CEO Inside Debt and Board Independence

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Abstract

CEO compensation is an outcome of the bargaining process between the board and the Chief Executive Officer (CEO). Whether the process reflects optimal contracting or managerial power remains one of the most fundamental and controversial topics. We contribute to the debate by being the first to study the role of independent directors in adjusting CEO inside debt. Consistent with the optimal contracting view, we find that firms with more independent directors adjust CEO inside debt more quickly toward the optimum level. Our results are stronger in financially unconstrained, growth, and under-levered firms, and firms led by more powerful or overconfident CEOs. We also find when the agency cost of CEO inside debt is low, board independence is associated with a slower adjustment speed. Our results have policy implications since executive compensation continues to grow in importance and our evidence suggests that independent directors make intricate tradeoff decisions when adjusting it.

JEL classification: G3; G34; M12

Keywords: Inside debt; Independent directors; Executive compensation; Adjustment model; Compensation dynamics; Corporate governance.

I. INTRODUCTION

Despite decades of empirical research, whether executive compensation practices reflect optimal contracting or managerial power has continued to be one of the most fundamental and controversial topics in compensation and governance research (Core and Guay 2010; Murphy and Jensen 2018; Göx and Hemmer 2020; Edmans, Gosling, and Jenter 2023). We contribute to this on-going debate by being the first to study the relation between board independence and the adjustment speed of CEO inside debt.

We focus on independent directors because of the central role they play in designing executive compensation contracts. U.S. corporate law delegates the decision of how to design executive compensation to the board of directors. The optimal contracting view argues that boards act in the best interest of shareholders in designing executive compensation contracts to minimize agency costs (Core, Guay and Larcker 2003; Göx and Hemmer 2020). In contrast, the managerial power view argues that boards do not negotiate compensation arrangements at arm's length with managers; rather managers have substantial power to influence the compensation-setting process to extract rents, especially in publicly traded firms with dispersed ownership (Bebchuk, Fried, and Walker 2002; Bebchuk and Fried 2003). It has been difficult to test these alternative views because executive compensation is extremely complex and hence challenging for researchers to model and measure (Fernandes, Ferreira, Matos, and Murphy 2013; Edmans and Gabaix 2016).

However, recent developments in the compensation literature show that the optimal level of CEO inside debt can be theoretically modeled and empirically measured (Edmans and Liu 2011; Edmans and Gabaix 2016; Campbell, Galpin, and Johnson 2016). Defined benefit pensions and deferred compensation, commonly known as inside debt, are unsecured, unfunded, and fixed future claims with equal priority as debt holders in bankruptcy. Therefore, unlike options and stock awards that align CEOs' interests with shareholders, inside debt aligns CEOs' interests with debt holders. Despite its unique impact on the agency conflict between CEOs and shareholders, inside debt has received considerably less attention in the literature than equity-like pay (see, e.g., Sundaram and Yermack, 2007; Cadman, Klasa, and Matsunaga 2010; Edmans and Liu 2011). Therefore, by being the first to study the impact of independent directors on CEO inside debt, our paper provides unique insights into the design of CEO compensation contracts.

Given their perceived objectivity, independent directors are charged with key governance duties (Linck, Netter, and Yang 2009; Faleye, Hoitash, and Hoitash 2011).[1] The optimal contracting hypothesis predicts a positive relation between board independence (the fraction of independent directors on the board) and the adjustment speed at which firms reduce the distance between the actual and the optimal levels of CEO inside debt. The managerial power hypothesis predicts either an insignificant or a negative relation. We also acknowledge that there is another possibility for an insignificant relation. Our sample period starts after the Sarbanes-Oxley Act (SOX). Due to the SOX mandate on board independence, our sample firms will consistently have a high fraction of independent directors and thus may lack the necessary variation for us to detect any relation. To better discern between the alternative explanations, we design various tests to triangulate our results.

[1] For example, the Sarbanes-Oxley Act (SOX) of 2002 and the major U.S. stock exchanges mandate that the three principal monitoring committees—audit, compensation, and nominating—consist entirely of independent directors.

To address our research question rigorously, we employ two different models. The first examines the moderating role of board independence with respect to the relation between the year-on-year change in CEO inside debt and its deviation from the predicted optimum. The second is the partial adjustment model that directly relates board independence to the adjustment speed toward the predicted optimum in one step as opposed to the two-step process of the first model.

We find evidence consistent with the optimal contracting hypothesis. Results from both models show that a one-standard-deviation increase in board independence is associated with an increase in the adjustment speed of about 1.4 percent, or approximately 4 percent of the gap that firms close between the actual and the predicted optimum of CEO inside debt in a given year. We address the potential endogeneity of board independence by: 1) controlling for firm and year fixed effects (FEs), in addition to a wide array of relevant variables, to mitigate latent heterogeneities; 2) using the historical values of board independence to ensure the predetermined condition, which significantly mitigates the endogeneity concern (Bebchuk and Cohen 2005; Coles, Daniel, and Naveen 2008; Cheng 2008; Faleye et al. 2011); 3) using the generalized method of moments (GMM) dynamic panel estimation method, which is robust to endogeneity problems due to reverse causality, simultaneity, and unobserved heterogeneity (Wintoki, Linck, and Netter 2012); and 4) using the two-stage-least-squares instrumental-variable (2SLS-IV) method. Our results hold in all these endogeneity checks.

To directly test the managerial power hypothesis, we use two popular proxies in the compensation literature to capture CEO bargaining power in their negotiation with the boards over pay: the fraction of the aggregate compensation of the top five executives captured by the CEO

(Bebchuk, Cremers, and Peyer 2011) and whether the CEO's total compensation is in the top 25% of the sample in a given year (Humphery-Jenner, Lisic, Nanda, and Silveri 2016). The managerial power hypothesis predicts that the boards are captured by powerful CEOs and hence unable to adjust CEO compensation arrangements to the optimum. We find that our results are concentrated in firms with more powerful CEOs, which is inconsistent with the managerial power hypothesis and offers additional support for the optimal contracting hypothesis.

To further test the hypotheses, we perform four subsample tests to probe the conditions under which the optimal contracting hypothesis predicts that independent directors should wield a stronger influence. To mitigate the agency conflicts between CEOs and equity holders, CEOs are given equity-like compensation (stocks and options). In contrast, inside debt resembles debt securities and heightens the misalignment between CEOs and equity holders by exacerbating managerial risk aversion and inducing conservative financial and investment policies (Edmans and Liu 2011; Wei and Yermack 2011). The four subsample tests explore these tensions between CEOs and equity holders and the benefits and costs associated with adjusting inside debt.

In the first test, we examine whether independent directors play a more significant role in adjusting CEO inside debt toward the optimum at financially unconstrained, rather than constrained, firms. Compared to constrained firms, financially unconstrained firms face greater agency costs of inside debt, while their CEOs enjoy more discretion in choosing projects with varying risk-return profiles, engendering greater variance of firm value (Berger, Ofek, and Yermack 1997; Chen, Huang, and Jha 2012; Falato, Kadyrzhanova, and Lel 2014). Therefore, it is more important for financially unconstrained firms to optimize CEO inside debt so that their

CEOs are properly incentivized to exert efforts and identify and execute the best risk-return projects that maximize shareholder value. Consistent with the optimal contracting hypothesis, using both models, we find stronger results for financially unconstrained firms.

In the second test, we distinguish between high vs. low growth firms. High growth firms enjoy a larger set of growth opportunities, and their firm value is more sensitive to discretionary future investments, especially when the growth rate is compounded over a long-time horizon. Since the value of growth firms is more sensitive to CEOs' discretionary investment decisions and appetite for risk taking, it is more important for high growth firms to optimize CEO inside debt so that their CEOs are properly incentivized to exert efforts and take risks. Consistent with the optimal contracting hypothesis, using both models, we find stronger results for high growth firms.

In designing the third test, we draw from the insights of Morellec, Nikolov, and Schurhoff (2012) and Brisker and Wang (2017). Morellec et al. (2012) show theoretically that self-interested managers keep firms under levered. Inside debt exacerbates this agency conflict because it magnifies managerial risk aversion, thereby increasing the divergence in risk preferences between CEOs and shareholders. Consistent with the theoretical prediction, Brisker and Wang (2017) find that when firms are under (over) levered, CEO inside debt negatively (positively) affects the adjustment speed of the firm's debt ratio toward the optimum. As equity value is maximized when the debt ratio is optimized, a larger deviation from the optimal debt ratio should be associated with a larger reduction of equity value. Therefore, the optimal contracting hypothesis predicts that independent directors play a more significant role in adjusting CEO inside debt toward the optimum at under-levered firms. This is indeed our finding based on both models.

In our fourth test, we analyze whether independent directors play a more significant role at firms led by overconfident CEOs. The agency costs of CEO over-confidence are well documented (see, e.g., Malmendier and Tate 2005, 2008; Chung and Hribar 2021). Overconfident CEOs systematically overestimate their ability in generating superior returns, underestimate risks, and therefore tend to pursue riskier projects (Hackbarth 2008; Hirshleifer, Low, and Teoh 2012). As inside debt aggravates managerial risk aversion and reduces risk-taking incentives, inside debt can be an effective tool in restraining the "dark side" of CEO overconfidence (Galariotis, Louca, Petmezas, and Wang 2022). Additionally, as CEO overconfidence is an empirically detectable behavioral trait (Goel and Thakor 2008), it is reasonable to assume that independent directors can identify overconfident CEOs and use inside debt to mitigate the agency costs of CEO over-confidence (Gervais, Heaton, and Odean 2011). Using both models, we find results consistent with the optimal contracting hypothesis that independent directors more quickly adjust CEO inside debt toward the optimum at firms led by overconfident CEOs.

Lastly, we perform two tests to ascertain whether it is independent directors, not independent directors simply capturing aspects of better corporate governance, that drive our results. In the first test, we draw from the literature and use popular proxies for poor internal controls (the Entrenchment-index (the E-index), classified board, and coopted board) to investigate whether our results hold after controlling for these governance characteristics. The literature has shown that these characteristics significantly entrench managers and reduce board effectiveness (Bebchuk, Cohen, and Ferrell, 2009; Bebchuk and Cohen, 2005; Faleye, 2007; Coles, Daniel, and Naveen, 2014). Our results hold after controlling for the E-index, classified board, and coopted board. In our second test, we consider the monitoring role of blockholders and institutional investors. Nguyen, Galpin, and Twite (2022) find that blockholders impact the adjustment speed of CEO inside debt. There is a vast literature documenting the important role that institutional investors play in promoting better corporate governance (see, e.g., Hartzell and Starks 2003; Chung and Zhang, 2011; Doidge, Dyck, Mahmudi, and Virani, 2019). Our results hold after controlling for the ownership by blockholder and institutional investors.

