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Inside Debt and Corporate Investment

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Abstract

Prior literature has examined the role of inside debt in dampening CEO risk-taking incentives, and several recent studies have documented a negative association between CEO inside debt holdings and firm investment in R&D. We examine whether inside debt, by providing greater alignment of CEOs' incentives with debtholders', can reduce the cost of debt financing and therefore increase investment levels. In contrast to the simple negative relationship documented in prior research, we hypothesize and find that the relationship between inside debt and both R&D and Capital Expenditure investment levels depends on the degree of financing constraints facing the firm. In particular, we find that the observed negative relation between inside debt and risky investment (R&D) is reduced or reversed for firms facing financing constraints. Similarly, the positive relation between inside debt and safe investment (CapEx) is increased for firms facing financing constraint. Our findings contribute to the literature on CEO incentives and corporate investment policy, and provide a richer understanding of the role of debt-like compensation in reducing agency costs.

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Inside Debt and Corporate Investment

by Joonil Lee, Kevin J. Murphy, Peter SH. Oh, Marshall Vance

1. Introduction

Over the past several decades, a large literature has explored how corporate investment decisions are influenced by top-management incentives. The early literature documented a positive relation between investment and equity-based (as opposed to accounting-based) compensation, concluding that equity-based compensation mitigates short-term investment horizons by better aligning the interests of managers and shareholders. In addition, researchers have argued (and sometimes even found) that asymmetric payoffs from stock options (and equity claims in levered firms) promote risk taking, including investment in relatively risky projects. More recently, researchers have explored the relation between investment activity and "inside debt," defined as unsecured long-term fixed claims (primarily defined-benefit pensions and deferred compensation) held by managers. In contrast to equity-based incentives, which are characterized by large upside potential with limited downside losses, the value of inside debt is particularly sensitive to downside risk and helps align the interest of managers and debtholders, who will typically prefer less risky investments relative to those preferred by shareholders. Indeed, inside debt has been proposed as a key control mechanism for reducing managers' overall risk-taking incentives.

Several recent studies have documented a negative association between management inside debt holdings and firm investment in research and development (R&D). However, while inside debt can dampen managerial risk-taking incentives, the overall effect of inside debt on the level

of investment activity is unclear. First, managers with increased inside debt might substitute riskier investments with safer investments, without reducing the overall level of investment. Second, inside debt aligns the interests of managers with those of debtholders, reducing agency costs that arise due to the conflicts of interest between shareholders and debtholders (Jensen and Meckling, 1976). Therefore, to the extent that lenders take inside debt into account when structuring debt-contracting terms, inside debt will reduce the cost of debt financing which in turn will *increase* the level of investments for firms that relying on external debt to fund investments.

In this paper, we explore the relation between inside debt and corporate investment, taking into account the effect of inside debt on both the demand side (i.e., inside debt reduces the managerial demand for risky investments but potentially increases the demand for safer investments) and the supply side (i.e., inside debt reduces the cost of external debt financing). We use R&D and capital expenditures (CapEx) as proxies for risky and safe investment activity, respectively. We exploit the fact that the "supply side" is only relevant for firms that require external debt financing to fund investments, and use several measures of financial constraints as proxies for reliance on external funding. We hypothesize that the relationship between inside debt and investment levels depends on the degree of financial constraints facing the firm. In particular, for firms with low financial constraints (i.e., firms with sufficient internal funds to finance investments), we predict a negative relation between inside debt and R&D (i.e., risky investment), and a (weakly) positive relation between inside debt and CapEx (i.e., safe investment). However, we expect the negative relation between inside debt and R&D to be reduced or reversed for firms with high financial constraints (i.e., firms requiring external

funding), and also expect the (weakly) positive relation between inside debt and CapEx to be increased for firms with high financial constraints.

Our empirical results largely support our hypotheses. We find the expected negative association between inside debt and R&D spending when financial constraints are low, but find that this relation is reduced or reversed for firms with high financial constraints. Similarly, we show that the association between inside debt and CapEx spending is insignificant (or weakly negative) for firms with low financial constraints, but positive for firms with high financial constraints. Moreover, we find that the positive association between inside debt and investment for financially constrained firms is strongest for firms with a greater risk of default (based on Altman's Z-scores) where shareholder-debtholder conflicts are expected to be particularly high. Our findings are robust to a number of alternative specifications, including alternative measures of financial constraints and an instrumental variables approach to address concerns about endogeneity.

In supplemental tests, we directly assess the relationship between inside debt and changes in debt financing. For financially constrained firms, we find a significant positive association between inside debt and changes in debt financing levels. However, we do not find a significant association for unconstrained firms. In addition, we re-examine Wei and Yermack's (2011) finding that equity prices fell when high levels of inside debt were first disclosed following a 2006 SEC disclosure reform. In particular, we show that the stock-price reaction to high disclosed levels of inside debt were negative for firms facing few financial constraints, but positive for firms facing high financial constraints.

This study contributes to the literature examining the relation between management incentives and corporate investment decisions, and also contributes to the literature focusing on underinvestment in financially constrained firms (Stein, 2003; Franzoni, 2009). In particular, lenders protect themselves from shareholder-debtholder conflicts by charging higher interest rates, by imposing restrictive covenants or collateral requirements, and through costly monitoring (Jensen and Meckling, 1976). These "protections" increase the cost of capital for firms requiring external debt financing, leading to underinvestment relative to the level that would maximize firm value in the absence of agency costs. Our results suggest that inside debt, by providing greater alignment of management incentives with those of debtholders, can reduce the cost of debt financing for firms facing financial constraints and therefore increase investment levels in such firms, mitigating the underinvestment problem.

We proceed as follows. Section 2 develops our central hypotheses and provides a literature review. Section 3 discusses our research design, and Section 4 describes our data and presents our primary findings. Section 5 describes our supplemental analyses, and Section 6 concludes.

2. Literature Review and Hypothesis Development

There is a conflict of interest between a firm's "residual claimants" (e.g., owners of common equity) and "fixed claimants" (e.g., owners of unsecured debt) over the level of acceptable risk associated with firm investment. In particular, since shareholders in a levered firm receive a disproportionately large share of the positive cash flows associated with successful risky investments, but bear a disproportionately smaller share of failures (since shareholder losses are limited by the value of their equity), shareholders will typically prefer riskier investments relative to those preferred by fixed claimants. CEOs with wealth tied primarily to

equity prices (through, for example, stock ownership, stock options, restricted shares, or other equity-based compensation) have incentives to pursue investments that have positive NPV from the standpoint of shareholders, regardless of whether those projects are valuable for fixed claimants or, indeed, the firm as a whole.[1] Excessive risk-taking (from the perspective of debtholders) after initiating debt financing is commonly referred to as "asset substitution" or "risk-shifting." Fixed claimants, of course, understand these incentives and will protect themselves by charging higher interest rates, by imposing restrictive covenants or collateral requirements, and through costly monitoring.

