.95	Debtor-in-possession	5	0.62
			Revolver/Term Loan	2	0.25	Equipment Purchase	1	0.12
			Synthetic Lease	2	0.25	LBO/MBO	13	1.60
			Term Loan	45	5.56	Lease finance	3	0.37
			Term Loan A	10	1.23	Other	7	0.86
			Term Loan B	13	1.60	Project finance	1	0.12
			Term Loan C	1	0.12	Real estate	2	0.25
			Term Loan D	1	0.12	Recapitalization	3	0.37
			Term Loan E	1	0.12	Spinoff	1	0.12
						Stock buyback	12	1.48
						Takeover	158	19.51
						Trade finance	1	0.12
						Working capital	98	12.10

Table 3

Percentage of repeated borrowers and number of deals

The Table reports the percentage of repeated borrowers and the number of deals per borrower for the whole, private, and public samples. The private sample consists of 631 U.S. dollar-denominated bank loans to U.S. non financial corporations between 1992 and 2005; the public sample consists of 1,567 public bonds issued in the U.S. by U.S. non financial corporations between 1992 and 2005. Panel A presents the percentage of repeated borrowers; Panel B shows the mean, median, min, and max number of deals per borrower.

	Panel A - % repeated borrowers				**Panel B - Number of deals**		
# of loans/ bond issues	**Whole sample N=2,198**	**Private sample N=631**	**Public sample N=1,567**	**# of loans/bond issues per borrower**	**Whole sample N=2,198**	**Private sample N=631**	**Public sample N=1,567**
1	0.442	0.656	0.358	**Mean**	3.204	1.585	3.363
2	0.192	0.191	0.232	**Median**	2	1	2
3	0.087	0.090	0.112	**Min**	1	1	1
>3	0.278	0.063	0.298	**Max**	30	6	30

Table 4

Univariate analysis of debt characteristics

The Table reports univariate comparisons and summary statistics for debt contract features. The private sample consists of 631 U.S. dollar-denominated bank loans to U.S. non financial corporations between 1992 and 2005; the public sample consists of 1,567 public bonds issued in the U.S. by U.S. non financial corporations between 1992 and 2005. *Deal Amount* is total amount of the loan/bond in $ million; *Deal/TA* is deal amount to total assets; *Deal/TD* is deal amount divided by the sum of the firm current liabilities and long term debt. For firms in the private sample *Spread,* computed in basis points (bps), is the sum of spread over the LIBOR and any other annual fee; for firms in the public sample, *Spread* is the spread over a Treasury bond of comparable maturity. For firms in the private sample *Rate Paid,* computed in basis points (bps), is the sum of spread over LIBOR (or Prime) and any other annual fee, plus then prevailing one-month LIBOR and rate for the Treasury bond with the same maturity of the loan, minus then prevailing three-month Treasury rate; for firms in the public sample, *Rate Paid* is the bond offering yield. *Maturity* is maturity of the loan/bond in years. All continuous variables are winsorized at 1%. Panel A presents the sample means (medians in parentheses); p-values are from a Kruskal-Wallis test of equality across categories. Panel B, C, and D report mean, standard deviation, min, max, 25^{th}, 50^{th}, and 75^{th} percentile of debt characteristics for the whole, private, and public sample respectively.

Panel A – Test of sample differences

New debt issues characteristics	**Whole sample N=2,198**	**Private sample N=631**	**Public sample N=1,567**	**p-values for equality across categories**
Total Issue Volume (in $ million)	1,020,794	441,953	578,840	
Deal Amount (in $ million)	464.419	700.401	369.394	0.049
	(300.000)	(300.000)	(275.000)	
Deal/TA	0.101	0.199	0.062	0.000
	(0.050)	(0.131)	(0.036)	
Deal/TD	0.204	0.434	0.111	0.000
	(0.083)	(0.234)	(0.056)	
Spread (in bps)	138.119	81.050	161.100	0.000
	(98.000)	(55.000)	(112.500)	
Rate Paid (in bps)	655.555	599.550	678.107	0.000
	(670.747)	(640.114)	(686.000)	
Maturity (in years)	10.465	2.920	13.504	0.000
	(7.008)	(3.000)	(10.001)	
Fraction with Collateral	0.065	0.386	0.010	0.000

Table 4 (continued)

Panel B – Whole Sample (N=2,198)

New debt issues characteristics	Mean	Std	Min	Max	25th	50th	75th
Deal (in $ million)	464.419	652.469	10	7,000	175	300	500
Deal/TA	0.101	0.141	0.003	1.168	0.024	0.050	0.120
Deal/TD	0.204	0.400	0.015	150.000	0.067	0.170	0.457
Spread (in bps)	138.119	120.487	15	640	60	98	175
Rate Paid (in bps)	655.555	160.033	206.652	1,125.00	568.587	670.747	747.694
Maturity (in years)	10.465	11.775	1	99.999	4.996	7.008	10.008

Panel C - Private Sample (N=631)