Our study makes several contributions. First, given the complexity of executive compensation contracts, the empirical evidence on the role of board independence in setting executive pay is mixed. While some find that board independence is associated with lower CEO pay (Chhaochharia and Grinstein 2009), others find a positive (Guthrie, Sokolowsky, and Wan 2012) or an insignificant relation (Anderson and Bizjak 2003). We contribute to this literature by providing robust evidence that independent directors play an important role in setting the optimal level of CEO inside debt, the only pay instrument whose optimal level has been theoretically modeled and empirically measured. Therefore, this paper provides fresh perspectives for the continuing debate of whether executive compensation reflects optimal contracting or managerial power view.

Second, until recently, compensation theorists have advocated for the exclusive use of equity-like pay instruments (Edmans and Liu 2011; Edmans et al. 2023). However, recent evidence shows the prevalence and the significant influence of CEO inside debt on corporate policies.[2] Therefore,

[2] Researchers have found that inside debt has a significant impact on corporate policies, operating environments, and firm performance including risk taking (Cassell et al. 2012; Choy, Lin, and Officer 2014; van Bekkum 2016; Milidonis, Nishikawa, and Shim 2017), financing (Brisker and Wang 2017; Freund, Latif, and Phan 2018), payout policies (Srivastav, Armitage, and Hagendorff 2014; Caliskan and Doukas 2015; Eisdorfer, Giaccotto, and White 2015; mergers and acquisitions (Phan 2014; Lin, Officer, and Shen 2018), financial reporting (Kalyta 2009; He 2015;

it is surprising that we know little about boards' role in designing this important component of executive pay. By filling this literature gap, our paper provides unique insights. For example, we document that the adjustment speed and the costs and benefits of adjusting CEO inside debt are asymmetric, which suggests that boards are aware of the nuances associated with the adjustment costs of CEO compensation contracts and make adjustment decisions accordingly.

Third, as directors and shareholders disagree on the design of optimal CEO compensation contracts (Edmans et al. 2023), this paper complements Nguyen et al. (2022) who find that blockholders play an important role in devising CEO inside debt. Fourth, our paper relates to the literature on CEO overconfidence (see, e.g., Hsu, Novoselov, and Wang 2017; Galariotis et al. 2022) by showing that independent directors understand the agency costs of CEO inside debt and CEO overconfidence and use CEO inside debt to curb the "dark side" of CEO overconfidence.

The remainder of the paper is organized as follows: Section 2 describes the two adjustment models; Section 3 reviews the sample construction process and the proxy for CEO inside debt; Section 4 presents the results; and Section 5 concludes.

Wang, Xie, and Xin 2018), cash holdings (Liu, Mauer, and Zhang 2014), internal capital market efficiency (Freund, Nguyen, Phan, and Tang 2021), cost of capital (Kabir, Li, and Veld-Merkoulova 2013; Shen and Zhang 2020), debt contract designs (Anantharaman, Fang, and Gong 2014; Dang and Phan 2016), credit ratings (Hasan, Hossain, and Hossain 2023), analyst forecasts (Bhandari, Mammadov, and Thevenot 2018), tax sheltering (Chi, Huang, and Sanchez 2017), corporate social responsibility (Buchanan, Cao, and Wang 2021; Hossain, Saadi, and Amin 2023; Wu, Li, and Yu 2023), and firm performance (Campbell et al. 2016; James, Benson, and Park 2020).

II. ADJUSTMENT MODELS

The Adjustment Model

To assess whether independent directors play a role in adjusting CEO inside debt toward a target or the predicted optimum, we follow the literature (see, e.g., Core and Guay 1999; Fama and French 2002; Campbell et al. 2016) to undertake a two-step estimation procedure. In the first step, we follow the model of Campbell et al. (2016) and estimate the following median regression to obtain the optimal CEO inside debt ratio[3]:

$$\begin{aligned} \textit{Inside debt}_{it} = {} & \gamma_0 + \gamma_1 \textit{Leverage}_{it-1} + \gamma_2 \textit{Investment grade}_{it-1} + \gamma_3 \textit{Idiosyncratic risk}_{it-1} + \gamma_4 \textit{MTBAT}_{it-1} + \gamma_5 \textit{Aasset} \\ & \textit{tangibility}_{it-1} + \gamma_6 \textit{R\&D}_{it-1}/\textit{Sales}_{it-1} + \gamma_7 \textit{Firm size}_{it-1} + \gamma_8 \textit{CEO age}_{it-1} + \gamma_9 \textit{CEO tenure}_{it-1} + \\ & \gamma_{10} \textit{Liquidity constraint}_{it-1} + \gamma_{11} \textit{Tax loss carry forward}_{it-1} + d_j + \varepsilon. \end{aligned} \quad (1)$$

where *Inside debt* is the natural logarithm of the CEO relative incentive ratio (Jensen and Meckling 1976; Edmans and Liu 2011; Wei and Yermack 2011; Cassell, Huang, Sanchez, and Stuart 2012). We follow Campbell et al. (2016) in controlling for all the optimal contracting variables. Proxies for governance characteristics and CEO power are not included because the theory does not model CEO inside debt as a function of these variables (Edmans and Liu 2011; Campbell et al. 2016). Including these variables captures the observed rather than the optimal CEO inside debt (Campbell et al. 2016). d_j denotes industry FEs based on the Fama-French 48 industries. ε is the error term. The optimal CEO inside debt for Firm i in Year t (*Optimal inside debt*) is the fitted value from Equation (1). Following Campbell et al. (2016), median regression is used because as the summary

[3] Campbell et al. (2016) do not consider year FEs. To allow for the possibility of time trends playing a more important role in our sample given that our sample period has 14 years compared to the four years of their sample, in unreported robustness check we also add year FEs. Our results remain qualitatively unchanged.

statistics in Table 1 show, even after taking the natural logarithm, CEO inside debt is still highly skewed. Appendix I provides variable definitions.

In the second step, Campbell et al. (2016) estimate the following ordinary least squares (OLS) regression to examine whether firms adjust their CEO inside debt toward the predicted optimum estimated using Equation (1):

$$\Delta Inside\ debt_{it} = \beta_0 + \beta_1 Deviation_{it-1} + \kappa \boldsymbol{X} + d_j + \varepsilon. \qquad (2)$$

where $\Delta Inside\ debt_{it}$ is the year-on-year change in CEO inside debt ($Inside\ debt_{it} - Inside\ debt_{it-1}$). $Deviation_{it-1} = Actual\ inside\ debt_{it-1} - Optimal\ inside\ debt_{it-1}$. $\boldsymbol{X}$ is the vector of optimal contracting variables listed in Equation (1). d_j and ε are as defined in Equation (1). β_1 measures the speed of adjustment—how quickly the average sample firm reduces the distance between the actual and the optimal CEO inside debt. A significantly negative β_1 is consistent with the optimal contracting view that firms adjust their CEO inside debt toward the optimum as predicted by the firm and CEO characteristics (Campbell et al. 2016).

To investigate whether independent directors play a role in adjusting CEO inside debt toward the optimum, we adapt Campbell et al. (2016)'s model and estimate the following OLS regression:

$$\Delta Inside\ debt_{it} = \beta_0 + \beta_1 Deviation_{it-1} * \%INDEP_{it-1} + \beta_2 Deviation_{it-1} + \beta_3 \%INDEP_{it-1} + \kappa \boldsymbol{X} + d_i + d_t + \varepsilon. \qquad (3)$$

where $\Delta inside\ debt_{it}$, $Deviation_{it-1}$, $\boldsymbol{X}$, and ε are as defined in Equation (2). d_i and d_t denote firm and year FEs, respectively. *%INDEP* is the fraction of independent directors on the board. A significantly negative β_1 is consistent with the optimal contracting view that firms with a more independent board adjust their CEO inside debt more quickly to the optimum. An insignificant or a significantly positive β_1 is consistent with the managerial power view.

The Partial Adjustment Model

For robustness, we also estimate the partial adjustment model, which has been used to estimate the adjustment speed of capital structure, ownership structure, and board structure (see, e.g., Flannery and Rangan 2006; Faulkender, Flannery, Hankins, and Smith 2012; Cheung and Wei 2006; Cicero, Wintoki, and Yang 2013). The conventional partial adjustment model can be written as follows to estimate the adjustment speed of CEO inside debt:

$$Inside\ debt_{it} - Inside\ debt_{it-1} = \lambda(Inside\ debt_{it}^{*} - Inside\ debt_{it-1}) + \varepsilon. \tag{4}$$

where *Inside debt* is the observed CEO inside debt, and *Inside debt** is the target or the optimal CEO inside debt. λ is the speed of the adjustment toward the optimal CEO inside debt. The partial adjustment model predicts that a typical sample firm closes λ percent per time period of the gap between the target and the beginning year CEO inside debt. Therefore, $\lambda = 1$ indicates complete adjustment in a given year.

Replacing *Inside debt** in Equation (4) with the fitted value from Equation (1) yields:

$$Inside\ debt_{it} = aInside\ debt_{it-1} + \eta\boldsymbol{X} + d_i + d_t + \varepsilon. \tag{5}$$

where α = 1-λ. A significantly positive α and statistically significant η (or some of the optimal contracting variables) are consistent with firms adjusting toward the optimal CEO inside debt based on their contracting environments.