Jensen and Meckling (1976) termed the costs arising from the conflict of interest between residual and fixed claimants the "Agency Cost of Debt," and defined these costs as including not only the loss from suboptimal (risky) investments, but also the costs of monitoring and writing and enforcing debt covenants, and the opportunity cost of forgone investments that would increase the value of the firm as a whole but are either precluded by the covenants or are unprofitable to shareholders when evaluated at the inflated cost of capital charged by appropriately suspicious fixed claimants.

Jensen and Meckling (1976) conjecture that the agency cost of debt can be mitigated by contractually obligating the CEO to hold equity and debt securities in proportion to the residual and fixed claims held by outside investors. They note that requirements for CEOs to hold firm debt are not commonly observed in practice, and subsequent research attempts to explain why CEOs' wealth is tied to the value of equity and not to the value of the firm as a whole (e.g., Hirshleifer and Thakor, 1992; John and John, 1993). However, more recent research

[1] Several studies document an association between managerial equity incentives and risk taking (e.g., Guay, 1999; Coles et al., 2006).

demonstrates that pensions and deferred compensation represent a substantial component of executives' firm-related wealth,[2] and argues these forms of compensation are debt-like because the manager receives a fixed unsecured claim with value that, in the event of bankruptcy, depends on the liquidating value of the firm (e.g., Sundaram and Yermack, 2007; Wei and Yermack, 2011).

Following the intuition from Jensen and Meckling (1976), several recent papers document empirical support for the role of debt-like compensation, termed "inside debt," in aligning managers' risk-taking preferences with debt holders compared to equity holders. Sundaram and Yermack (2007) find that the ratio of inside debt to equity is negatively associated with default risk, which they interpret as evidence for inside debt motivating managers to reduce firm risk, e.g., by accepting fewer risky investments. Similarly, Cassell et al. (2012) find a negative association between CEO inside debt holdings and the volatility of future firm stock returns. More directly, they also show that inside debt is associated with lower R&D expenditures along with other proxies for firm risk taking. Choy et al. (2014) find firm risk generally, and R&D spending in particular, increases when executive switch from defined-benefit to defined-contribution pension plans (with the benefits under the existing defined-benefit plan "frozen" as of the date of the switch). Wei and Yermack (2011) examine equity and debt prices immediately following initial disclosures of CEO inside debt holdings, and find that when inside debt is large, equity prices fall and debt prices rise. These results are consistent with capital markets adjusting prices to reflect CEOs' incentives being relatively more aligned with debt holders than equity holders. However, they observe that "The net effect appears to destroy enterprise value for these

[2]In both our paper and the prior literature, firm-related wealth is defined as the sum of the value of the executive's equity holdings (including stock, restricted shares, and stock options), the actuarial present value of the executive's pension, and the nominal value of the executive's deferred compensation accounts.

firms overall, as the gains to bondholders appear to be more than offset by losses to stockholders (p. 3839)." Collectively, these studies provide evidence suggesting that the effect of CEO debt compensation is to reduce firm risk taking, and reduce investment in R&D in particular.

Although the literature to this point has emphasized the role of debt-like compensation in reducing managers' incentives to engage in risk shifting, agency conflicts can manifest in other forms of investment distortions, including underinvestment. Under traditional finance theory, in the absence of market frictions firms maximize value by pursuing all positive NPV investment opportunities. However, a large theoretical and empirical literature has examined reasons why firms invest below efficient levels.[3] A standard result from this literature is that investment distortions depend not only on managers' incentives, but also on the availability of financing. That is, when sufficient internal financing is available, firms can pursue all available positive NPV projects. However, in the absence of readily available internal financing, whether the firm can undertake a given project will depend on its ability to access external capital and on the cost of that capital. While in a frictionless capital market firms should be able to fund all positive NPV projects, under more realistic circumstances financing may be too costly or even unavailable even for an otherwise positive NPV project.

Inside debt can mitigate the agency cost of debt and therefore may improve a firm's ability to obtain debt financing to pursue positive NPV projects. As the ratio of inside debt to inside equity increases, the CEO's incentives are increasingly aligned with those of the outside debtholders. Lenders, in turn, offer more favorable debt contracting terms for firms that use inside debt to compensate their chief executives, including lower interest rates (Anantharaman et

[3] See Hubbard (1998) and Stein (2003) for reviews of this literature.

al., 2013), reduced use of covenants (Chava et al., 2010; Anantharaman et al., 2013), and lower collateral requirements (Wang et al., 2011). To the extent inside debt reduces the perceived cost of debt financing (e.g., from lower interest rates and fewer costly covenants), inside debt can *increase* investment for firms that depend on debt financing to fund investments.

Prior research has generally assumed that firm investment in risky projects will be negatively related to inside debt, because inside debt reduces the CEO's benefit from risk-taking activities. We argue that, since inside debt reduces the cost of external debt financing, the relation between inside debt and investment depends on the financing constraints facing the firm. In particular, for firms with sufficient capital to finance all projects using internal funds, the relation between inside debt and investment will be unambiguously negative since the reduction in the cost of external debt financing associated with inside debt is irrelevant. But, for financially constrained firms requiring external financing, inside debt lowers the cost of external debt capital which, ceteris paribus, increases the equilibrium level of investment. Since financially constrained firms are generally assumed to underinvest (because the perceived cost of external debt is higher than the cost of debt in a frictionless market due to agency-cost-of-debt considerations), inside debt can, in fact, mitigate the underinvestment problem.

Based on the above discussion, we hypothesize that the relationship between CEO inside debt holdings and investment levels depends on financing constraints. Following the conventional wisdom, inside debt reduces CEO's incentives to take risks, and therefore we expect that in the absence of financing constraints inside debt will be negatively associated with risky investment levels. However, when firms are financially constrained, inside debt reduces the cost of external debt financing which, in turn, will increase investment levels. Thus, the overall

effect of inside debt for financially constrained firms can be either positive or negative, depending on whether the offsetting effects of reducing risk-taking incentives or increasing ability to borrow funds prevails.

3. RESEARCH DESIGN

To test the relation between inside debt and the level of investment conditional on financial constraints, we regress investment on prior-year values for the ratio of CEO inside debt to firm-related wealth, a measure of financial constraints facing the firm, and an interaction between the two. Specifically, our primary model is the following:

$$Investment_{i,t+1} = \alpha + \beta_1 INDEBT\_RATIO_{i,t} + \beta_2 INDEBT\_RATIO_{i,t} \bullet Constrained_{i,t} + \beta_3 Constrained_{i,t} + \Sigma\Gamma_j Control_{j,i,t} + \varepsilon_{i,t} \quad (1)$$

where *Investment* is either research and development ("R&D") expense or capital expenditures ("CAPEX") depending on the test, *INDEBT_RATIO* is our measure of CEO debt-based incentives, *Constrained* is a proxy for financing constraints, and *Control* represents a vector of control variables. We estimate the above model separately for R&D and CAPEX because, following prior literature (e.g., Coles et al., 2006; Choy et al., 2014), we expect that CAPEX are relatively less risky than R&D, and thus subject to differential influence from risk-taking incentives from debt and equity compensation. Following prior literature (e.g., Biddle et al., 2009), we scale R&D by lagged total assets and CAPEX by lagged property, plant, and equipment ("PP&E").