New debt issues characteristics	Mean	Std	Min	Max	25th	50th	75th
Deal (in $ million)	700.401	1,079.036	10	7000	128	300	800
Deal/TA	0.199	0.211	0.008	1.168	0.062	0.131	0.253
Deal/TD	0.434	0.612	0.022	150.000	0.200	0.519	1.246
Spread (in bps)	81.050	69.616	15	325	30	55	110
Rate Paid (in bps)	599.550	155.336	206.652	901.760	485.164	640.114	705.243
Maturity (in years)	2.920	1.758	1	6.679	1.000	3.000	5.000

Panel D - Public Sample (N=1,567)

New debt issues characteristics	Mean	Std	Min	Max	25th	50th	75th
Deal (in $ million)	369.394	312.047	75	2,000	200	275	500
Deal/TA	0.062	0.069	0.003	0.373	0.019	0.036	0.075
Deal/TD	0.111	0.210	0.015	6.048	0.055	0.121	0.269
Spread (in bps)	161.100	128.749	30	640	73	113	205
Rate Paid (in bps)	678.107	156.365	269.000	1,125.000	600.000	686.000	763.000
Maturity (in years)	13.504	12.693	2.008	99.999	7.000	10.001	12.007

Table 5

Univariate analysis of compensation variables and firm characteristics

The Table reports univariate comparisons and summary statistics for compensation variables and firm characteristics. The private sample consists of 631 U.S. dollar-denominated bank loans to U.S. non financial corporations between 1992 and 2005; the public sample consists of 1,567 public bonds issued in the U.S. by U.S. non financial corporations between 1992 and 2005. *PPS* (Pay Performance Sensitivity) is the dollar increase in the value of the manager's portfolio for a $1,000 increase in firm value; *Delta* is the dollar increase in the value of the manager's stock options for a $1 increase in the stock price; *Size* is total assets of the firm in $ million; *Age* is number of years since first record in Compustat; *Profitability* is operating income before depreciation to total assets; *Market-to-Book* ratio is book value of debt plus market value of common and preferred stock divided by total assets; *R&D* is R&D expenditures to total assets; *Book Leverage* is liabilities divided by total assets; *Interest Coverage* is operating income before depreciation to interest expense; Z-*Score* is defined as (3.3*EBIT/Sales + 0.999*Sales/Total Assets + 1.4*Retained Earnings/Total Assets + 1.2*Working Capital/Total Assets + 0.6*Market Value of Equity/ Book Value of Liabilities); *Returns Volatility* is the moving standard deviation of daily returns on a window of 30 days (in percentage); *Tangibility* is property, plant and equipment to total assets. All continuous variables are winsorized at 1%. Panel A presents the sample means (medians in parentheses); p-values are from a Kruskal-Wallis test of equality across categories. Panel B, C, and D report mean, standard deviation, min, max, 25th, 50th, and 75th percentile of firm characteristics for the whole, private, and public sample respectively.

Panel A - Test of sample differences

Sample firms characteristics	**Whole sample N=2,198**	**Private sample N=631**	**Public sample N=1,567**	**p-values for equality across categories**
PPS	16.481	20.050	15.043	0.000
	(5.681)	(7.317)	(5.001)	
Delta	0.647	0.650	0.646	0.233
	(0.642)	(0.647)	(0.640)	
Size (in $ million)	13,756	7,338	16,340	0.000
	(6,051)	(2,459)	(7,908)	
Age	40.383	37.602	41.503	0.000
	(47.000)	(45.000)	(48.000)	
Profitability	0.039	0.040	0.039	0.202
	(0.037)	(0.038)	(0.036)	
Market-to-Book	1.849	2.018	1.781	0.000
	(1.493)	(1.582)	(1.454)	
R&D	0.005	0.007	0.004	0.000
	(0.000)	(0.000)	(0.000)	
Book Leverage	0.195	0.161	0.208	0.000
	(0.178)	(0.149)	(0.192)	
Interest Coverage	14.167	22.818	10.683	0.027
	(6.757)	(7.492)	(6.586)	

Table 5 (continued)

Panel A - Test of sample differences

Sample firms characteristics	Whole sample N=2,198	Private sample N=631	Public sample N=1,567	p-values for equality across categories
Z-Score	3.449	4.191	3.151	0.000
	(2.967)	(3.384)	(2.764)	
Returns Volatility (%)	2.178	2.363	2.103	0.000
	(1.923)	(2.033)	(1.886)	
Tangibility	0.370	0.334	0.385	0.000
	(0.319)	(0.265)	(0.347)	
Fraction with Op. Profit <0	0.087	0.101	0.081	0.125
Fraction with block holder	0.733	0.731	0.735	0.850

Panel B - Whole Sample (N=2,198)