To assess the impact of board independence on the adjustment speed of CEO inside debt, we endogenize board independence by following Cheung and Wei (2006) and Cicero et al. (2013):

$$\lambda = \varphi_0 + \varphi_1\%INDEP. \tag{6}$$

Substituting Equation (6) into (5) yields the following:

$$Inside\ debt_{it} = c_0 + \theta_1 Inside\ debt_{it-1} * \%INDEP_{it-1} + \theta_2 Inside\ debt_{it-1} + \eta \boldsymbol{X} + d_i + d_t + \varepsilon. \quad (7)$$

where $\%INDEP_{it-1}$, $\boldsymbol{X}$, d_i, d_t, and ε are as defined in Equation (3). $\theta_1 = -\varphi_1$ and $\theta_2 = 1 - \varphi_0$. Thus, a significantly negative θ_1 is consistent with the optimal contracting view that firms with a more independent board adjust their CEO inside debt more quickly to the optimum, whereas an insignificant or a significantly positive θ_1 is consistent with the managerial power view.

Campbell et al. (2016) use industry FEs to estimate the optimal level of CEO inside debt because the determinants such as the value of asset in liquidation vary systematically across industries and using firm FEs captures the observed, not the optimal, CEO inside debt.[4] Therefore, following Campbell et al. (2016), we use industry FEs in Equation (1) to estimate the optimal CEO inside debt. In all other regressions when we model the observed CEO inside debt, we use firm FEs because they better control for time-invariant firm-specific factors that are critical to modeling the observed CEO pay. For example, Murphy and Sandino (2020) find that adding firm FEs reduces the CEO pay premium from 51.4 percent to 8.8 percent.[5] In all regressions, we estimate standard errors that are robust to heteroskedasticity and clustered at the firm level (Petersen 2009; Abadie, Athey, Imbens, and Wooldridge 2022).

[4] It is worth noting that the partial adjustment model uses firm FEs and yields similar estimation results as Campbell et al. (2016)'s adjustment model for the adjustment speed of CEO inside debt in Table 2.

[5] Although firm FEs eliminate the confounding effects due to time-invariant, latent firm characteristics, one concern is that board independence is sticky and hence using firm FEs loses valuable information from the subsample of firms that do not exhibit a change in %*INDEP*. In our sample, 36% observations do not change %*INDEP*. Our results remain qualitatively similar after eliminating these observations.

III. DATA AND SAMPLE

Sample Construction

We obtain CEO inside debt and other CEO-related data from ExecuComp (which primarily covers S&P 1500 firms), accounting data from Standard and Poor's Compustat Industrial Annual, and stock data from the Center for Research in Security Prices (CRSP). Board data come from Institutional Shareholder Services (ISS, formerly RiskMetrics). Our sample period starts in 2006 because it is the first year that the U.S. Securities and Exchange Commission (SEC) required firms to disclose their top executives' deferred compensation plans, pension benefits, and other post-employment payments. Following Wei and Yermack (2011), Cassell et al. (2012), and Phan (2014), we restrict the sample to firms that have positive CEO inside debt holdings. After meeting the requisite data requirements, the final sample consists of 942 unique firms or 6,357 firm-year observations from 2006 to 2019.

Measure of CEO Inside Debt

Following the literature, both theoretical and empirical, we use the relative (to the firm) CEO debt-to-equity *incentive* ratio as our measure of CEO inside debt (Jensen and Meckling 1976; Edmans and Liu 2011; Wei and Yermack 2011; Cassell et al. 2012; Campbell et al. 2016). This measure of CEO inside debt is calculated as the ratio of the CEO's pensions and deferred compensation to the overall delta of the CEO's equity claims, scaled by an analogous ratio of the firm's debt to equity claims. We choose this *incentive* measure over other proxies such as the CEO's debt-to-equity ratio scaled by the firm's debt-to-equity ratio (*the CEO-to-firm debt/equity* *ratio*) or the dummy that equals one if *the CEO to firm debt/equity ratio* is greater than one (the *CEO-to-firm debt/equity dummy*) (see, e.g., Cassell et al. 2012; Phan 2014) because the *incentive* measure emphasizes the pay incentives due to the marginal change in CEO wealth (CEO inside debt and equity holdings) associated with a one unit change in firm value (Wei and Yermack 2011).

This choice has two main benefits. First, the level measures such as *the CEO-to-firm debt/equity ratio* and *the CEO-to-firm debt/equity ratio dummy* imply a one-size-fit-all solution in that CEOs should have a similar debt-to-equity ratio to that of their firms. The literature shows that the optimal CEO inside debt is typically not the firm's debt-to-equity ratio (Edmans, Gabaix, and Jenter 2017). In comparison, the *incentive* measure recognizes that the optimal CEO inside debt is a function of each firm's unique contracting environment and therefore the same investment or financial policy decision can have different value implications for the firm and its CEO, even if the CEO has an identical debt-to-equity ratio as that of the firms (Cassell et al. 2012; Campbell et al. 2016). Second, focusing on the changes of the relative CEO debt-to-equity *incentive* ratio as opposed to the level measures alleviates the concern that the durations and the payoff functions of a firm's debt and equity securities may be different from those of its CEO's respective securities. Specifically, the inside debt of the CEO likely has different durations than the debt of the firm. Additionally, the equity holdings of the CEO tend to be in stock options that have finite expiration dates and convex slopes with respect to firm value, while much of the firm's equity takes the form of shares that have unlimited lives and linear slopes regarding firm value (Wei and Yermack 2011).

Summary Statistics

Table 1 reports summary statistics for the key variables used in our analyses. The mean and median values of the raw CEO inside debt ratio are 3.224 and 0.222, respectively, which is in line with prior studies (Campbell et al. 2016; Phan 2014; Nguyen et al. 2022). For example, Phan (2014) reports the mean and median values of 2.853 and 0.518, respectively. The mean and median values of *Deviation* are -0.274 and 0.041, respectively, suggesting a highly left skewed distribution. The fraction of independent directors for an average board in our sample is 0.865. To mitigate outlier concerns, we winsorize all continuous variables, except for those normalized using natural logarithm, at the 1% level in both tails.

IV. RESULTS

Is Board Independence Related to the Adjustment of CEO Inside Debt?

Panel A of Table 2 reports the estimation results from the adjustment model. In column (1), we estimate Campbell et al. (2016)'s adjustment model without considering board independence. Consistent with the optimal contracting view and Campbell et al. (2016), *Deviation* is significantly and negatively related to the year-over-year change in CEO inside debt. A coefficient estimate of -0.398 suggests that the average firm in our sample closes about 40 percent of the gap between the actual and the optimal CEO inside debt. For comparison, Campbell et al. (2016) report -0.533 for ExecuComp firms from 2006 to 2009. Column (2) reports the estimation results from Equation (3). While *Deviation* remains significantly negative, *Deviation**%INDEP* is significantly and negatively related to the year-over-year change in CEO inside debt, consistent with the optimal contracting hypothesis. A coefficient estimate of -0.212 suggests that a one-standard-deviation increase in board independence (0.067) is associated with an increase in adjustment speed of 1.42 percent (=0.067*0.212), or 3.57 percent (=0.0142/0.398) of the gap that firms close between the actual and the optimal CEO inside debt in a given year.[6]

Panel B of Table 2 reports the estimation results from the partial adjustment model. Column (1) reports the estimation results from Equation (5). Lagged inside debt is significantly and positively related to *Inside debt,* consistent with Panel A's results and the optimal contracting view that firms adjust their CEO inside debt toward the optimum as predicted by their contracting environments (Campbell et al. 2016). A coefficient estimate of 0.602 suggests an adjustment speed of λ=0.40 (λ = 1- α = 1-0.602), namely firms close the gap between the actual CEO inside debt and the predicted optimum by 40 percent in a given year, which is very close to 0.398 reported in column (1) of Panel A. Column (2) reports the estimation results from Equation (7). Consistent with the optimal contracting hypothesis, *Inside debt*%INDEP* enters the regression with a significantly negative sign. A coefficient estimate of -0.215 suggests that a one-standard-deviation increase in board independence (0.067) is associated with an increase in adjustment speed of 1.44 percent, or 3.62 percent of the gap that firms close between the actual and the optimal CEO inside debt in a given year. In column (3), we also add *%INDEP* to allow for the possibility that the

[6] To mitigate concerns about uncertainty in the predicted optimums that are near a firm's starting value, Campbell et al. (2016) omit the potentially problematic observations in which the actual CEO inside debt ratio is close (within ten percentage points) to the predicted optimum. Following Campbell et al. (2016), in an untabulated test, we exclude those observations and obtain qualitatively similar results. Specifically, the coefficient estimate of *Deviation *%INDEP* is -0.215 with a *p*-value of 0.012. In another untabulated robustness check, we follow Campbell et al. (2016) and exclude observations in which the CEO inside debt ratio crosses the predicted optimum. Our results remain qualitatively the same. Specifically, the coefficient estimate of *Deviation*%INDEP* is -0.148 with a *p*-value of <0.000.

estimation result of an interaction term may change after including the primary variables (Aiken and West 1991). Including *%INDEP* does not qualitatively change our results.

To summarize, using both adjustment models, we find evidence consistent with the optimal contracting hypothesis. The impact of board independence on the adjustment speed of CEO inside debt is also economically meaningful—a one-standard-deviation increase in board independence closes about 4 percent of the gap between the actual and the predicted optimal level of CEO inside debt, considering that 1) the model has controlled for all the optimal contracting variables (Campbell et al. 2016), 2) the coefficient only captures the effect of independent directors not the entire board, and 3) post SOX board independence lacks variation making it difficult to estimate the effect of *%INDEP*. Additionally, the two adjustment models offer consistent estimates of the adjustment speed of CEO inside debt and the influence of independent directors, lending credence to our results. Since we obtain qualitatively similar results using the Campbell et al. (2016)'s adjustment model and the partial adjustment model, for the rest of the analyses, we only report the estimation results from the adjustment model for brevity. We report the estimation results from the partial adjustment model in an Internet Appendix (IA).

CEO Bargaining Power

CEO pay packages are an outcome of the bargaining process between the board and the CEO. To more directly test the managerial power hypothesis, we use two popular proxies for CEO power in the compensation literature: 1) *Payslice*, the fraction of the aggregate compensation of the top five executives captured by the CEO (Bebchuk, Cremers, and Peyer 2011); 2) *Top25*, an indicator that equals one if the CEO's total compensation is in the top 25% of the sample in a given year

(Humphery-Jenner et al., 2016). We do not use proxies such as CEO tenure or whether the CEO is also the Chairperson of the Board to measure CEO bargaining power over CEO pay because these proxies tend to capture the superior ability of the CEO (Yang and Zhao 2004).