We construct a measure of financial constraints, *Constrained,* to capture firms' *ex-ante* susceptibility to the underinvestment problem. Following recent studies in accounting (e.g., Biddle et al 2009; Cheng et al, 2013; Balakrishnan et al., 2013) we construct the decile rank of

each firm for cash holdings and leverage, two variables shown in the prior literature to be associated with financing constraints, and scale the average of both ranks to obtain values between zero and one. Since high values of cash and leverage have opposite implications for firms' ability to fund potential investment opportunities, prior to generating decile ranks we multiply cash by negative one. Thus, higher values of *Constrained* are interpreted as indicating a higher *ex-ante* tendency towards underinvestment. The coefficient on the interaction of *INDEBT_RATIO* and *Constrained* is interpreted as the incremental effect of financial constraints on the relation between investment and inside debt. Thus, the overall relationship between inside debt and investment levels when constraints are highest (i.e., *Constrained*=1) is captured by the sum of the main effect of inside debt (β_1) and the interactive effect (β_2). Including *Constrained* and the interaction term in the model allows us to separately examine the effect of inside debt holdings when constraints are lowest (β_1 for *Constrained*=0) from the effect when constraints are highest ($\beta_1 + \beta_2$).

We operationalize CEO debt incentives using the amount of inside debt divided by CEO's firm related wealth as follows:

$$\begin{aligned} \textit{INDEBT\_RATIO} &= \text{Inside debt / (Inside debt + Inside equity)} \\ &= \text{Inside debt / Firm related wealth} \end{aligned} \qquad (2)$$

As discussed above, whether a manager's incentives are to adopt investment policies to favor equity holders over debt holders (or vice-versa) depends on the portion of debt-like claims in the CEO's overall firm-related wealth portfolio. We calculate the value of CEO inside debt and inside equity following the recent literature (e.g., Wei and Yermanck, 2011; Cassell et al., 2012; He, 2015). The value of CEO inside debt is calculated as the sum of the actuarial present value of accumulated benefits under defined-benefit pension plans and the total balance in the deferred compensation plans at fiscal year-end. Inside equity is the sum of stock holdings (obtained by

multiplying the number of shares, including restricted shares, by the stock price) and the year-end fair value of stock options based on the Black–Scholes formula.[4] *INDEBT_RATIO*, which ranges from 0 (no inside debt) to 1 (only inside debt), is intended to capture the relative alignment of CEO incentives with outside debt holders compared to equity holders.

Jensen and Meckling (1976) observed that CEO incentives to favor one group of financial claimants over others are mitigated by requiring the CEO to hold strips of residual and fixed claims in exact proportion to the firm's capital structure. Based on this observation, many empirical studies of inside debt have measured inside debt as the ratio of the CEO's debt-equity ratio (i.e., inside debt divided by inside equity) to the firm's debt-equity ratio, which measures the alignment between the CEO's risk-shifting incentives and the risk-shifting policy that would optimize the value of the firm as a whole. We depart from this "ratio of ratios" approach for three primary reasons. First, the ratio-of-ratios makes sense only if the firm's fixed claims are composed entirely of unsecured claims with payoff characteristics similar to the CEO's deferred compensation and defined-benefit pension plans (which would be highly unusual).[5] Second, our focus is on whether the CEO's incentives are aligned with debtholders relative to shareholders, and not whether incentives are aligned to the overall capital structure. Third, since we use the firm's debt-equity ratio in constructing our proxy for financing constraints, the ratio-of-ratios would be mechanically related to this proxy.

We include a number of control variables to account for determinants of firm investment policy that are also likely to be correlated with CEO debt-based compensation. Consistent with

[4] Option values for the portfolio of option held at the end of the fiscal year are computed assuming a risk-free rate equal to yield on 7-year U.S. treasuries, volatilities based on monthly stock returns over the prior 48 months, and dividend yields based on three-year rolling averages. The expected term for options is assumed to be 70% of the full term.

[5] For example, the ratio-of-ratios is irrelevant if the CEO's inside debt consists of unsecured claims while the firm's debt is secured or collateralized.

prior research on corporate investment levels, we include proxies for firm size, asset growth, and Tobin's Q to control for the investment opportunity set available to the firm. We also control for operating environment volatility and Altman's Z-score as proxies for firm risk. All variables are defined in the Appendix.

4. RESULTS

4.1. Data composition and sample description

While theoretical interest in the impact of inside debt on investment decisions is not new (Jensen and Meckling, 1976; Sundaram and Yermack, 2007), changes in disclosure laws in 2006 have substantially improved researchers' ability to examine this topic empirically. Beginning in 2006, the Securities and Exchange Commission (SEC) adopted expanded executive compensation disclosure requirements which mandate firms provide detailed information on executive pension benefits, deferred compensation, and year-end option holdings. Information from these augmented disclosures is available in the Execucomp database for firms with a fiscal year-end following December 15, 2006, which we adopt as the starting period for our sample selection. We combine these data on executive equity and debt-based compensation with financial statement data from Compustat and stock price data from CRSP to form the primary basis of our sample.[6] We exclude financial firms (SIC codes from 6000-6999) because they do not report research and development expenses. Our full sample is comprised of 1,307 firms and 7,164 firm-year observations over the years 2006 to 2013. Our sample selection procedure is detailed in Panel A of Table 1.

Table 1, Panel B presents descriptive statistics for executive debt and equity holdings, as

[6] We limit our sample to Execucomp firms, which include firms in the S&P 500, the S&P MidCap 400, the S&P SmallCap 600, and a small number of other firms tracked by Standard and Poors.

well as other variables used in our models. Inside debt comprises a non-trivial portion of a CEO's overall incentive package; the average CEO's inside debt holdings is $5,358,000 (with a median of $646,000). By comparison, the average CEO's equity holding is $83,923,000 (median of $13,634,000). For the average CEO in our sample, inside debt makes up approximately 15% of total firm related wealth. However, we document large variation in the proportion of CEO wealth comprised of inside debt. While the lower-quartile value of INDEBT_RATIO is zero (i.e., no inside debt), CEOs in the third quartile hold inside debt representing nearly one-fourth of total firm-related wealth. We expect this variation in debt-like holdings to manifest in differential incentives to favor the interests of debtholders vs. equityholders. On average, firms' annual investment in CAPEX and R&D amounts to 25.45% and 5.56% of their PP&E and total assets, respectively. Pairwise correlations among variables are reported in Table 2. Consistent with the prior literature, our measure of debt-based incentives, *INDEBT_RATIO*, is negatively associated with R&D, consistent with the effect of inside debt being to reduce CEO incentives to take risks. Also, we find a negatively correlation between *Constrained* and both measures of investment, consistent with financial constraints reducing firms' ability to pursue investment opportunities.

4.2. The relation between inside debt, financing constraints, and investment

Table 3 reports coefficients from ordinary least-squares regressions showing the relation between investment, inside debt, and financing constraints. The dependent variable in columns (1) and (3) is the following year's investment in CAPEX while the dependent variable in columns (2) and (4) is the following year's investment in R&D. Observations with missing R&D data are excluded from the regressions in columns (2) and (4), which accounts for the different sample sizes across our tests.[7]

[7] Managers exercise discretion in reporting R&D expense and thus not all firms choose to separately report R&D.