Sample firms characteristics	Mean	Std	Min	Max	25th	50th	75th
PPS	16.481	31.439	0.377	211.912	2.463	5.681	13.886
Delta	0.647	0.093	0.414	0.840	0.580	0.642	0.718
Size (in $ million)	13,756	25,220	114	216,549	2,101	6,051	15,616
Age	40.383	13.900	8.000	56.000	31.000	47.000	51.000
Profitability	0.039	0.022	-0.046	0.126	0.026	0.037	0.051
Market-to-Book	1.849	1.092	0.818	8.340	1.196	1.493	2.081
R&D	0.005	0.011	0.000	0.072	0.000	0.000	0.005
Book Leverage	0.195	0.121	0.000	0.551	0.103	0.178	0.272
Interest Coverage	14.167	38.027	-2.431	536.500	3.832	6.757	12.615
Z-Score	3.449	2.375	-0.225	19.389	1.906	2.967	4.320
Returns Volatility (%)	2.178	1.020	0.751	6.721	1.468	1.923	2.621
Tangibility	0.370	0.225	0.012	0.913	0.012	0.319	0.529

Table 5 (continued)

Panel C - Private Sample (N=631)

Sample firms characteristics	Mean	Std	Min	Max	25th	50th	75th
PPS	20.050	35.366	0.455	211.912	3.504	7.317	19.881
Delta	0.650	0.101	0.414	0.840	0.572	0.647	0.729
Size (in $ million)	7,338	12,711	114	79,467	800	2,459	8,193
Age	37.602	14.744	8.000	56.000	28.000	45.000	50.000
Profitability	0.040	0.026	-0.046	0.126	0.025	0.038	0.053
Market-to-Book	2.018	1.346	0.825	8.340	1.254	1.582	2.246
R&D	0.007	0.014	0.000	0.072	0.000	0.000	0.008
Book Leverage	0.161	0.119	0.000	0.511	0.067	0.149	0.229
Interest Coverage	22.818	66.773	-2.431	536.500	3.750	7.492	14.760
Z-Score	4.191	3.013	0.332	19.389	2.223	3.384	4.895
Returns Volatility (%)	2.363	1.181	0.751	6.721	1.528	2.033	2.916
Tangibility	0.334	0.221	0.021	0.901	0.021	0.265	0.471

Panel D - Public Sample (N=1,567)

Sample firms characteristics	Mean	Std	Min	Max	25th	50th	75th
PPS	15.043	29.602	0.377	183.204	2.295	5.001	11.931
Delta	0.646	0.089	0.447	0.838	0.582	0.640	0.713
Size (in $ million)	16,340	28,356	479	216,548	3,295	7,907	17,912
Age	41.503	13.388	10.000	56.000	34.000	48.000	52.000
Profitability	0.039	0.020	-0.027	0.104	0.026	0.036	0.050
Market-to-Book	1.781	0.964	0.818	5.801	1.181	1.454	2.020
R&D	0.004	0.010	0.000	0.048	0.000	0.000	0.004
Book Leverage	0.208	0.119	0.006	0.551	0.118	0.192	0.283
Interest Coverage	10.683	13.881	0.000	88.316	3.847	6.586	11.888
Z-Score	3.151	1.988	-0.225	11.388	1.773	2.764	4.110
Returns Volatility (%)	2.103	0.938	0.783	5.930	1.446	1.886	2.482
Tangibility	0.385	0.225	0.012	0.913	0.012	0.347	0.539

Table 6

OLS regression of %New Bank

The Table reports OLS regressions *of %New Bank* on the compensation variables. The sample consists of 631 U.S. dollar-denominated bank loans to U.S. non financial corporations, and 1,567 public bonds issued in the U.S. by U.S. non financial corporations between 1992 and 2005. *%New Bank* is new bank debt to total new debt. *PPS* is the natural logarithm of the dollar increase in the value of the manager's portfolio for a $1,000 increase in firm value; *Delta* is the natural logarithm of the dollar increase in the value of the manager's stock options for a $1 increase in the stock price; *% Existing Bank Debt* is existing bank debt to total assets; *Size 2* and *Size 3* are dummy variables for the second and third tercile of firm size; *Age* is number of years since first record in Compustat; *Block* is a dummy variable equal to 1 if at least one shareholder holds 5% or more of the shares outstanding, 0 otherwise; *Profitability* is operating income before depreciation to total assets; *Market-to-Book* ratio is book value of debt plus market value of common and preferred stock divided by total assets; *R&D* is R&D expenditures to total assets; *Book Leverage* is liabilities divided by total assets; *Interest Coverage* is operating income to interest expense; Z-*Score* is defined as the natural logarithm of (3.3*EBIT/Sales+0.999*Sales/Total Assets+1.4*Retained Earnings/Total Assets+1.2*Working Capital/Total Assets+0.6*Market Value of Equity/ Book Value of Liabilities); *Returns Volatility* is the moving standard deviation of daily returns on a window of 30 days (in percentage); *Maturity* is maturity of the loan/bond in years; *Deal Amount* is the natural logarithm of the total amount of the loan/bond in $ million. Industry dummies are based on the first two digits of the NAICS code. All continuous variables are winsorized at 1%. Columns (1) to (4) present estimated coefficients (p-values) from OLS regressions of *%New Bank*. Standard errors are robust and clustered by firm. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