We partition the sample into those with high vs. low CEO bargaining power. Firms with *Payslice* > the median value of the sample in a given year (*Payslice* = 1) and *Top25* = 1 are classified as their CEOs having stronger bargaining power. As columns (1) and (3) of Table 3 Panel A show, *Deviation*%INDEP* is significantly negative in the subsample of firms with higher CEO bargaining power, which is inconsistent with the managerial power hypothesis and offers further support for the optimal contracting hypothesis.

Deviation%INDEP* is marginally significant with a positive sign in the subsample of firms with *Payslice*=0 and insignificant in the subsample of firms with *Top25*=0. We do not view these results as inconsistent with the optimal contracting hypothesis or in support of the managerial power hypothesis. Rather, for two reasons, we interpret the results as consistent with the notion that boards make rational trade-off decisions when adjusting CEO inside debt. First, as Panel B shows, compared to firms whose CEOs have greater bargaining power (*Payslice*=1 and *Top25*=1), CEO inside debt at firms with weaker CEOs (*Payslice*=0 and *Top25*=0) is closer to (based on the median value) or lower than (based on the mean value) the optimum. As CEOs are more risk averse than equity holders and inside debt aggravates this risk aversion, the costs of adjusting CEO inside debt likely outweigh the benefits when the actual CEO inside debt is lower than the optimum at firms with weaker CEOs. Second, *Deviation* has the expected negative sign with a larger magnitude of coefficient estimate at firms with weaker CEOs. In untabulated tests, we re-estimate the regressions after excluding *Deviation*%INDEP* and *%INDEP*, and find the coefficient estimate of *Deviation* to be -0.365, -0.464, -0.256, -0.479 for columns (1), (2), (3), and (4), respectively.[7] Further, the coefficient equality test fails to reject the null that the coefficient estimates of *Deviation* are equal across the subsamples. Therefore, including the impact of *%INDEP* makes *Deviation* more negative, suggesting a faster adjustment speed for firms with weaker CEO once considering the impact of *%INDEP*.[8] As Table 1 of IA shows, using the partial adjustment model, we obtain qualitatively similar results.

Subsample Tests

So far, we have found evidence consistent with the optimal contracting hypothesis, but not the managerial power hypothesis. In this section, we use four subsample tests to explore the conditions under which the optimal contracting hypothesis predicts that independent directors should play a more significant role. Therefore, these tests also serve as a useful check for endogeneity because it is similar to the Method of Concomitant Variation in that it tests whether the hypothesized effect is stronger when the hypothesized cause is stronger (Acharya and Ryan 2016).

More specifically, the first two subsample tests identify two firm operating characteristics (financially unconstrained and growth) that are associated with greater managerial discretion. The optimal contracting hypothesis predicts that it should be more important for the boards of those

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[7] Results are available upon request.

[8] After excluding *Deviation*%INDEP* but still including *%INDEP*, we find the coefficient estimate of *Deviation* to be -0.366, -0.464, -0.256, -0.479 for columns (1), (2), (3), and (4) of Table 3, respectively. For Panel A of Tables 4 through 7, we detect a similar pattern that including the impact of *%INDEP*, specifically *Deviation*%INDEP*, makes *Deviation* more negative. Results are not tabulated to conserve space and are available upon request.

firms to adjust CEO inside debt more quickly to guide CEO efforts in selecting the projects with the best risk-return-tradeoff profiles. The third and fourth subsample tests identify two types of firms—under-levered firms and firms led by overconfident CEOs—that the prior literature has documented to experience the type of high agency conflicts that a greater attention to optimizing CEO inside debt can help alleviate.

Financial Unconstrained vs. Constrained Firms

In the first subsample test, we distinguish between firms that are financially unconstrained vs. constrained. We argue that it is more important for financially unconstrained firms to optimize CEO inside debt for the following reasons. Agency conflicts between the CEO and shareholders arise because 1) CEOs are more risk averse and less diversified than equity holders and 2) CEOs bear the entire cost of their efforts to maximize the return to the firm but retain just a fraction of the benefits. To encourage CEOs to take risks and exert efforts in ways aligned with the interest of equity holders, CEOs are given equity-like compensation (stocks and options). In contrast, inside debt resembles debt financing, heightens managerial risk aversion and desire for a quiet life, and therefore aggravates the misalignment between CEOs and equity holders. CEOs at financially unconstrained firms face less discipline associated with fixed periodic debt payments (Jensen 1986) and enjoy more discretion in choosing projects with varying risk-return profiles (Chen et al. 2012). As CEOs prefer lower firm risk, and hence more conservative financing and investment policies, to protect their less diversified wealth and human capital (Berger et al. 1997; Chen et al. 2012; Falato et al. 2014), it is more important for financially unconstrained, rather than constrained, firms to optimize CEO inside debt so that their CEOs are properly incentivized to identify and undertake the best risk-return projects that maximize shareholder value.

We use three measures to proxy for financial constraints: the Kaplan and Zingales (1997) Index (the KZ Index), the Size-Age Index of Hadlock and Pierce (2010) (the SA Index), and whether a firm pays any dividends. We partition the sample into financially unconstrained (KZ = 0; SA = 0) and financially constrained firms (KZ = 1; SA = 1) based on whether the KZ index and the SA index are below or above the sample median in a given year, respectively, and whether a firm pays dividends (financially unconstrained) or does not pay any dividends (financially constrained).

As Table 4 shows, for all three measures of financial constraints, results based on the adjustment model are stronger for financially unconstrained firms, consistent with the optimal contracting hypothesis. Additionally, the coefficient equality test rejects the null that the coefficient estimates of *Deviation*%INDEP* are equal across the subsamples. *Deviation*%INDEP* is significantly positive in the subsamples of financially constrained firms. As Table 2 of IA shows, using the partial adjustment model, we find similar results with the exception that *Deviation*%INDEP* is positive with an insignificant sign in the subsample of non-dividend-paying firms.

Similar to Table 3, we do not view the positive coefficient of *Deviation*%INDEP* for financially constrained firms as inconsistent with the optimal contracting hypothesis or in support of the managerial power hypothesis for the same two reasons discussed earlier: 1) the coefficient estimate of *Deviation* is more negative in financially constrained firms; and 2) the agency costs of CEO inside debt are less severe in financially constrained firms and adjusting executive compensation contracts can be costly (Oyer 2004; Edmans et al. 2023). As Panel B shows, the deviations between the actual and the predicted optimal level of CEO inside debt tend to be more negative in financially constrained, rather than unconstrained, firms, consistent with the argument that the agency costs of CEO inside debt are less detrimental to the equity value of financially constrained firms. The finding that when the predicted optimal level of inside debt is higher than the actual ratio, board independence is associated with a slower adjustment speed may give rise to the argument that independent directors prioritize equity holders' interests over debt holders' because inside debt slants managerial incentives toward debt holders and transfers value from equity holders to debt holders by aggravating managerial risk aversion and inducing conservative financial and investment policies (Edmans and Liu 2011; Wei and Yermack 2011). However, as we discussed earlier, including the influence of *%INDEP*, especially including *Deviation**%INDEP*, makes *Deviation* more negative at financial constrained firms. Taking this evidence together with the argument that equity holders ultimately bear the agency costs of debt, we interpret the overall results in Table 4 as consistent with the conjecture that independent directors make rational tradeoff decisions by adjusting CEO inside debt more slowly in financially constrained firms because the costs of adjusting CEO inside debt in those firms exceed the benefits of overcoming the agency costs of CEO inside debt.

High vs. Low Growth firms

In the second subsample test, we distinguish between high vs. low growth firms. High growth firms enjoy a larger set of growth opportunities, and therefore, their firm value is more sensitive to discretionary investment decisions that their CEOs make, especially when the growth rate is compounded over a long-time horizon. Since CEOs are more risk averse and less diversified than equity holders, it is more important for growth firms to optimize CEO inside debt to incentivize their CEOs to exert efforts and take the appropriate risks that maximize the firm's growth potential.

Table 5 reports the estimation results when we partition the sample based on the median value of the growth prospect proxies in a given year—the ratio of the market-to-book value of equity (MTBEQ) and $Sale_{t+1}/Sales_t$. We choose the ratio of the MTBEQ as opposed to the ratio of the MTB value of assets to better capture the conflict between equity holders and debt holders. We choose a forward-looking ($Sale_{t+1}/Sales_t$), rather than a backward-looking ($Sale_t/Sales_{t-1}$), measure of sales growth to better capture future growth prospects. As Panel A shows, using the adjustment model, we find results consistent with the optimal contracting hypothesis for both growth proxies. *Deviation*%INDEP* is significantly negative in the subsamples of firms with high growth opportunities. Additionally, the coefficient equality test rejects the null that the coefficient estimates of *Deviation*%INDEP* are equal across the subsamples. Similar to Tables 3 and 4, we do not interpret the significantly positive coefficient of *Deviation*%INDEP* in the subsamples of low-growth firms as inconsistent with the optimal contracting hypothesis because 1) the coefficient estimate of *Deviation* is more negative in low growth firms and 2) as Panel B shows, the deviation between the actual and the optimal CEO inside debt is less negative in high, but not low, growth firms. As Table 3 of IA shows, using the partial adjustment model, we find corroborating results.

Under- vs. Over-levered Firms

Morellec et al. (2012) show theoretically that self-interested managers keep firms' debt ratio below the optimal level. Consistent with CEOs being self-serving and risk averse, Brisker and Wang (2017) document that a higher level of CEO inside debt is associated with lower firm leverage. Importantly, they also find that firms with higher CEO inside debt adjust toward the optimal debt ratio more quickly if the firm is over levered, but more slowly if under levered. Since equity value is maximized when the debt ratio is optimized, the optimal contracting hypothesis predicts that independent directors should play a more significant role in targeting the optimal CEO inside debt at under-levered firms because self-interested CEOs prefer leverage lower than desired by shareholders and when firms are under levered, CEO inside debt exacerbates this conflict between CEOs and shareholders.