As shown in Column 1 of Table 3, we find a *positive* but insignificant association between INDEBT_RATIO and CAPEX, while in Column 2 we find a significant (at the 5% level) *negative* association between *INDEBT_RATIO* and R&D. Since R&D expenditures are presumably more risky than CAPEX, these results are consistent with a number of recent papers that document a negative association between inside debt and the riskiness of firm investment policies. As noted earlier, we expect the relationship between inside debt and firm investment to vary based on the level of financial constraints facing the firm. This is because the effect of inside debt on the supply of debt financing (i.e., due to its effect of reducing the cost of debt capital) is likely to only apply to firms requiring external financing to fund investments.

In Columns 3 and 4, we include *Constrained* as an additional independent variable, as well as an interaction between INDEBT_RATIO and *Constrained*. Of note, the coefficient on *Constrained* is significantly negative in both Column 3 and 4, suggesting that our measure of financial constraints does indeed reflect firms' underlying ability to fund investments. In contrast to the results in Column 1, after controlling for financial constraints we find a significant *negative* relationship between INDEBT_RATIO and CAPEX, indicating that for financially unconstrained firms inside debt is associated with reduced investment. Consistent with Column 2, we continue to find a significant negative association between INDEBT_RATIO and R&D after controlling for financial constraints, although the magnitude and significance of this association is now greater for financially unconstrained firms. Turning to the interactions, we find a significant positive coefficient for the interaction of *INDEBT_RATIO* and *Constrained* in the

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Prior studies have commonly replaced missing R&D values with zero (i.e., interpret missing to mean there is no significant R&D activity). Koh and Reeb (2015) examine innovation activities of missing R&D firms, as well as changes in R&D reporting following auditor changes, and conclude that treating missing R&D as zero can lead to substantial bias in tests. Therefore, we do not replace missing R&D with zero, and instead drop firms with missing R&D from our sample. However, we note that our results are not sensitive to replacing missing R&D observations with zero.

models of both CAPEX and R&D, suggesting that investment increases with inside debt in financially constrained firms (but not in unconstrained firms). In particular, we find that while for unconstrained firms there is a negative association between inside debt and R&D, the incremental effect of financing constraints on this relationship is positive. Moreover, the overall effect (i.e., the main effect plus the interaction) is significantly *positive* (at the 10% level). Thus, the evidence in Table 3 suggests that when financing constraints are high (i.e., when underinvestment is most likely), inside debt increases investment. It is particularly notable that we find this *positive* effect of inside debt on R&D levels given the expected risk-reducing influence of inside debt on CEO risk-taking preferences (as suggested in Column 2 and in prior literature).

We recognize that CEO compensation and firm investment are endogenously determined, which raises the possibility that omitted variables correlated with both inside debt and investment policy are driving our results. Two elements of our research design mitigate this concern. First, we estimate the relationship between CEOs' inside debt incentives and *future* firm investment (i.e., INDEBT_RATIO is measured at time t and both R&D and CAPEX are measured at time t+1). Since inside debt and firm investment are not measured contemporaneously, there is reduced likelihood that an omitted variable associated with both is causing our results. Second, in all of our regressions we employ firm fixed effects. As such we hold constant any omitted factor that is constant at the firm level across time. Thus, in order for an omitted variable to affect our results, it must be the case that *changes* in any such variable is associated with time-series variation in both our measures of inside debt and investment, which we view as less likely. Prior studies examining the effects of inside debt have also considered the potential for endogeneity, and have attempted to address this issue using an instrumental

variables (IV) approach. In untabulated analyses, we conduct 2SLS using instruments identified in prior studies on inside debt (e.g., Anantharaman et al., 2013; Cassell et al., 2012; He, 2015), we continue to find significant results consistent with those in Table 3.[8]

4.3. Alternative measures of financing constraints

As noted above, we use an accounting-based approach to identifying financial constraints based on firms' ex-ante cash holdings and leverage (Biddle et al., 2009; Cheng et al, 2013). While our measure assumes both cash holdings and leverage have an equal effect on firm's ability to fund investments, in this section we repeat our analyses after developing measures of financial constraints based on cash holdings and leverage separately. Columns 1 and 2 of Table 4, Panel A report the results of tests using the scaled decile rank based on (the negative of) cash holdings, and Columns 3 and 4 report results based on the scaled decile rank of leverage. While the results using the cash-based measure are very similar to those reported in Table 3, the results using the leverage-based measure are weaker. In particular, the interaction between INDEBT_RATIO and Constrained is not significant (though still positive) in the CAPEX model in Column 3 and the interaction is significant at only the 10% level in the R&D model. While both sets of results are still broadly consistent with our hypothesis that the relationship between inside debt and firm investment depends on the level of financing constraints, Panel A of Table 4 indicates that the existence (or lack) of internal funds is particularly important for understanding the effect of inside debt on firm investment choices.

While a very large literature has examined the effect of financial constraints on firm

[8] As noted in these prior studies, identifying appropriate instruments for inside debt is a difficult task, and requires variables that are both correlated with inside debt, and uncorrelated with investment (except through the relationship with inside debt). Based on our own assessment of the likelihood these instruments used in prior literature meet both criteria (the latter of which cannot be directly tested), we have doubts an IV approach can adequately rule out endogeneity, and thus we do not emphasize our IV results.

behavior, there is ongoing debate about how best to measure financial constraints. In a recent paper, Farre-Mensa and Ljungqvist (2015) asses how well common accounting-based and other measures of financial constraints actually capture constrained behavior, and conclude that none of the most popular measures capture constrained behavior well, and therefore results based on these measures must be interpreted with caution.[9]

Hoberg and Maksimovic (2015) develop a novel approach to measure financial constraints based on textual analysis of the MD&A section of firms' 10-Ks. As Hoberg and Maksimovic (2015) note, SEC regulations require firms to discuss challenges to their liquidity, and how these challenges impact their investment plans. Specifically, they use text-extraction techniques to identify firms that disclose having to delay investment due to financial liquidity difficulties. While relatively few firms explicitly state that they face financial constraints, Hoberg and Maksimovic (2015) develop a continuous measure of constraints by calculating the overall verbal similarity of each MD&A to these firms that explicitly state their constraints. To assuage concerns that our primary *Constrained* variable does not adequately capture firms' financial constraints, we repeat our main analyses using a scaled decile rank (to be consistent with our *Constrained* variable) of Hoberg and Maksimovic's (2015) "Debt Focus Delay Investment Score", which measures financial constraints faced by firms with plans to issue debt to finance investment.

Column 1 of Table 4, Panel B reports results using this disclosure-based measure of constraints for our model of CAPEX, while Column 2 reports results for our model of R&D. We note that in both models, *Constrained* is significantly (at the 10% level) negatively associated with investment, as expected. However, this association appears to be weaker than for models

[9] Specifically, they assess constraints measures based on the KZ, HP, and WW indices, as well as whether a firm pays a dividend or has a credit rating.

using our primary measure of constraints, as the magnitude and significance of both coefficients is much smaller than for those reported in Table 3. The interaction of INDEBT_RATIO with Constraints is positively associated with CAPEX in Column 1, although the association is not significant. In Column 2, we find a significantly positive association between the interaction and R&D investment, which corroborates our findings in Table 3 using our primary measure of constraints.