Independent Variables	**(1) N=2,198**	**(2) N=2,198**	**(3) N=713**	**(4) N=713**
Intercept	-0.242**	-0.064	-0.589***	0.097
	(0.045)	(0.617)	(0.002)	(0.696)
PPS	0.041**		0.064**	
	(0.034)		(0.013)	
PPS^2	-0.009**		-0.008	
	(0.029)		(0.246)	
Delta		0.762**		1.428**
		(0.028)		(0.018)
$Delta^2$		0.925***		1.289**
		(0.008)		(0.027)
% Existing Bank Debt			0.259**	0.267***
			(0.012)	(0.008)
Size 2	-0.236***	-0.230***	-0.132***	-0.147***
	(0.000)	(0.000)	(0.000)	(0.000)
Size 3	-0.306***	-0.315***	-0.175***	-0.207***
	(0.000)	(0.000)	(0.000)	(0.000)
Age	0.000	0.000	-0.001	0.000
	(0.804)	(0.992)	(0.238)	(0.797)

Table 6 (continued)

Independent Variables	**(1) N=2,198**	**(2) N=2,198**	**(3) N=713**	**(4) N=713**
Block	-0.028	-0.018	-0.016	0.007
	(0.190)	(0.372)	(0.529)	(0.783)
Profitability	-1.285***	-1.227**	0.318	0.184
	(0.008)	(0.012)	(0.652)	(0.792)
Market-to-Book	0.007	0.007	-0.032**	-0.042**
	(0.541)	(0.574)	(0.050)	(0.012)
R&D	1.288	1.163	0.241	0.029
	(0.195)	(0.251)	(0.855)	(0.982)
Book Leverage	-0.509***	-0.532***	-0.307**	-0.341***
	(0.000)	(0.000)	(0.011)	(0.005)
Z-Score	0.064**	0.066**	0.068	0.071
	(0.046)	(0.034)	(0.212)	(0.184)
Returns Volatility (%)	0.016	0.015	0.003	0.001
	(0.130)	(0.142)	(0.844)	(0.935)
Maturity	-0.010***	-0.010***	-0.004***	-0.004***
	(0.000)	(0.000)	(0.000)	(0.000)
Deal Amount	0.091***	0.088***	0.101***	0.095***
	(0.000)	(0.000)	(0.000)	(0.000)
Industry Dummies	*Yes*	*Yes*	*Yes*	*Yes*
Year Dummies	*Yes*	*Yes*	*Yes*	*Yes*
R^2	*0.365*	*0.367*	*0.274*	*0.276*

Table 7

Test for endogeneity of PPS and Delta

The Table reports statistics from tests for the endogeneity of *PPS* (*PPS*^{2}) and *Delta* (*Delta*^{2}), and for the relevance and validity of the instruments. The sample consists of 631 U.S. dollar-denominated bank loans to U.S. non financial corporations, and 1,567 public bonds issued in the U.S. by U.S. non financial corporations between 1992 and 2005. *PPS* is the natural logarithm of the dollar increase in the value of the manager's portfolio for a $1,000 increase in firm value; *Delta* is the natural logarithm of the dollar increase in the value of the manager's stock options for a $1 increase in the stock price. Shea partial R^2, partial R^2, and F-statistics of joint significance of the instruments in the first stage provide tests of instrument relevance. The Hansen J statistic tests the exogeneity of the instruments for validity. Difference in Sargan C statistic tests the exogeneity of the endogenous variables. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

	PPS	**PPS^2**	**Delta**	**Delta^2**
	N=1,427		**N=1,464**	
Instruments: CEO tenure, PPS (Delta) on the previous year, sales growth.				
Shea Partial R^2	0.014	0.011	0.002	0.002
Partial R^2	0.532	0.414	0.333	0.305
F	140.960***	56.120***	91.370***	77.700***
	(0.000)	(0.000)	(0.000)	(0.000)
Hansen J	0.215	1.111	0.322	0.327
	(0.898)	(0.574)	(0.851)	(0.849)
C statistic	1.273	0.377	0.008	0.002
	(0.259)	(0.539)	(0.930)	(0.965)