Following the literature (see, e.g., Flannery and Ragan 2006; Faulkender et al. 2012), we estimate the optimal debt ratio using the following model:

$$D_{it} = \upsilon \boldsymbol{X}_{it-1} + d_i + d_t + \varepsilon. \tag{8}$$

where *D* is the market debt ratio, which is total book debt (sum of the book values of long-term debt and notes payable) over the sum of total book debt plus the market value of equity (the number of shares outstanding multiplied by the share price at the fiscal year end)[9]. ***X*** is the vector of firm characteristics that drive the costs and benefits of firms operating with various debt ratios, including *Firm size*, profitability (Income before extraordinary items + Interest expense + Income

[9] Our results remain similar if we use two alternative measures of the book debt ratio: 1) total book debt scaled by the sum of total book debt and the book value of equity or 2) *Leverage* (Campbell et al. 2016).

taxes) / Total assets), the MTB ratio ((Book liabilities + the market value of equity) / Total assets), Depreciation (Depreciation and amortization / Total assets), *Asset tangibility*, the R&D ratio (Research and development expenses / Total assets; missing R&D expenses are set to zero), the R&D dummy that equals one if R&D expenses = 0 and zero otherwise, and the median industry debt ratio of the firm's Fama and French (1997) industry. d_i and d_t denote firm and year FEs, respectively. ε is the error term. The optimal debt ratio is the fitted value from Equation (8). A firm is classified as over-levered if its debt ratio is above the optimal debt ratio and under-levered otherwise.

As Panel A of Table 6 shows, using the adjustment model, we find that *Deviation*%INDEP* is significantly negative in the subsample of under-levered firms with 1 percent significance and is positive in the subsample of over-levered firms with 10 percent significance. Additionally, the coefficient equality test rejects the null that the coefficient estimates of *Deviation*%INDEP* are equal across the subsamples. As Panel B shows, the deviation between the actual and the optimal CEO inside debt is less negative in under-levered, than over-levered, firms. One main source of agency costs of debt is the risk-shifting or asset substitution problem (Jensen and Meckling 1976). Equity holders have an incentive to expropriate wealth from debt holders by shifting investment policies to risky projects because equity can be viewed as a call option on the firm's net assets and the value of a call option increases in the volatility of the underlying asset. The more negative the deviation, the less incentive CEOs receive from inside debt to make conservative decisions, which exacerbates the risk-shifting problem. Therefore, the results in Table 6 seem to affirm the patterns of the results in Tables 4 and 5 in that when board independence is associated with a slower adjust speed, the agency costs of CEO inside debt appear to be low and hence the costs of adjusting CEO inside debt may outweigh the benefits. As Table 4 of IA shows, using the partial adjustment model yields similar results.

Firms Led by Overconfident CEOs

CEO overconfidence can distort corporate decisions because overconfident CEOs overestimate the precision of their own information, as opposed to information from others, and their ability in generating superior returns (Malmendier and Tate 2005). Consistent with this argument, studies have found that managerial hubris or overconfidence explains why firms engage in value-destroying mergers and acquisitions (Roll 1986; Malmendier and Tate 2008). As overconfident CEOs systematically overestimate the growth rate, but underestimate the riskiness, of earnings (Hackbarth 2008; Libby and Rennekamp 2012), inside debt can be an effective tool in reducing excessive risk taking by overconfident CEO (Galariotis et al. 2022). Therefore, the optimal contracting hypothesis predicts that firms with a more independent board should adjust CEO inside debt more quickly toward the optimum in firms led by overconfident CEOs.

Following the literature (see, e.g., Malmendier and Tate 2005, 2008; Hirshleifer et al. 2012), we use the tendency of CEOs to delay exercising their stock options to proxy for overconfidence. The intuition is that risk-averse, under-diversified CEOs would have exercised in-the-money options well before expiration to reduce their exposure to firm-specific risks. Not doing so signals CEOs' overconfidence about their ability in generating superior returns for their firms. We classify a firm as led by an overconfident CEO if the CEO fails to exercise vested options that are at least

67% in-the-money at least twice during their tenure as the CEO, and zero otherwise. CEOs are classified as overconfident from the first instance that they fail to exercise because overconfidence is a permanent, rather than transitory, trait.[10] As Table 1 shows, 62.4% of our sample firms are led by an overconfident CEO, which is similar to studies using more recent data: Hirshleifer et al. (2012) report 61.1 percent, Chen, Ho, and Yeh (2020) 62.6 percent, and Hossain, Rabarison, Ater, and Sobngwi (2022) 62.8 percent.

As Panel A of Table 7 shows, using the adjustment model, we find that *Deviation*%INDEP* is significantly negative in the subsample of firms led by overconfident CEOs and is significantly positive in the subsample of firms not led by overconfident CEOs or rational CEOs. Additionally, the coefficient equality test rejects the null that the coefficient estimates of *Deviation*%INDEP* are equal across the subsamples. Similar to our interpretation of the results in Tables 3 through 6, we do not view the positive coefficient of *Deviation*%INDEP* in the subsample of firms led by rational CEOs as inconsistent with the optimal contracting hypothesis because 1) the coefficient estimate of *Deviation* is more negative in those firms and 2) as Panel B shows, the deviation between the actual and the optimal CEO inside debt is also more negative in those firms, suggesting that the CEOs at those firms tend to hold less than the optimal level of inside debt. As Table 5 of IA shows, using the partial adjustment model yields qualitatively similar results.

[10] In a untabulated robustness check, we measure CEO overconfidence using *Longholder* (Malmendier and Tate 2005; Malmendier, Tate, and Yan 2011). *Longholder* is a dummy that equals one if the CEO at any point during our sample period holds an option until the year of expiration even though the option is at least 40% in the money entering its final year. Therefore, similar to *Holder 67*, *Longholder* aims to capture managerial personal trait of habitual failure to diversify. Using this alternative measure of CEO overconfidence, we obtain qualitatively similar results.

Summary and Discussion

After documenting that firms with a more independent board adjust CEO inside debt more quickly toward the optimum, especially in firms led by more powerful CEOs, we explore the conditions under which the optimal contracting hypothesis predicts that independent directors should play a more significant role. We find further evidence in support of the optimal contracting hypothesis that a higher level of board independence at financially unconstrained firms, firms with more growth prospects, under-levered firms, and firms led by overconfident CEOs are associated with a faster adjustment speed toward the optimal level of CEO inside debt. Additionally, in all subsample tests, we find results consistent with the notion that the adjustment speed is asymmetric because independent directors seem to be aware of the costs and benefits of adjusting CEO inside debt being a function of firm characteristics and adjust the CEO inside debt accordingly.

Additional Tests

Endogeneity Tests

A common concern in empirical research involving board structure as the independent variable of interest is the potential for endogeneity issues that may confound the results. In addition to a wide array of relevant variables, we control for firm and time FEs to mitigate latent heterogeneity in our baseline regression, which mitigates a major source of endogeneity. More importantly, we perform the endogeneity test to determine whether *%INDEP* and *Deviation*%INDEP* (*Inside debt*%INDEP*) are in fact exogenous in the adjustment model (the partial adjustment model). The test statistics fail to reject the null that the variables are exogenous (the *p*-value is 0.513 for the adjustment model and 0.299 for the partial adjustment model)[11]. Nonetheless, in this section, we perform three distinct tests to alleviate endogeneity concerns.

In the first test, we use the historical values of *%INDEP* to ensure the predeterminant condition, which mitigates endogeneity. Prior studies (see, e.g., Bebchuk and Cohen 2005; Coles et al. 2008; Cheng 2008; Faleye et al. 2011) have used this method in their study of board structure. Since our independent variables start in 2005, we use the 2004 values of *%INDEP*. As board structure can be sticky, we also use the 1996 values of *%INDEP* as another robustness check. The earliest board data available for S&P1500 firms is 1996. Additionally, 1996 is before the 2002 SOX Act, which substantially increased board independence and created significant director turnover (Linck, et al. 2009). In other words, if there is any endogenous concern for *%INDEP* due to simultaneity or reverse causality, the exogenous shock of SOX breaks such linkages between *%INDEP* and inside debt. Therefore, 1996 serves as a useful robustness check. As columns (1) and (2) of Table 8 Panel A show, our results remain similar using the 1996 and 2004 historical values of *%INDEP*.

In the second test, we use the GMM dynamic panel estimation method, which is robust to endogeneity problems due to reverse causality, simultaneity, and unobserved heterogeneity (Wintoki et al. 2012). As column 3 in Panel A shows, our results remain qualitatively similar in this endogeneity check. As dynamic GMM accounts for time-invariant firm heterogeneities, we control for year- and industry-FEs in the regressions. We also report the results of specification tests for the validity of the GMM estimation procedure. If the assumptions of the specification are

[11] The results of the endogeneity test are available upon request.

valid, then the residuals in the first differences (AR(1)) should be correlated, but uncorrelated in the second differences (AR(2)). Results of these tests confirm that these conditions hold. The Hansen test for over-identifying restrictions (*J*-statistic) shows that under the null hypothesis of instrument validity, we cannot reject the null that our GMM instruments are valid.

In the third test, we use the 2SLS-IV method with the industry average of *%INDEP* and director sudden death as the instruments. The industry average is a popular choice for instruments (see, e.g., Bonaimé, Hankins, and Harford 2014; Ferrell, Liang, and Renneboog 2016; Miller, Moussawi, Wang, and Yang 2021) because the averages should be highly correlated with the endogenous variable but orthogonal to factors that drive the response variable in individual firms, and hence satisfies the two criteria for a valid IV—relevance and orthogonality. By design, director sudden death is exogenous to board structure and hence satisfies the orthogonality condition. Since it takes time for a board to identify the replacement and director election occurs once a year, this instrument ensures a change in *%INDEP* and hence also satisfies the relevance condition. We follow the literature (see, e.g., Nguyen and Nielsen 2010; Fedaseyeu, James, and Hannes 2018) in identifying director sudden death. Specifically, we first start with finding independent directors who left our sample firm in a given year using the ISS database. We then search in Lexis-Nexis and the SEC Edgar Online for reasons for these departures. We conservatively classify a death as sudden only when we have no evidence that the death was not sudden or was expected in any way. Sudden deaths include heart attacks, strokes, suicides, accidents, and deaths for which the cause was unreported but the death was described as unanticipated, or the cause was unreported and the director was no more than 65 years old. Following this procedure, we manually collected data for a total of 180 sudden independent director deaths during our sample period.