4.4. Subsample Analyses

To this point we have documented evidence consistent with our hypothesis that the relationship between inside debt and investment levels depends on the financing constraints facing the firm. To the extent that inside debt leads to increased investment for financially constrained firms by reducing agency costs associated with borrowing, and hence reducing the cost of debt capital, we expect this effect to be particularly strong in settings in which the agency cost of debt is likely to be most severe. As firms get nearer to default, the agency conflict between equityholders vs. debtholders becomes more acute because the differential payoffs for positive compared to negative realizations of risky projects for the two groups of claimholders becomes more salient (i.e., the further a firm is from default, the more closely the payoff function for debtholders and equityholders resemble each other). In this section we repeat our primary analyses for subsamples based on financial distress, using Altman's Z-scores.

To examine whether the interaction between inside debt and financial constraints is more pronounced for firms that are closer to default, we classify firms with a Z-Score below the conventional cut-off of 1.81 as financially distressed (Begley et al. 1996, Blay et al. 2011), while firms with a Z-score above 3.00 are classified as financially sound (Altman, 2012). Results from

the subsample analysis are presented in Table 5. The main effect of INDEBT_RATIO (i.e., the effect of inside debt for unconstrained firms) is negative across all models, but particularly so for firms classified as being financially distressed (as shown in Column 3, for financially sound firms, the association between INDEBT_RATIO and CAPEX is insignificant). Thus, it appears that inside debt has an especially pronounced effect on CEOs' incentives to take risks when firms are nearer to default. Similarly, we find that the magnitude of the interaction term is much greater for both the CAPEX and R&D models for the distressed sample than for the sound sample, consistent with inside debt having more scope for reducing the debt cost of capital when agency costs between shareholders and lenders is greater.

5. ADDITIONAL TESTS

5.1. Credit market accessibility analysis

We argue that inside debt can reduce financing frictions caused by the agency conflict between debt and equity holders, and hence reduces the cost of external debt. Thus, while inside debt may reduce a manager's incentive to take risky investments, our results suggest that the reduced cost of debt for financially constrained firms (i.e., those requiring external financing) results in an overall positive effect on investment. In this section we examine the mechanism of debt market access more directly.

Building upon the research designs used in prior studies examining debt financing (Bradshaw et al. 2006; Bharath et al. 2008; Balakrishnan et al. 2013), we examine the effect of inside debt on the propensity to obtain debt financing using the following equation:

$$\Delta DEBT_{i,t+1} = \alpha + \beta_1 INDEBT\_RATIO_{i,t} + \beta_2 Constrained_{i,t} + \Sigma\Gamma_j Control_{j,i,t} + \varepsilon_{i,t} \quad (3)$$

where $\Delta DEBT$ is net debt financing measured as the cash proceeds from the issuance of long-

term debt less cash payments for long-term debt reductions less the net changes in current debt. Consistent with our earlier argument that reducing financing frictions is likely to be particularly helpful for firms with ex-ante financing constraints, we partition our sample based on the median value of our *Constrained* measure (Balakrishnan et al. 2013). We expect $\beta_1 > 0$ only for the constrained subsample.

Table 6 presents the results for the credit market accessibility analysis. While the coefficient on *INDEBT_RATIO* for the financially constrained sample (Column 1) is positive and significant, the coefficient on *INDEBT_RATIO* for financially unconstrained firms (Column 2) is not significant. This result indicates that the positive effect of inside debt on net debt financing is concentrated among financially constrained firms, i.e., firms for which a reduction in the cost of debt financing is expected to have a greater impact on borrowing. Our results are similar when we divide the sample by top and bottom terciles based on our *Constrained* measure (Columns 3 and 4). This evidence corroborates the finding in Anantharaman et al. (2013) that inside debt has a favorable effect on debt contracting terms.

5.2. Market reaction analysis

Wei and Yermack (2011) document a transfer of value from equity holders toward debt holders leading to an overall decrease in firm value when CEOs' inside debt holdings are large. Specifically, bond prices rise while equity prices fall for firms which disclose that their CEOs have sizeable defined benefit pensions or deferred compensation. This evidence is consistent with equity markets recognizing a loss of value due to CEOs taking actions (e.g., adopting "too safe" investment policies) that favor debtholders over equityholders. However, if inside debt reduces the agency costs of debt, which are born by shareholders (Jensen and Meckling, 1976), there may be potential offsetting benefits of inside debt from equityholders' perspective. In

particular, to the extent that agency costs of debt prevent firms from pursuing otherwise attractive investment opportunities, we expect the negative stock market reaction to disclosure of inside debt should be less pronounced for firms more likely to underinvest. As discussed above, firms that are financially constrained are more likely to underinvest (Hubbard, 1998; Stein, 2003). Accordingly, we examine whether there is a difference in stock market reaction for financially constrained and unconstrained firms.

Following Wei and Yermack (2011), we examine stock market reactions to the initial disclosure of inside debt values in the proxy filings following increased compensation disclosure regulations following fiscal year 2006. A univariate analysis of cumulative abnormal returns (CAR) is presented in Panel A of Table 7. CAR is calculated using Fama and French's 4 factor model with a window (0,1) around the proxy filing date. The average CAR for constrained firms (firms with above-median values of *Constrained)* is positive, while the average CAR for unconstrained firms is negative. The difference between the mean CAR for constrained vs. unconstrained firms is positive and significant at the 1% level. This is true both for firms disclosing any inside debt holdings for their CEOs, as well as firms disclosing above-median values of inside debt holdings

Next, we conduct a multivariate test of the difference in market response to initial disclosures for constrained vs. unconstrained firms using the following model:

$$CAR_{i,t} = \alpha + \beta_1 INDEBT\_RATIO_{i,t} + \beta_2 INDEBT\_RATIO_{i,t} \bullet Constrained_{i,t} + \beta_3 Constrained_{i,t} + \Sigma\Gamma_j \text{Control}_{j,i,t} + \varepsilon_{i,t+1} \quad (4)$$

For unconstrained firms, we expect a negative or insignificant response to the disclosure of inside debt, as found in Wei and Yermack (2011) (i.e., we expect $\beta 1 < 0$). If the market recognizes the ability of inside debt to mitigate underinvestment for financially constrained

firms, then we expect $\beta_2 > 0$. Since information about the financing constraints facing firms is less likely to be new to the market, we expect either an insignificant or negative sign for β_3. Consistent with the findings in Wei and Yermack (2011), in Panel B of Table 7 we find a negative response to the disclosure of inside debt for unconstrained firms, although this relationship is insignificant when we include industry fixed effects in the model (Columns 2 and 4). However, consistent with our expectations, we find a significantly positive interaction across all four specifications, indicating that the negative market reaction to inside debt is mitigated, and even reversed, when the firm faces financial constraints. Thus, an assessment of the market reaction to inside debt supports our argument that inside debt can increase investment by reducing agency costs of debt, but this effect manifests primarily for firms facing financing constraints.