Table 8

OLS regression of %New Bank on truncated sample

The Table reports OLS regressions of *%New Bank* on the compensation variables on the main sample truncated at 10% on firm size, maturity, and both firm size and maturity. The main sample consists of 631 U.S. dollar-denominated bank loans to U.S. non financial corporations, and 1,567 public bonds issued in the U.S. by U.S. non financial corporations between 1992 and 2005. *%New Bank* is new bank debt to total new debt. *PPS* is the natural logarithm of the dollar increase in the value of the manager's portfolio for a $1,000 increase in firm value; *Delta* is the natural logarithm of the dollar increase in the value of the manager's stock options for a $1 increase in the stock price; *% Existing Bank Debt* is existing bank debt to total assets; *Size 2* and *Size 3* are dummy variables for the second and third tercile of firm size; *Age* is number of years since first record in Compustat; *Block* is a dummy variable equal to 1 if at least one shareholder holds 5% or more of the shares outstanding, 0 otherwise; *Profitability* is operating income before depreciation to total assets; *Market-to-Book* ratio is book value of debt plus market value of common and preferred stock divided by total assets; *R&D* is R&D expenditures to total assets; *Book Leverage* is liabilities divided by total assets; *Interest Coverage* is operating income to interest expense; Z-*Score* is defined as the natural logarithm of (3.3*EBIT/Sales+0.999*Sales/Total Assets+1.4*Retained Earnings/Total Assets+1.2*Working Capital/Total Assets+0.6*Market Value of Equity/ Book Value of Liabilities); *Returns Volatility* is the moving standard deviation of daily returns on a window of 30 days (in percentage); *Maturity* is maturity of the loan/bond in years; *Deal Amount* is the natural logarithm of the total amount of the loan/bond in $ million. Industry dummies are based on the first two digits of the NAICS code. All continuous variables are winsorized at 1%. Columns (1) and (2), (3) and (4) , and (5) and (6) present estimated coefficients (p-values) from OLS regressions of *%New Bank* on the main sample truncated at 10% on firm size, maturity, and both firm size and maturity respectively. Standard errors are robust and clustered by firm. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

Independent Variables	**(1) N=1,759**	**(2) N=1,759**	**(3) N=1,770**	**(4) N=1,770**	**(5) N=1,407**	**(6) N=1,407**
Intercept	-0.521***	-0.332**	-0.182	-0.006	-0.558***	-0.373**
	(0.000)	(0.034)	(0.152)	(0.964)	(0.000)	(0.017)
PPS	0.025		0.039**		0.014	
	(0.307)		(0.039)		(0.565)	
PPS^2	-0.008		-0.009**		-0.006	
	(0.105)		(0.025)		(0.200)	
Delta		1.015**		0.774**		1.058***
		(0.016)		(0.019)		(0.004)
$Delta^2$		1.142***		0.933***		1.199***
		(0.008)		(0.005)		(0.002)
Size 2	-0.164***	-0.156***	-0.255***	-0.247***	-0.182***	-0.172***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Size 3	-0.270***	-0.262***	-0.313***	-0.319***	-0.270***	-0.257***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age	0.000	0.001	0.000	0.000	0.001	0.001
	(0.510)	(0.237)	(0.701)	(0.908)	(0.371)	(0.153)

Table 8 (continued)

Independent Variables	**(1) N=1,759**	**(2) N=1,759**	**(3) N=1,770**	**(4) N=1,770**	**(5) N=1,407**	**(6) N=1,407**
Block	-0.029	-0.027	-0.021	-0.012	-0.029	-0.026
	(0.205)	(0.225)	(0.319)	(0.566)	(0.196)	(0.222)
Profitability	-0.928	-0.818	-0.948*	-0.912	-0.059	0.012
	(0.116)	(0.164)	(0.087)	(0.103)	(0.926)	(0.985)
Market-to-Book	0.014	0.014	0.009	0.008	0.010	0.011
	(0.321)	(0.337)	(0.502)	(0.531)	(0.529)	(0.477)
R&D	0.346	0.231	0.824	0.658	-0.869	-0.946
	(0.775)	(0.849)	(0.409)	(0.518)	(0.440)	(0.390)
Book Leverage	-0.451***	-0.474***	-0.466***	-0.488***	-0.388***	-0.406***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Z-Score	0.037	0.040	0.044	0.045	0.009	0.011
	(0.283)	(0.242)	(0.149)	(0.139)	(0.783)	(0.728)
Returns Volatility (%)	0.002	0.000	0.015	0.015	0.001	0.000
	(0.892)	(0.990)	(0.135)	(0.138)	(0.907)	(0.976)
Maturity	-0.009***	-0.009***	-0.021***	-0.021***	-0.018***	-0.017***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Deal Amount	0.158***	0.157***	0.098***	0.096***	0.180***	0.179***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Industry Dummies	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Year Dummies	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
R^2	*0.349*	*0.352*	*0.423*	*0.425*	*0.425*	*0.430*