As Panel B of Table 8 shows, our results remain qualitatively similar in this endogeneity check. Additionally, supporting that industry averages meet the relevance condition, column (1) shows that *IV.Industry_AVG* is significantly and positively related to *%INDEP*. Director sudden death is related to *%INDEP* with the expected negative sign, consistent with the idea that a considerable portion of firms are unable to replace deceased directors within the following year (45% of the firms according to Nguyen and Nielsen (2010)). Although the coefficient estimate of *IV.Sudden death* itself is not statistically significant likely due to the rarity of the event—the 180 cases of sudden deaths represent 2.07% of the total observations, the joint F-tests for *IV.Industry_AVG* and *IV.Sudden death* are statistically significant for column (1) with 1 percent significance and marginally significant for column (2) with 10 percent significance. Additionally, the weak identification test rejects the null that the IVs are weak (the Kleibergen-Paap F statistics = 41.884). The underidentification test also rejects the null that the IVs are unrelated to the endogenous variable (the Kleibergen-Paap F statistics = 70.411). As the equations are exactly identified, we are unable to conduct the Hansen overidentification test that checks the orthogonality condition of the IVs. As Table 6 of IA shows, the results hold in these endogeneity checks using the partial adjustment model.

Control for Internal Governance Mechanisms

To mitigate the concern that our results are not driven by *%INDEP* simply proxying other governance controls. We draw from the literature and use three popular proxies for poor internal controls (the E-index, classified board, and coopted board) to investigate whether our results hold after controlling for these governance characteristics. The literature has shown that these characteristics significantly entrench managers and reduce board effectiveness (Bebchuk, Cohen, and Ferrell, 2009; Bebchuk and Cohen, 2005; Faleye, 2007; Coles et al., 2014). We obtain data on the E-index from ISS, classified board from Guernsey, Sepe, and Serfing (2022) and Guernsey, Guo, Liu, and Serfing (2024), and coopted board from Coles et al. (2014).[12]

As columns (1)–(6) of Table 9 show, when included in the regression on its own, none of the E-index, classified board, and coopted board (*Co-Opt*) measures have any effect on the adjustment speed of CEO inside debt. When including them together with *%INDEP* in the regression (column (8)), *Deviation**%INDEP* retains the expected negative sign and the statistical significance. *Deviation**Co-Opt* becomes significantly positive, consistent with the idea that coopted boards are captured by self-dealing CEOs. As Table 7 of IA shows, our results remain qualitatively similar using the partial adjustment model with the exception that *Co-Opt* no longer has any impact on the adjustment speed when we include *%INDEP* and the other two controls simultaneously in the regression.

[12] We thank Matthew Serfling and Lalitha Naveen for making the data available, https://sites.google.com/utk.edu/matthew-serfling/data and https://sites.temple.edu/lnaveen/data/, respectively.

Control for the Monitoring Roles of Blockholders and Institutional Investors

Nguyen et al. (2022) find that the presence of new active blockholders decreases the deviation of CEO inside debt from the predicted optimum. Additionally, abundant theoretical and empirical studies have established the governance role of institutional investors (Hartzell and Starks 2003). For example, Chhaochharia and Grinstein (2009) find that a high level of institutional ownership reduces the importance of board independence for CEO compensation decisions. Therefore, to further triangulate our results, we first separately examine the impact of blockholder ownership and institutional ownership on the adjustment speed of CEO inside debt, and then reevaluate the impact of board independence after controlling for the influence of blockholder and institutional investors. We obtain blockholder data from Harries (2022)[13] and institutional ownership data from Thomson Reuters' Institutional (13F) Holdings database.

As columns (1)–(4) of Table 10 show, we find no evidence that blockholders or institutional investors have any impact on the adjustment speed of CEO inside debt. As column (5) shows, when we account for the impact of board independence, blockholders, and institutional investors simultaneously, *Deviation*%INDEP* continues to be statistically significant with a more negative coefficient estimate of -0.330 compared to -0.212 in the baseline (column (2) of Table 2 Panel A). As Table 8 of IA shows, we obtain qualitatively similar results using the partial adjustment model. These results are consistent with the notion that the board of directors sits at

[13] https://www.degruyter.com/document/doi/10.1515/jbnst-2021-0033/html

the apex of corporate governance system and is the first line of defense in safeguarding shareholders' interests against self-dealing managers.[14]

V. CONCLUSION AND DISCUSSION

Whether executive compensation practices reflect optimal contracting or managerial power is one of the most fundamental and controversial topics in compensation and governance research. We contribute to this debate by providing the initial evidence for the role of independent directors in adjusting CEO inside debt. Until recently, scholars have focused on equity-based pay, while inside debt received limited attention. However, growing evidence shows the prevalence and the significant influence of CEO inside debt on corporate policies. Importantly, as the executive compensation contract is extremely complex, inside debt is the only pay instrument whose optimum researchers have so far been able to theoretically model and empirically measure (Edmans and Liu 2011; Edmans and Gabaix 2016; Campbell et al. 2016). We are the first to analyze whether board independence is positively related to the speed at which firms adjust their CEO inside debt to the predicted optimum. Therefore, our results have important policy

[14] We obtain different results from Nguyen et al. (2022) probably because we 1) estimate different models, 2) have different samples, and 3) cluster standard errors at the firm level while Nguyen et al. (2022) do not cluster standard errors at any level. Nguyen et al. (2022) do not focus on the adjustment speed of CEO inside debt. Instead, they relate the presence of active blockholders to the change in deviation from target CEO relative incentive ratio this year minus that last year. Our sample is the intersection of ExecuComp and ISS, which focuses on S&P 1500 firms (6,357 firm-year observations). Nguyen et al. (2022) collect blockholder and inside debt data directly from the SEC Edgar website and build a sample of 35,549 firm-year observations. If we do not cluster standard errors, we find a significantly negative coefficient of -0.314 for *Deviation*Block* (*p*-value =0.000) in column (2), which is consistent with Nguyen et al. (2022). *Deviation*IO* also enters the regression in column (4) with a significantly negative coefficient of -0.166 (*p*-value =0.000). In this model specification, when we do the horse race, *Deviation*%INDEP* continues to be statistically significant with a coefficient estimate of -0.330 (*p*-value =0.000), while *Deviation*Block* retains its negative sign with *p*-value = 0.093 and *Deviation*IO* becomes positive with *p*-value = 0.046.

implications because corporate laws in the United States as in many other countries such as the United Kingdom and China delegate the decision of how to design executive compensation to the board of directors and independent directors play a central monitoring role.

Consistent with the optimal contracting hypothesis, we find that firms with a more independent board adjust CEO inside debt to the optimum more quickly. This result is stronger in financially unconstrained firms, growth firms, under-levered firms, and firms led by more powerful CEOs or overconfident CEOs. Our results are robust to alternative models that calibrate the adjustment speed of CEO inside debt, various endogeneity tests, and controlling for the governance effects of the E-index, classified board, coopted board, blockholders, and institutional investors. Intriguingly, our subsample tests document asymmetric responses by independent directors in adjusting CEO inside debt. More specifically, we consistently find that when the predicted optimal level of inside debt is higher than the actual ratio, firms with a more independent board adjust their CEO inside debt level more slowly toward the optimum. We interpret this pattern of results as consistent with the conjecture that independent directors make rational tradeoff decisions when making changes to CEO compensation arrangements; firms with a more independent board adjust CEO inside debt more slowly when the costs of adjusting CEO inside debt exceed the benefits of overcoming the agency costs of CEO inside debt.

Executive compensation is extremely complex and continues to grow in complexity (Albuquerque, Carter, Guo, and Lynch 2023). Therefore, similar to other studies on executive compensation, our paper has several limitations. First, we only consider inside debt. We acknowledge that it is possible that certain aspects of CEO compensation arrangements support the optimal contracting hypothesis, while others do not. Second, we draw from the long-standing literature on the optimal contracting and managerial power views of executive compensation in developing our hypotheses and designing our tests. However, as Edmans et al. (2022) reveals, neither perspective is a realistic reflection of the complex pay-setting process in the real world. For example, a third explanation for the executive compensation practices is that they are shaped by institutional forces such as regulation, tax, accounting policies, and social pressures (Bebchuk et al. 2002; Edmans et al. 2017; Edmans et al. 2023). Our results, together with the recent evidence by Chang, Dambra, Schonberger, and Suk (2022), highlight that the board of directors make complex tradeoff decisions when setting executive compensation and yet our knowledge of how these decisions are made is far from complete. Therefore, we call for more research into this important issue, especially considering the important role of the board of directors in the corporate governance system.

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Appendix I: Variable definitions

This table provides definitions for all the variables used in our analysis, in alphabetical order. The mnemonics associated with Compustat variables are in parentheses, italics, and in capitals.

Variable	Variable Description
Dependent variables	
Inside debt	The CEO inside debt ratio, which is the natural logarithm of the relative incentive ratio developed by Wei and Yermack (2011) and Cassell et al. (2012): CEO relative incentive ratio = (*ΔCEO IDH*/*ΔCEO EH*)/(*ΔFD*/*ΔFE*) where *ΔCEO IDH* is set to equal CEO inside debt holdings (*CEO IDH*), which is the present value of accumulated pension benefits and deferred compensation; the change in CEO equity holdings (*ΔCEO EH*) is set to equal to the number of shares held by the CEO plus the number of options held by the CEO times the option delta (the option delta is calculated for each option tranche using the Black-Scholes option valuation formula); the change in the firm's external debt (*ΔFD*) is set to equal to total debt (*DLC*+*DLTT*); and the change in the firm's external equity (*ΔFE*) is constructed using an approach similarly to that used for *ΔCEO EH* except that complete data are not available for all of the outstanding option tranches issued by the firm and hence the inputs to the valuation formula are the total number of employee stock options outstanding (*OPTOSEY*), the average exercise price of outstanding options (*OPTPRCBY*), and an assumed remaining life of four years for all options.
ΔInside debt	Year-over-year change in CEO inside debt: $\textit{Inside debt}_t - \textit{Inside debt}_{t-1}$
Main independent variables of interest	
Deviation	Following Campbell et al. (2016), the deviation is the actual CEO inside debt ratio minus the predicted optimum. The precited optimum is the fitted value from using the median model and regressing CEO inside debt on firm- and CEO-level determinants that reflect optimal contracting variables, including firm size, liquidity constraint, tax-loss carry-forward, investment grade, R&D/sales, the market to book ratio, net PPE to asset, idiosyncratic risk, CEO age, and CEO tenure.
%INDEP	The proportion of independent directors on the board
Other variables	
Block	The percent of ownership by blockholders (13D and 13G filers who hold at least five percent of a firm's equity)
CEO age	CEO age
CEO tenure	The number of years the CEO in the office
Classified board	An indicator variable that equals one, if the firm has a classified board
Co-Opt	The number of co-opted directors over the total number of directors. A director is classified as co-opted if the director joined the board after the CEO assumed office (Coles et al., 2014).
DIV	A firm is classified as financially constrained (DIV=1) in a given year if it does not pay any dividends, and financially unconstrained (DIV=0) otherwise.
Firm size	The natural logarithm of a firm's total assets
Holder 67	An indicator variable that equals one when the CEOs fail to exercise vested options that are at least 67% in-the-money at least twice during their tenure as the CEO, and zero otherwise. CEOs are classified as overconfident from the first instance that they fail to exercise because overconfidence is a permanent, rather than transitory, trait. We construct the variable using year-by-year aggregate data on CEO vested option holdings and calculate a continuous confidence measure as follows:

	$Confidence = \frac{Average\ value\ per\ vested\ option}{Average\ strike\ price}$ where *Average value per vested option* is the value of vested unexercised options scaled by the number of vested unexercised options; and *Average strike price* is the stock price at the end of the fiscal year minus the average value per vested option (Malmendier and Tate, 2005 and 2008; Hirshleifer et al., 2012).
Idiosyncratic risk	The natural logarithm of the standard deviation of residuals from a market model estimated over the prior 24 monthly returns
Institutional ownership (IO)	Institutional ownership, which is the number of shares held by institutional investors over the total number of shares outstanding.
Investment grade	An indicator variable that equals one if a firm with debt outstanding in year t has an investment grade rating, and zero otherwise.
KZ	The Kaplan and Zingales (KZ) Index. KZ = 1 if the KZ Index is above the sample median in a given year (i.e., the firm is financially constrained), and zero otherwise (i.e., the firm is financially unconstrained). Following Lamont et al. (2001), KZ_t = – 1.001909*$Cash\ Flow_t/PPE_{t-1}$ + 0.2826389*Q_t + 3.139193*$Debt_t/Capital_t$ – 39.3678*DIV_t/PPE_{t-1} – 1.314759*$Cash_t/PPE_{t-1}$, where *Cash Flow* = Income Before Extraordinary Items (*IB*) + Depreciation and Amortization (*DP*); PPE = Net Property, Plant & Equipment (*PPENT*); *Q* = (Total Assets (*AT*)+Market value of equity from CSRP - Book Value of Common Equity (*CEQ*) - Deferred Taxes (*TXDB*)) / *AT)*; *Debt* = Total Long-Term debt (*DLTT*) + Debt in Current Liabilities (*DLC*); *Capital* = *DLTT* + *DLC* + Stockholders' Equity (*SEQ*); *DIV* = Common Dividends (*DVC*)+ Preferred Dividends (*DVP*); *Cash* = Cash and Short-Term Investments (*CHE*).
Leverage	Book value of long-term debt divided by book value of total assets
Liquidity constraint	An indicator variable that equals one if the firm has negative operating income, and zero otherwise.
MTBAT	The ratio of the market-to-book value of assets = (Book value of assets – Book value of common equity + market value of common equity) / book value of assets. Market value of common equity = Number of shares outstanding * Share closing price
MTBEQ	The ratio of the market-to-book value of common equity = Market value of common equity / Book value of common equity
Asset tangibility	Net property, plant and equipment scaled by the total assets
Over-levered	A firm is defined as over-levered if its debt ratio is above the optimal debt ratio
Payslice	The fraction of the aggregate compensation of the top five executives captured by the CEO (Bebchuk et al., 2011)
R&D / Sales	Research and development expenditure scaled by the total sales
SA	The Size-Age (SA) index created by Hadlock and Pierce (2010). SA = 1 (i.e., the firm is financially constrained), if the SA index is above the sample median in a given year (these are generally smaller and younger firms), and zero otherwise. Following Hadlock and Pierce (2010), SA = (-0.737*Size) + (0.043*$Size^2$) - (0.040*Age), where *Size* is the natural logarithm of the 2019 constant book assets, and *Age* is the number of years the firm has been in Compustat with a non-missing stock price. *Size* is replaced with log($4.5 billion) and *Age* with 37 years if the actual values exceed these thresholds.
Sales growth	Year-on-year percent growth in the net sales
The E-Index	The Entrenchment Index from Bebchuk et al. (2009), which is the sum of six indicator variables that equal one, if a firm has a classified board, limits to shareholder bylaw amendments, poison pills, golden parachutes, and supermajority requirements for mergers and charter amendments.
The optimal debt ratio	The fitted value estimated from regressing the market debt ratio, which is total book debt (sum of the book values of long-term debt and notes payable) over the sum of total book

	debt plus the market value of equity (the number of shares outstanding multiplied by the share price at the fiscal year end) on Firm size, profitability (Income before extraordinary items + Interest expense + Income taxes)/Total assets), the MTB ratio ((Book liabilities + the market value of equity)/Total assets), Depreciation (Depreciation and amortization/Total assets), Asset tangibility, the R&D ratio (Research and development expenses/Total assets; missing R&D expenses are set to zero), the R&D dummy that equals one if R&D expenses = 0 and zero otherwise, and the median industry debt ratio of the firm's Fama and French (1997) industry (Flannery and Ragan 2006; Faulkender et al. 2012).
Top25	An indicator that equals one if the CEO's total compensation is in the top 25% of the sample in a given year (Humphery-Jenner et al., 2016)
Tax loss carry forward	An indicator variable that equals one if the firm has net operating loss carryforwards, and zero otherwise
Under-levered	A firm is defined as under-levered if its debt ratio is under the optimal debt ratio

Table 1: Summary statistics

This table presents summary statistics for key variables used in our analyses. The sample consists of 6,357 firm-year observations from 2006 to 2019. All continuous variables, except for those normalized using natural logarithm, are winsorized at the 1% level at both tails. All variable definitions are provided in Appendix I.

Variable	N	Mean	Median	Std. dev.	Min	Max
Inside debt (raw)	6,357	3.224	0.222	18.415	0.000	391.217
Inside debt (in natural logarithm)	6,357	-1.317	-0.766	2.903	-58.753	9.860
Deviation	6,357	-0.274	0.041	2.316	-58.847	8.448
%INDEP	6,357	0.865	0.889	0.067	0.571	1.000
CEO tenure	6,357	7.504	6.000	6.195	0.000	33.000
CEO age	6,357	57.086	57.000	5.855	41.000	76.000
Firm size	6,357	22.595	22.417	1.549	18.196	28.595
Liquidity constraint	6,357	0.038	0.000	0.191	0.000	1.000
Tax-loss carry-forward	6,357	0.508	1.000	0.500	0.000	1.000
Investment grade	6,357	0.161	0.000	0.367	0.000	1.000
R&D / Sales	6,357	0.019	0.000	0.044	0.000	0.322
MTBAT	6,357	1.705	1.422	0.851	0.678	7.874
Asset tangibility	6,357	0.268	0.179	0.251	0.001	0.903
Idiosyncratic risk	6,357	-2.771	-2.814	0.442	-4.369	-0.848
Leverage	6,357	0.218	0.206	0.150	0.000	0.874
KZ	5,706	-9.245	-2.385	19.251	-166.857	3.830
SA	6,357	-4.271	-4.455	0.404	-4.637	-3.185
DIV	6,357	0.225	0.000	0.418	0.000	1.000
Sales growth	6,357	0.054	0.049	0.155	-0.508	0.859
Holder 67	6,357	0.624	1.000	0.484	0.000	1.000
Payslice	5,728	0.437	0.438	0.091	0.099	0.771
Top25	6,357	0.261	0.000	0.439	0.000	1.000
The E-Index	5,792	3.220	3.000	0.864	0.000	5.000
Classified board	5,767	0.447	0.000	0.497	0.000	1.000
Co-Opt	5,766	0.385	0.333	0.254	0.000	0.909
Block	6,357	0.118	0.073	0.146	0.000	0.827
Institutional ownership (IO)	6,304	0.766	0.778	0.146	0.321	1.000

Table 2: Impact of board independence on the adjustment of CEO inside debt

This table reports the regression results from estimating an OLS model. In Panel A, the dependent variable is the year-over-year change in CEO inside debt (*ΔInside debt$_t$*). The main independent variable of interest is *Deviation$_{t-1}$ *%INDEP$_{t-1}$*. *Deviation* is the actual CEO inside debt minus the predicted optimum. The precited optimum is the fitted value from the median model that regresses CEO inside debt on firm- and CEO-level determinants that reflect optimal contracting variables, including firm size, leverage, an investment grade dummy, idiosyncratic risk, the market-to-book ratio, R&D/sales, net PPE to asset, liquidity constraint, a tax-loss carry-forward dummy, CEO age, and CEO tenure (Campbell et al. 2016). In Panel B, the dependent variable is CEO inside debt (*Inside debt$_t$*). The main independent variable of interest is *Inside debt$_{t-1}$*%INDEP$_{t-1}$*. The column of Predicted gives the positive or negative signs as consistent with the optimal contracting hypothesis. Coefficient estimates of variables of interest are in boldtype if found to be consistent with the optimal contracting hypothesis. In parentheses are *p*-values computed based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Appendix I provides variable definitions.