6. CONCLUSION

In this paper, we hypothesize that the relationship between inside debt and investment levels depends on the degree of financial constraints facing the firm, whereas prior studies have documented a simple negative relationship between inside debt and R&D investment. For firms with low financial constraints, we predict and find a negative relation between inside debt and R&D (i.e., risky investment). However, find that the negative relation between inside debt and R&D is reduced or reversed for firms with high financial constraints (i.e., firms requiring external funding), and we also find the positive relation between inside debt and CapEx is increased for financially constrained firms.

We contribute to the literature on the relationship between management incentives and firm investment policies, as well as to studies investigating the underinvestment problem. Given the

findings in the prior literature showing that inside debt reduces investment in R&D, our finding of a positive relationship for firms facing financing constraints (and thus being more likely to underinvest) is noteworthy. Our results suggest that inside debt, through aligning management's incentives with those of debtholders, can reduce the agency costs of debt, and therefore increase investment levels in firms facing financial constraints, thus mitigating the underinvestment problem.

APPENDIX
Variable Definitions

Variable		Definitions	Data Source
Inside_Debt	=	Sum of the actuarial present value of accumulated benefits under defined-benefit pension plans and the total balance in the deferred compensation plans.	Execucomp
INDEBT_RATIO	=	*Inside_Debt* scaled by the sum of inside debt and inside equity. Inside equity is the sum of stock holdings and the fair value of stock options.	Execucomp
Constrained	=	The average rank of decile measures of cash and leverage. Cash is multiplied by -1 before ranking so that both variables are increasing constraints. This variable is scaled to range between zero to one.	Compustat
Corporate Investments			
CAPEX	=	Capital expenditure multiplied by 100 and scaled by PP&E	Compustat
R&D	=	R&D expenditure multiplied by 100 and scaled by lagged total assets	Compustat
Control Variables			
SIZE	=	Natural log of total asset at the end of fiscal year	Compustat
MTB	=	Ratio of the market value to the book value of the firm	Compustat
TA_Growth	=	Natural log of annual growth in total assets	Compustat
RET	=	Annual returns compounded from monthly returns beginning the fourth month after fiscal year end	CRSP
STD_Sale	=	Standard deviation of the sales deflated by average total assets from years t-5 to t-1	Compustat
STD_CFO	=	Standard deviation of cash flow from operations deflated by average total assets from years t-5 to t-1	Compustat
Zscore	=	Altman's (1968) Z-score	Compustat
IND_K	=	Mean LEVERAGE for firms in the same SIC three-digit industry	Compustat
CFO_Sale	=	Cash flow from operations deflated by total sales at the beginning of the year	Compustat

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TABLE 1
Summary Statistics

Panel A: Sample Refinement Procedure

	Number of firm-years
Total firms in Compustat Universe (2006 ~ 2012)	41,530
Less: Firms without RET information	(15,576)
Less: Firms without compensation information	(16,230)
Less: Firms without investment information	(406)
Less: Firms without other control variables information	(2,150)
Final Sample	**7,168**

Panel B: Descriptive Statistics of Main and Control Variables

Variable	n	Mean	Std. Dev.	Q1	Median	Q3
INDEBT_RATIO	7,164	0.151	0.208	0.000	0.043	0.247
Inside_Debt	7,164	5358.576	12737.550	0.000	645.982	5149.651
Inside_Equity	7,164	83923.620	981426.600	5202.263	13634.660	37218.010
CAPEX	7,164	25.455	20.430	12.733	19.619	30.852
R&D	4,683	5.568	6.660	0.754	3.034	8.154
Constrained	7,164	0.505	0.316	0.222	0.556	0.778
Cash	7,164	0.160	0.164	0.034	0.100	0.238
Leverage	7,164	0.378	0.676	0.031	0.181	0.449
Size	7,164	7.615	1.600	6.485	7.524	8.689
MTB	7,164	1.705	0.953	1.104	1.448	2.030
TA_Growth	7,164	0.088	0.231	-0.016	0.055	0.142
RET	7,164	0.136	0.581	-0.164	0.078	0.306
STD_Sale	7,164	0.130	0.110	0.056	0.097	0.165
STD_CFO	7,164	0.045	0.036	0.021	0.035	0.056
Zscore	7,164	4.047	3.659	1.958	3.255	5.145
Tangible	7,164	0.264	0.226	0.091	0.182	0.384
IND_K	7,164	0.325	0.253	0.155	0.233	0.385
CFO_Sale	7,164	0.138	0.131	0.063	0.115	0.189

Panel B in Table 1 presents descriptive statistics for inside debt holdings and other variables used in our models. All variables are defined in the Appendix.

TABLE 2
Pairwise Pearson Correlations

	INDEBT_ RATIO	*CAPEX*	*R&D*	*Constrained*	*Size*	*MTB*	*TA_Growth*	*RET*	*STD_Sale*	*STD_CFO*	*Zscore*	*Tangible*	*IND_K*
INDEBT_RATIO	1.0000												
CAPEX	**-0.2706***	1.0000											
R&D	**-0.2428***	**0.3000***	1.0000										
Constrained	**0.3741***	**-0.3511***	**-0.4952***	1.0000									
Size	**-0.3682***	**-0.2438***	**-0.2761***	**0.4257***	1.0000								
MTB	**-0.2517***	**0.3242***	**0.2349***	**-0.4745***	**-0.1420***	1.0000							
TA_Growth	**-0.1128***	**0.2401***	-0.0137	-0.0191	**0.0476***	**0.2051***	1.0000						
RET	**-0.0581***	**0.0662***	-0.0152	-0.0011	-0.0134	**0.1191***	0.0288	1.0000					
STD_Sale	**-0.0924***	**0.1133***	0.0071	**-0.1054***	**-0.2326***	-0.0091	**0.0566***	-0.0037	1.0000				
STD_CFO	**-0.2119***	**0.2707***	**0.3357***	**-0.3288***	**-0.3897***	**0.1393***	**0.1070***	-0.0121	**0.4278***	1.0000			
Zscore	**-0.2396***	**0.2550***	**0.0667***	**-0.5473***	**-0.2585***	**0.6639***	**0.1649***	**0.0481***	**0.0688***	**0.1403***	1.0000		
Tangible	**0.2455***	**-0.2972***	**-0.3766***	**0.4809***	**0.2859***	**-0.2022***	**-0.0471***	0.0057	**-0.1278***	**-0.1716***	**-0.2201***	1.0000	
IND_K	**0.2706***	**-0.2410***	**-0.2441***	**0.4465***	**0.2712***	**-0.2877***	**-0.0886***	**-0.1078***	**-0.1349***	**-0.1809***	**-0.2857***	**0.4739***	1.0000

Correlations significant at the 0.01 level are shown in bold. All variables are defined in the Appendix.