Table 9

2SLS regression of %New Bank and endogeneity of Spread

The Table reports 2SLS regressions of *%New Bank* on the compensation variables, and statistics from tests for the endogeneity of *Spread*. The sample consists of 631 U.S. dollar-denominated bank loans to U.S. non financial corporations, and 1,567 public bonds issued in the U.S. by U.S. non financial corporations between 1992 and 2005. *%New Bank* is new bank debt to total new debt. For firms in the private sample *Spread,* computed in basis points (bps), is the sum of spread over the LIBOR and any other annual fee; for firms in the public sample, *Spread* is the spread over a Treasury bond of comparable maturity. *PPS* is the natural logarithm of the dollar increase in the value of the manager's portfolio for a $1,000 increase in firm value; *Delta* is the natural logarithm of the dollar increase in the value of the manager's stock options for a $1 increase in the stock price; *% Existing Bank Debt* is existing bank debt to total assets; *Size 2* and *Size 3* are dummy variables for the second and third tercile of firm size; *Age* is number of years since first record in Compustat; *Block* is a dummy variable equal to 1 if at least one shareholder holds 5% or more of the shares outstanding, 0 otherwise; *Profitability* is operating income before depreciation to total assets; *Market-to-Book* ratio is book value of debt plus market value of common and preferred stock divided by total assets; *R&D* is R&D expenditures to total assets; *Book Leverage* is liabilities divided by total assets; *Interest Coverage* is operating income to interest expense; Z-*Score* is defined as the natural logarithm of (3.3*EBIT/Sales+0.999*Sales/Total Assets+1.4*Retained Earnings/Total Assets+1.2*Working Capital/Total Assets+0.6*Market Value of Equity/ Book Value of Liabilities); *Returns Volatility* is the moving standard deviation of daily returns on a window of 30 days (in percentage); *Maturity* is maturity of the loan/bond in years; *Deal Amount* is the natural logarithm of the total amount of the loan/bond in $ million. *Dividend* is a dummy variable equal to 1 if the company pays a dividend, 0 otherwise; *Interest Volatility* is the monthly average of the 12-month moving standard deviation of daily yields on 10-years U.S. T-bonds. Industry dummies are based on the first two digits of the NAICS code. All continuous variables are winsorized at 1%. Standard errors are robust and clustered by firm. Columns (1) and (2) of Panel A present estimated coefficients (p-values) from 2SLS regressions of *%New Bank*. Panel B reports statistics from tests for the endogeneity of *Spread* and for the relevance and validity of the instruments. Shea partial R^2, partial R^2, and F-statistics of joint significance of the instruments in the first stage provide tests of instrument relevance. The Hansen J statistic tests the exogeneity of the instruments for validity. Difference in Sargan C statistic tests the exogeneity of the endogenous variables. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

Panel A: 2SLS regression

Independent Variables	**(1) N=2,185**	**(2) N=2,185**
Intercept	-0.121	0.061
	(0.562)	(0.808)
Spread	0.001	0.000
	(0.479)	(0.579)
PPS	0.038*	
	(0.075)	
PPS^2	-0.010**	
	(0.029)	
Delta		0.694*
		(0.074)
$Delta^2$		0.874**
		(0.022)

Panel B: tests for endogeneity

Statistics	**(1) N=2,185**	**(2) N=2,185**
Partial R^2	0.022	0.021
F	10.010	11.250
Hansen J	1.447	1.537
	(0.229)	(0.215)
C statistic	7.057***	5.973**
	(0.008)	(0.015)

Instruments for Spread: Dividend and Interest Volatility

Table 9 (continued)

Panel A: 2SLS regression			Panel B: tests for endogeneity		
Independent Variables	**(1) N=2,185**	**(2) N=2,185**	**Statistics**	**(1) N=2,185**	**(2) N=2,185**
Size 2	-0.227***	-0.221***			
	(0.000)	(0.000)			
Size 3	-0.282***	-0.292***			
	(0.000)	(0.000)			
Age	0.000	0.000			
	(0.805)	(0.750)			
Block	-0.027	-0.019			
	(0.216)	(0.357)			
Profitability	-1.142**	-1.101**			
	(0.034)	(0.042)			
Market-to-Book	0.009	0.009			
	(0.457)	(0.499)			
R&D	1.131	1.065			
	(0.281)	(0.309)			
Book Leverage	-0.582***	-0.591***			
	(0.000)	(0.000)			
Z-Score	0.098*	0.092			
	(0.099)	(0.106)			
Returns Volatility (%)	0.002	0.005			
	(0.927)	(0.837)			
Maturity	-0.011***	-0.011***			
	(0.000)	(0.000)			
Deal Amount	0.094***	0.090***			
	(0.000)	(0.000)			
Industry Dummies	*Yes*	*Yes*			
Year Dummies	*Yes*	*Yes*			
R^2	*0.310*	*0.493*			

Table 10

OLS regression of Spread

The Table reports OLS regressions of *Spread* on the compensation variables on the public and private samples. The private sample consists of 251 U.S. dollar-denominated bank loans to U.S. non financial corporations; the public sample consists of and 1,476 public bonds issued in the U.S. by U.S. non financial corporations between 1992 and 2005. For firms in the private sample *Spread,* computed in basis points (bps), is the sum of spread over the LIBOR and any other annual fee; for firms in the public sample, *Spread* is the spread over a Treasury bond of comparable maturity. *PPS* is the natural logarithm of the dollar increase in the value of the manager's portfolio for a $1,000 increase in firm value; *Delta* is the natural logarithm of the dollar increase in the value of the manager's stock options for a $1 increase in the stock price; *Size 2* and *Size 3* are dummy variables for the second and third tercile of firm size; *Age* is number of years since first record in Compustat; *Profitability* is operating income before depreciation to total assets; *Loss* is a dummy variable equal to 1 if the operating income before depreciation is negative, 0 otherwise; *Market-to-Book* ratio is book value of debt plus market value of common and preferred stock divided by total assets; *R&D* is R&D expenditures to total assets; *Book Leverage* is liabilities divided by total assets; *Interest Coverage* is operating income to interest expense; Z-*Score* is defined as the natural logarithm of (3.3*EBIT/Sales+0.999*Sales/Total Assets+1.4*Retained Earnings/Total Assets+1.2*Working Capital/Total Assets+0.6*Market Value of Equity/ Book Value of Liabilities); *Collateral* is a dummy variable equal to 1 if the bond/loan is collateralized, 0 otherwise; *Returns Volatility* is the moving standard deviation of daily returns on a window of 30 days (in percentage); *Maturity* is maturity of the loan/bond in years; *Deal Amount* is the natural logarithm of the total amount of the loan/bond in $ million; *Interest Volatility* is the monthly average of the 12-month moving standard deviation of daily yields on 10-years U.S. T-bonds (in percentage). Industry dummies are based on the first two digits of the NAICS code. All continuous variables are winsorized at 1%. Columns (1) and (2) show the coefficients (p-values) of OLS regressions of *Spread* for the public sample; columns (3) and (4) show the coefficients (p-values) of OLS regressions of *Spread* for the private sample. Standard errors are robust and clustered by firm. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