TABLE 3
Primary Results

VARIABLES	(1) $CAPEX_{t+1}$	(2) $R\&D_{t+1}$	(3) $CAPEX_{t+1}$	(4) $R\&D_{t+1}$
INDEBT_RATIO	**0.635**	**-0.688****	**-6.030***	**-2.310*****
	(0.624)	**(0.031)**	**(0.074)**	**(0.000)**
INDEBT_RATIO*Constrained			**11.958*****	**3.162*****
			(0.006)	**(0.001)**
Constrained			-15.004***	-2.100***
			(0.000)	(0.000)
Size	-6.487***	-3.649***	-5.096***	-3.448***
	(0.000)	(0.000)	(0.000)	(0.000)
MTB	2.862***	0.472***	2.597***	0.449***
	(0.004)	(0.002)	(0.009)	(0.003)
TA_Growth	9.776***	-0.660**	10.195***	-0.593*
	(0.000)	(0.040)	(0.000)	(0.061)
RET	0.888**	-0.153*	0.804*	-0.168**
	(0.037)	(0.064)	(0.062)	(0.039)
STD_Sale	-1.146	-0.849	-1.677	-0.977
	(0.776)	(0.330)	(0.675)	(0.261)
STD_CFO	30.659*	-4.110	30.641*	-4.040
	(0.076)	(0.162)	(0.074)	(0.167)
Zscore	1.026***	-0.057	0.745**	-0.093**
	(0.001)	(0.194)	(0.027)	(0.039)
IND_K	-1.182	0.596**	-0.332	0.727**
	(0.416)	(0.032)	(0.819)	(0.012)
CFO_Sale	8.003	-3.702***	5.104	-4.046***
	(0.254)	(0.002)	(0.470)	(0.001)
Constant	63.365***	32.220***	62.449***	31.877***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	7,168	4,686	7,168	4,686
R-squared	0.134	0.225	0.144	0.234
Firms	1,307	878	1,307	878
Year FE	YES	YES	YES	YES
Clustered by	Firm	Firm	Firm	Firm
Firm FE	YES	YES	YES	YES

• Joint significance of *INDEBT_RATIO* + *INDEBT_RATIO*Constrained* for (3) and (4) are **5.927*** (0.001)** and **0.851* (0.068)** respectively. Robust p-value in parentheses (*** p<0.01, ** p<0.05, * p<0.1).

Table 3 presents analysis of the effect of inside debt on investment levels, conditional on the level of financial constraints. Robust clustered standard errors in parentheses. All variables are defined in the Appendix.

TABLE 4
Alternative Classification of Financing Constraint

Panel A: Analysis Using only Cash or Leverage as Financing Constraint Proxy

	Constrained – Low Cash		Constrained – High Leverage	
VARIABLES	(1) $CAPEX_{t+1}$	(2) $R\&D_{t+1}$	(3) $CAPEX_{t+1}$	(4) $R\&D_{t+1}$
INDEBT_RATIO	**-6.318****	**-2.085*****	**-0.974**	**-1.466****
	(0.050)	**(0.001)**	**(0.759)**	**(0.017)**
INDEBT_RATIO*Constrained	**12.095*****	**2.669*****	**3.703**	**1.743***
	(0.006)	**(0.002)**	**(0.360)**	**(0.055)**
Constrained	-11.245***	-0.710*	-8.550***	-2.171***
	(0.000)	(0.089)	(0.001)	(0.000)
Size	-5.789***	-3.615***	-5.532***	-3.374***
	(0.000)	(0.000)	(0.000)	(0.000)
MTB	2.803***	0.473***	2.655***	0.440***
	(0.005)	(0.002)	(0.008)	(0.003)
TA_Growth	9.796***	-0.656**	10.249***	-0.518*
	(0.000)	(0.041)	(0.000)	(0.095)
RET	0.861**	-0.155*	0.829*	-0.165**
	(0.043)	(0.060)	(0.055)	(0.043)
STD_Sale	-1.724	-0.893	-1.465	-1.008
	(0.664)	(0.310)	(0.718)	(0.241)
STD_CFO	29.026*	-4.274	32.273*	-3.483
	(0.092)	(0.147)	(0.059)	(0.228)
Zscore	0.932***	-0.063	0.786**	-0.115**
	(0.003)	(0.156)	(0.023)	(0.012)
IND_K	-0.961	0.575**	-0.570	0.740***
	(0.514)	(0.042)	(0.694)	(0.008)
CFO_Sale	5.756	-3.798***	6.541	-4.036***
	(0.418)	(0.002)	(0.351)	(0.001)
Constant	64.685***	32.315***	61.910***	31.487***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	7,168	4,686	7,168	4,686
R-squared	0.141	0.227	0.138	0.238
Firms	1,307	878	1,307	878
Year FE	YES	YES	YES	YES
Clustered by	Firm	Firm	Firm	Firm
Firm FE	YES	YES	YES	YES

Robust p-value in parentheses (*** p<0.01, ** p<0.05, * p<0.1).

Table 4, Panel A presents analysis of the effect of inside debt on investment levels, conditional on the level of financial constraints, where constraints are measured separately based on Cash (Columns 1 and 2) and Leverage (Columns 3 and 4). Robust clustered standard errors in parentheses. All variables are defined in the Appendix.

(Continued on next page)

TABLE 4 (Continued)

Panel B: Analysis using Hoberg and Maksimovic's (2015) disclosre-based measure of financial constraints

	Debt Financing Delay Score	
VARIABLES	(1) $CAPEX_{t+1}$	(2) $R\&D_{t+1}$
INDEBT_RATIO	**-2.117**	**-1.615*** **
	(0.414)	**(0.001)**
INDEBT_RATIO*Constrained	**4.309**	**1.420** **
	(0.261)	**(0.040)**
Constrained	-2.440*	-0.414*
	(0.067)	(0.089)
Size	-7.098***	-3.727***
	(0.000)	(0.000)
MTB	2.664**	0.472***
	(0.021)	(0.006)
TA_Growth	10.208***	-0.672*
	(0.000)	(0.073)
RET	0.559	-0.074
	(0.199)	(0.365)
STD_Sale	1.135	-0.961
	(0.813)	(0.339)
STD_CFO	17.689	-4.231
	(0.354)	(0.166)
Zscore	1.296***	-0.089*
	(0.000)	(0.071)
IND_K	-0.374	0.422
	(0.810)	(0.130)
CFO_Sale	2.641	-4.513***
	(0.725)	(0.001)
Constant	68.954***	32.842***
	(0.000)	(0.000)
Observations	5,783	3,801
R-squared	0.147	0.240
Firms	1,186	805
Year FE	YES	YES
Clustered by	Firm	Firm
Firm FE	YES	YES

Robust p-value in parentheses (*** p<0.01, ** p<0.05, * p<0.1).

Table 4, Panel B presents analysis of the effect of inside debt on investment levels, conditional on the level of financial constraints, where financial constraints are measured based on Hoberg and Maksimovic's (2015) "Debt Focus Delay Investment Score". This measure is based on analysis of MD&A sections of firms' 10-Ks, and is higher for firms more similar to a set of firms that (A) are at risk of delaying their investments due to liquidity issues and (B) that indicate plans to issue debt (presumably to address their liquidity challenges). Robust clustered standard errors in parentheses. All variables are defined in the Appendix.