	Public Bonds		**Bank Loans**	
Independent Variables	**(1) N=1,476**	**(2) N=1,476**	**(3) N=251**	**(4) N=251**
Intercept	211.038***	264.610***	183.066***	197.092***
	(0.000)	(0.000)	(0.000)	(0.000)
PPS	6.991**		2.295	
	(0.025)		(0.487)	
Delta		50.225*		12.546
		(0.059)		(0.606)
Size 2	-28.496***	-32.202***	-26.924**	-27.454**
	(0.001)	(0.000)	(0.018)	(0.015)
Size 3	-65.587***	-73.469***	-37.960**	-39.448***
	(0.000)	(0.000)	(0.014)	(0.010)
Age	-0.566*	-0.460	-0.137	-0.138
	(0.062)	(0.143)	(0.632)	(0.639)
Profitability	-538.902***	-571.633***	247.605	230.005
	(0.002)	(0.001)	(0.251)	(0.287)

Table 10 (continued)

	Public Bonds		Bank Loans	
Independent Variables	**(1) N=1,476**	**(2) N=1,476**	**(3) N=251**	**(4) N=251**
Loss	5.490	4.949	-1.080	-1.227
	(0.536)	(0.583)	(0.934)	(0.926)
Market-to-Book	-7.248*	-8.632*	2.225	2.210
	(0.093)	(0.051)	(0.645)	(0.648)
R&D	582.195**	516.343**	-238.236	-252.941
	(0.028)	(0.049)	(0.368)	(0.333)
Book Leverage	105.107***	107.618***	-3.717	-2.518
	(0.002)	(0.001)	(0.906)	(0.936)
Interest Coverage	0.146	0.158	-0.031	-0.030
	(0.576)	(0.539)	(0.549)	(0.559)
Z-Score	-64.507***	-65.227***	-53.228***	-53.266***
	(0.000)	(0.000)	(0.000)	(0.000)
Returns Volatility (%)	36.950***	36.725***	7.089	7.172*
	(0.000)	(0.000)	(0.105)	(0.098)
Deal Amount	3.362	1.854	-9.383**	-9.824**
	(0.518)	(0.718)	(0.040)	(0.031)
Maturity	0.454***	0.421***	1.919	2.073
	(0.000)	(0.001)	(0.417)	(0.378)
Collateral	204.892***	209.450***	72.842***	72.786***
	(0.000)	(0.000)	(0.000)	(0.000)
Interest Rate Volatility (%)	42.762	43.831	48.446	48.692
	(0.138)	(0.127)	(0.232)	(0.231)
Industry Dummies	*Yes*	*Yes*	*Yes*	*Yes*
Year Dummies	*Yes*	*Yes*	*Yes*	*Yes*
R^2	*0.607*	*0.606*	*0.650*	*0.649*

Table 11

Test for the endogeneity of PPS and Delta

The Table reports statistics from tests for the endogeneity of *PPS* and *Delta*, and for the relevance and validity of the instruments. The sample consists of 187 U.S. dollar-denominated bank loans to U.S. non financial corporations, and 1,427 public bonds issued in the U.S. by U.S. non financial corporations between 1992 and 2005. *PPS* is the natural logarithm of the dollar increase in the value of the manager's portfolio for a $1,000 increase in firm value; *Delta* is the natural logarithm of the dollar increase in the value of the manager's stock options for a $1 increase in the stock price. Shea partial R^2, partial R^2, and F-statistics of joint significance of the instruments in the first stage provide tests of instrument relevance. The Hansen J statistic tests the exogeneity of the instruments for validity. Difference in Sargan C statistic tests the exogeneity of the endogenous variables. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

	Public Sample		**Private Sample**	
	PPS	**Delta**	**PPS**	**Delta**
	N=1,427		**N=187**	
Instruments: CEO tenure, PPS (Delta) on the previous year.				
Partial R^2	0.658	0.382	0.226	0.298
F	336.450***	139.850***	14.930***	44.380***
	(0.000)	(0.000)	(0.000)	(0.000)
Hansen J	2.115	0.652	1.099	0.490
	(0.146)	(0.419)	(0.295)	(0.484)
C statistic	0.207	0.737	1.211	0.693
	(0.649)	(0.391)	(0.271)	(0.405)

Table 12

Logistic regression of Collateral

The Table reports logistic regressions of *Collateral* on the compensation variables. The sample consists of 242 U.S. dollar-denominated bank loans to U.S. non financial corporations between 1992 and 2005. *Collateral* is a dummy variable equal to 1 if the bond/loan is collateralized, 0 otherwise; *PPS* is the natural logarithm of the dollar increase in the value of the manager's portfolio for a $1,000 increase in firm value; *Delta* is the natural logarithm of the dollar increase in the value of the manager's stock options for a $1 increase in the stock price; *Size 2* and *Size 3* are dummy variables for the second and third tercile of firm size; *Age* is number of years since first record in Compustat; *Profitability* is operating income before depreciation to total assets; *Loss* is a dummy variable equal to 1 if the operating income before depreciation is negative, 0 otherwise; *Tangibility* is net property, plant and equipment to total asset; *Market-to-Book* ratio is book value of debt plus market value of common and preferred stock divided by total assets; *R&D* is R&D expenditures to total assets; *Book Leverage* is liabilities divided by total assets; *Interest Coverage* is operating income to interest expense; Z-*Score* is defined as the natural logarithm of (3.3*EBIT/Sales+0.999*Sales/Total Assets+1.4*Retained Earnings/Total Assets+1.2*Working Capital/Total Assets+0.6*Market Value of Equity/ Book Value of Liabilities); *Returns Volatility* is the moving standard deviation of daily returns on a window of 30 days (in percentage); *Deal Amount* is the natural logarithm of the total amount of the loan/bond in $ million; *Maturity* is maturity of the loan/bond in years; *Interest Volatility* is the monthly average of the 12-month moving standard deviation of daily yields on 10-years U.S. T-bonds (in percentage). Industry dummies are based on the first two digits of the NAICS code. All continuous variables are winsorized at 1%. Columns (1) and (2) show the coefficients (p-values) of a logistic regression of *Collateral*. Columns (3) and (4) show the coefficients (p-values) of a logistic regression of *Collateral*: in this sample, the dummy variable *Collateral* is set to 0 when the observation is missing. Standard errors are robust and clustered by firm. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

Independent Variables	**(1) N=242**	**(2) N=242**	**(3) N=611**	**(4) N=611**
Intercept	4.043	6.683**	-1.493	-0.104
	(0.109)	(0.015)	(0.515)	(0.965)
PPS	0.283*		0.099	
	(0.077)		(0.522)	
Delta		3.862**		3.047***
		(0.044)		(0.009)
Size 2	-1.038**	-1.008**	-1.595***	-1.588***
	(0.024)	(0.029)	(0.000)	(0.000)
Size 3	-1.600**	-1.847***	-1.970***	-1.985***
	(0.032)	(0.005)	(0.001)	(0.000)
Age	-0.015	-0.011	-0.022*	-0.017
	(0.400)	(0.498)	(0.066)	(0.127)
Profitability	-4.923	-3.333	-8.653	-9.304
	(0.664)	(0.765)	(0.258)	(0.221)
Tangibility	-2.635*	-2.615*	-0.385	-0.312
	(0.060)	(0.056)	(0.687)	(0.750)

Table 12 (continued)

Independent Variables	**(1) N=242**	**(2) N=242**	**(3) N=611**	**(4) N=611**
Loss	0.594	0.787	0.490	0.572
	(0.407)	(0.277)	(0.295)	(0.232)
Market-to-Book	-0.306	-0.345	-0.063	-0.071
	(0.280)	(0.205)	(0.803)	(0.762)
R&D	-23.301	-26.446	-7.646	-11.494
	(0.319)	(0.288)	(0.597)	(0.452)
Book Leverage	4.362*	4.823**	2.321*	2.807*
	(0.064)	(0.044)	(0.097)	(0.060)
Interest Coverage	0.001	0.001	0.004**	0.004**
	(0.621)	(0.663)	(0.040)	(0.025)
Z-Score	-0.400	-0.528	-0.346	-0.455
	(0.593)	(0.486)	(0.547)	(0.409)
Returns Volatility (%)	0.612***	0.629***	0.437***	0.420***
	(0.002)	(0.003)	(0.002)	(0.003)
Deal Amount	-0.447*	-0.525**	-0.110	-0.143
	(0.056)	(0.038)	(0.497)	(0.392)
Maturity	0.347**	0.384**	0.334***	0.359***
	(0.041)	(0.022)	(0.002)	(0.001)
Interest Rate Volatility (%)	1.292	1.224	2.021	1.701
	(0.556)	(0.587)	(0.253)	(0.340)
Industry Dummies	*Yes*	*Yes*	*Yes*	*Yes*
Year Dummies	*Yes*	*Yes*	*Yes*	*Yes*
Pseudo R^2	*0.403*	*0.415*	*0.331*	*0.345*