TABLE 5
Subsample Analysis Based on Distressed Firms vs. Sound Firms

	Financially Distressed Firms		Financially Sound Firms	
VARIABLES	(1) $CAPEX_{t+1}$	(2) $R\&D_{t+1}$	(3) $CAPEX_{t+1}$	(4) $R\&D_{t+1}$
INDEBT_RATIO	**-14.573***	**-5.191****	**-3.594**	**-1.406***
	(0.072)	**(0.029)**	**(0.441)**	**(0.063)**
INDEBT_RATIO*Constrained	**22.184****	**5.974****	**8.364**	**2.498****
	(0.017)	**(0.039)**	**(0.302)**	**(0.025)**
Constrained	-23.372***	-4.068**	-13.087***	-0.404
	(0.000)	(0.018)	(0.002)	(0.317)
Size	-5.964**	-4.274***	-6.762***	-2.594***
	(0.041)	(0.000)	(0.002)	(0.000)
MTB	1.268	0.464	3.688***	0.478***
	(0.623)	(0.437)	(0.000)	(0.000)
TA_Growth	8.601***	-0.034	14.026***	-1.548***
	(0.000)	(0.937)	(0.000)	(0.001)
RET	0.355	-0.174	-0.369	-0.050
	(0.603)	(0.359)	(0.730)	(0.631)
STD_Sale	-2.076	1.577	-5.602	-1.413
	(0.834)	(0.331)	(0.312)	(0.110)
STD_CFO	60.355	-5.515	25.366	-1.933
	(0.186)	(0.519)	(0.286)	(0.495)
Zscore	0.385	-0.284**	0.327	-0.032
	(0.280)	(0.016)	(0.231)	(0.244)
IND_K	2.784	1.167	-0.774	0.799**
	(0.244)	(0.109)	(0.819)	(0.039)
CFO_Sale	12.607	-4.104***	2.641	-2.326*
	(0.295)	(0.008)	(0.707)	(0.074)
Constant	79.759***	40.203***	71.008***	23.778***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	1,714	769	3,793	2,825
R-squared	0.125	0.376	0.135	0.167
Firms	502	281	908	674
Year FE	YES	YES	YES	YES
Clustered by	Firm	Firm	Firm	Firm
Firm FE	YES	YES	YES	YES

(*** p<0.01, ** p<0.05, * p<0.1)

Table 5 presents results of subsample analysis based on the level of financial distressed. Firms with their Z-Score below the conventional cut-off, 1.81, are classified as financially distressed (Begley et al. 1996, Blay et al. 2011) and firms above 3.00 are considered as financially sound (Altman, 2012). All models include firm and year fixed effects. All variables are defined in the Appendix.

TABLE 6
The Effect of CEO Inside Debt on Credit Market Accessibility

	Above and Below Tercile Constrained		Top and Low Median Constrained	
	(1)Constrained	(2)Unconstrained	(3)Constrained	(4)Unconstrained
VARIABLES	$\Delta DEBT_{i,t+1}$	$\Delta DEBT_{i,t+1}$	$\Delta DEBT_{i,t+1}$	$\Delta DEBT_{i,t+1}$
INDEBT_RATIO	**0.049*** **	**0.011**	**0.033** **	**0.001**
	(0.003)	**(0.540)**	**(0.024)**	**(0.940)**
Constrained	-0.091**	-0.163***	-0.088***	-0.150***
	(0.012)	(0.000)	(0.000)	(0.000)
Size	-0.068***	-0.017*	-0.064***	-0.014
	(0.000)	(0.066)	(0.000)	(0.128)
TA_Growth	0.001	-0.027**	-0.008	-0.034***
	(0.897)	(0.029)	(0.316)	(0.005)
MTB	0.014	-0.006	0.022**	-0.006*
	(0.257)	(0.120)	(0.029)	(0.072)
STD_CFO	-0.050	-0.051	-0.043	-0.022
	(0.702)	(0.539)	(0.810)	(0.795)
Z_Score	0.033***	0.006***	0.029***	0.006***
	(0.000)	(0.000)	(0.000)	(0.000)
CFO_Sale	0.081**	-0.026	0.029	-0.031
	(0.036)	(0.464)	(0.388)	(0.342)
Loss	-0.000	-0.002	0.001	-0.005
	(0.946)	(0.762)	(0.826)	(0.416)
Litigation	-0.025	0.052**	0.031	0.024
	(0.106)	(0.049)	(0.538)	(0.436)
Age	0.045	0.029	0.036	0.011
	(0.345)	(0.493)	(0.382)	(0.776)
Dividend	0.020*	0.004	0.014	-0.002
	(0.061)	(0.669)	(0.177)	(0.807)
Opr_cycle	0.018	0.008	0.028*	0.006
	(0.266)	(0.314)	(0.052)	(0.426)
Constant	0.312	-0.006	0.235	0.071
	(0.116)	(0.967)	(0.128)	(0.603)
Observations	2,169	2,825	3,607	3,541
R-squared	0.174	0.087	0.190	0.086
Firms	566	705	822	855
Year FE	YES	YES	YES	YES
Clustered by	Firm	Firm	Firm	Firm
Firm FE	YES	YES	YES	YES

(*** p<0.01, ** p<0.05, * p<0.1)

Table 6 presents results for credit market accessibility analyses. We divide the sample into financially constrained firms and financially unconstrained firms using median (or top and low tercile) value of *Constrained* measure. All variables are defined in the Appendix.

TABLE 7
Market Reaction to Initial Disclosure of Inside Debt

Panel A: Univariate Test

	Financially Constrained Sample (upper 50% Constrained)		Financially Unconstrained Sample (lower 50% Constrained)			
INDEBT_RATIO	**n**	**(1) CAR**	**n**	**(2) CAR**	**(1) - (2)**	**(t-value)**
Total	202	0.00549	205	-0.00066	**0.00615*** **	**2.98**
		(0.00138)		(0.00152)		
Above Median	125	0.00390	78	-0.00420	**0.00811*** **	**2.91**
		(0.00196)		(0.00236)		

(standard error in parenthesis, *** p<0.01, ** p<0.05, * p<0.1)

Panel B: Multivariate Test

VARIABLES	(1) CAR	(2) CAR	(3) CAR	(4) CAR
Indebt_Dummy	**-0.006***	**-0.003**	**-0.006***	**-0.004**
	(0.072)	**(0.341)**	**(0.084)**	**(0.220)**
Indebt_Dummy•Constrained	**0.017*****	**0.014****	**0.020*****	**0.018*****
	(0.002)	**(0.016)**	**(0.001)**	**(0.002)**
Constrained	-0.009**	-0.011**	-0.011**	-0.012**
	(0.024)	(0.012)	(0.025)	(0.029)
Constant	0.003	0.006	0.009	0.018
	(0.104)	(0.220)	(0.146)	(0.252)
Observations	746	746	670	670
R-squared	0.016	0.082	0.034	0.102
Controls	NO	NO	YES	YES
Industry FE	NO	YES	NO	YES

(*** p<0.01, ** p<0.05, * p<0.1)

Table 7 presents univariate and multivariate results for the market reaction to the initial disclosure of inside debt in proxy statements following changes to compensation disclosure regulations in 2006. *Indebt_Dummy* in Panel B equals 1 if the *INDEBT_RATIO* > 0, and otherwise 0. All variables are defined in the Appendix.