Panel A: Adjustment model

Dep. Var. = ΔInside debt $_t$	Predicted	(1)	(2)
Deviation $_{t-1}$ * %INDEP $_{t-1}$	-		**-0.212****
			(0.013)
Deviation $_{t-1}$	-	**-0.398*****	**-0.276*****
		(0.000)	(0.000)
%INDEP $_{t-1}$			0.499
			(0.522)
CEO age $_{t-1}$		-0.010	-0.010
		(0.310)	(0.362)
CEO tenure $_{t-1}$		0.013	0.013
		(0.217)	(0.197)
Firm size $_{t-1}$		-0.149	-0.132
		(0.161)	(0.237)
Liquidity constraint $_{t-1}$		0.239	0.234
		(0.179)	(0.191)
Tax loss carry forward $_{t-1}$		-0.034	-0.029
		(0.713)	(0.754)
Investment grade $_{t-1}$		0.190***	0.192***
		(0.001)	(0.001)
R&D / Sales $_{t-1}$		-0.070	-0.123
		(0.965)	(0.940)
MTBAT $_{t-1}$		-0.123**	-0.109*
		(0.040)	(0.090)
Asset tangibility $_{t-1}$		0.324	0.339
		(0.589)	(0.585)
Idiosyncratic risk $_{t-1}$		0.370***	0.390***
		(0.000)	(0.000)
Leverage $_{t-1}$		2.077***	2.025***
		(0.000)	(0.000)
Firm FE		YES	YES
Year FE		YES	YES
Observations		6,357	6,357
Adjusted R-squared		0.237	0.242

Panel B: Partial adjustment model

Dep. Var. = Inside debt $_t$	Predicted	(1)	(2)	(3)
Inside debt $_{t-1}$ * %INDEP $_{t-1}$	-		**-0.215****	**-0.214****
			(0.028)	(0.030)
Inside debt $_{t-1}$	+	**0.602*****	**0.728*****	**0.727*****
		(0.000)	(0.000)	(0.000)
%INDEP $_{t-1}$				0.322
				(0.677)
CEO age $_{t-1}$		0.00487	0.00759	0.00748
		(0.654)	(0.478)	(0.484)
CEO tenure $_{t-1}$		0.0132	0.0145	0.0146
		(0.193)	(0.159)	(0.156)
Firm size $_{t-1}$		-0.163	-0.146	-0.147
		(0.127)	(0.192)	(0.188)
Liquidity constraint $_{t-1}$		-0.00185	-0.0342	-0.0351
		(0.992)	(0.847)	(0.843)
Tax loss carry forward $_{t-1}$		-0.175*	-0.191**	-0.191**
		(0.067)	(0.040)	(0.040)
Investment grade $_{t-1}$		0.120**	0.112**	0.112**
		(0.034)	(0.049)	(0.049)
R&D/Sales $_{t-1}$		0.752	0.864	0.824
		(0.638)	(0.596)	(0.613)
MTBAT $_{t-1}$		0.0967	0.140**	0.140**
		(0.128)	(0.037)	(0.036)
Asset tangibility $_{t-1}$		0.152	0.141	0.147
		(0.800)	(0.821)	(0.813)
Idiosyncratic risk $_{t-1}$		0.0686	0.0437	0.0438
		(0.442)	(0.617)	(0.616)
Leverage $_{t-1}$		-0.103	-0.470	-0.467
		(0.843)	(0.165)	(0.167)
Firm FE		YES	YES	YES
Year FE		YES	YES	YES
Observations		6,357	6,357	6,357
Adjusted R-squared		0.701	0.702	0.702

Table 3: CEO bargaining power and the adjustment speed

This table reports the estimation results using the adjustment model (Campbell et al. 2016), contrasting the impact of *%INDEP* on the adjustment speed of CEO inside debt at firms with high vs. low CEO bargaining power. Firms with *Payslice* > the median value of the sample in a given year (*Payslice* = 1) or with *Top25*=1 are classified as high CEO bargaining power, and low otherwise (Bebchuk et al. 2011; Humphery-Jenner et al. 2016). In parentheses are *p*-values computed based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Appendix I provides variable definitions.

Panel A: Adjustment model

Dep. Var. = ΔInside debt $_t$	Payslice = 1	Payslice = 0	Top25 = 1	Top25 = 0
	(1)	(2)	(3)	(4)
(1) Deviation $_{t-1}$ * %INDEP $_{t-1}$	-0.286***	0.577*	-0.411***	0.068
	(0.000)	(0.100)	(0.000)	(0.467)
Deviation $_{t-1}$	-0.245***	-0.923***	-0.091***	-0.522***
	(0.000)	(0.002)	(0.006)	(0.000)
%INDEP $_{t-1}$	0.904	0.808	0.839	-0.058
	(0.487)	(0.522)	(0.665)	(0.949)
CEO age $_{t-1}$	0.001	-0.019	-0.021	0.002
	(0.952)	(0.391)	(0.348)	(0.910)
CEO tenure $_{t-1}$	-0.006	0.021	0.022	0.008
	(0.742)	(0.267)	(0.268)	(0.507)
Firm size $_{t-1}$	-0.113	-0.298	-0.081	-0.234*
	(0.528)	(0.140)	(0.697)	(0.096)
Liquidity constraint $_{t-1}$	0.118	0.109	0.262	0.053
	(0.687)	(0.665)	(0.346)	(0.798)
Tax loss carry forward $_{t-1}$	-0.017	-0.143	-0.034	-0.057
	(0.913)	(0.308)	(0.875)	(0.571)
Investment grade $_{t-1}$	0.191**	0.322***	0.136*	0.206***
	(0.033)	(0.000)	(0.100)	(0.007)
R&D / Sales $_{t-1}$	-4.500**	1.736	-1.056	-0.592
	(0.047)	(0.512)	(0.612)	(0.848)
MTBAT $_{t-1}$	-0.085	-0.213**	-0.019	-0.202***
	(0.497)	(0.015)	(0.880)	(0.006)
Asset tangibility $_{t-1}$	0.904	-1.362	-0.306	0.636
	(0.350)	(0.108)	(0.820)	(0.386)
Idiosyncratic risk $_{t-1}$	0.332**	0.434***	0.153	0.457***
	(0.034)	(0.004)	(0.367)	(0.000)
Leverage $_{t-1}$	2.295***	1.965***	2.189**	2.001***
	(0.000)	(0.000)	(0.010)	(0.000)
(1) *p*-value for coefficient equality test		0.015		0.555
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	2,919	2,520	1,555	4,643
Adjusted R-squared	0.162	0.285	0.216	0.293

Panel B: Mean and median values of *Deviation* for the subsamples

Deviation = Actual – optimal inside debt	Payslice = 1	Payslice = 0	Top25 = 1	Top25 = 0
Mean	-0.254	-0.273	-0.216	-0.294
Median	0.060	0.011	0.124	0.004

Table 4: Financially unconstrained vs. constrained firms

This table reports the estimation results using the adjustment model (Campbell et al. 2016), contrasting the impact of *%INDEP* on the adjustment speed of CEO inside debt at financially unconstrained (KZ=0, SA=0, and DIV=0) vs. constrained firms (KZ=1, SA=1, and DIV=1). Firms are partitioned into KZ=0 (KZ=1) or SA=0 (SA=1) based on the median value of their Kaplan and Zingales (KZ) index or Hadlock and Pierce Size-Age (SA) index, respectively. Firms are partitioned into DIV=0 if they pay dividends during the year, or DIV=1 if they do not. In parentheses are *p*-values based on using heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Appendix I provides variable definitions.

Panel A: Adjustment model

Dep. Var. = ΔInside debt $_t$	KZ = 0 (1)	KZ = 1 (2)	SA = 0 (3)	SA = 1 (4)	DIV = 0 (5)	DIV = 1 (6)
(1) Deviation $_{t-1}$ * %INDEP $_{t-1}$	-0.234***	0.679**	-0.216***	0.992***	-0.187**	0.829**
	(0.000)	(0.017)	(0.000)	(0.000)	(0.014)	(0.017)
Deviation $_{t-1}$	-0.247***	-1.032***	-0.291***	-1.291***	-0.282***	-1.305***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
%INDEP $_{t-1}$	1.139	0.248	1.067	0.253	0.780	0.200
	(0.202)	(0.860)	(0.316)	(0.818)	(0.341)	(0.935)
CEO age $_{t-1}$	-0.001	-0.014	-0.004	-0.010	-0.014	0.006
	(0.944)	(0.442)	(0.738)	(0.658)	(0.248)	(0.835)
CEO tenure $_{t-1}$	0.002	0.021	0.021	0.003	0.022*	-0.039
	(0.901)	(0.189)	(0.108)	(0.870)	(0.052)	(0.176)
Firm size $_{t-1}$	-0.000	-0.106	-0.254	-0.112	-0.119	-0.160
	(1.000)	(0.516)	(0.114)	(0.472)	(0.376)	(0.486)
Liquidity constraint $_{t-1}$	0.116	0.066	-0.040	0.291	0.293	0.094
	(0.741)	(0.753)	(0.870)	(0.145)	(0.180)	(0.759)
Tax loss carry forward $_{t-1}$	0.093	-0.136	-0.108	0.052	-0.046	-0.042
	(0.536)	(0.252)	(0.396)	(0.722)	(0.664)	(0.852)
Investment grade $_{t-1}$	0.187**	0.212**	0.221***	0.178**	0.239***	0.0888
	(0.013)	(0.017)	(0.005)	(0.034)	(0.000)	(0.493)
R&D / Sales $_{t-1}$	-1.656	-8.439***	4.298	-2.170	0.605	-0.326
	(0.597)	(0.008)	(0.102)	(0.313)	(0.799)	(0.890)
MTBAT $_{t-1}$	-0.109	-0.129	-0.0913	-0.152*	-0.155**	0.151
	(0.212)	(0.188)	(0.356)	(0.069)	(0.022)	(0.244)
Asset tangibility $_{t-1}$	1.911	1.065	1.057	0.252	0.403	1.288
	(0.225)	(0.132)	(0.235)	(0.813)	(0.535)	(0.356)
Idiosyncratic risk $_{t-1}$	0.443***	0.313**	0.438***	0.286*	0.510***	0.110
	(0.000)	(0.033)	(0.000)	(0.055)	(0.000)	(0.564)
Leverage $_{t-1}$	2.539***	1.629***	1.695***	2.285***	1.845***	3.079***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
(1) *p*-value for coefficient equality test		0.009		0.000		0.029
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Observations	2,779	2,806	3,389	2,928	4,904	1,387
Adjusted R-squared	0.154	0.292	0.214	0.329	0.226	0.321

Panel B: Mean and median values of *Deviation* for the subsamples

Deviation = Actual – optimal inside debt	KZ = 0	KZ = 1	SA = 0	SA = 1	DIV = 0	DIV = 1
Mean	-0.165	-0.362	-0.253	-0.299	-0.261	-0.321
Median	0.146	-0.060	0.126	-0.073	0.091	-0.147

Table 5: High vs. low growth firms

This table reports the estimation results using the adjustment model (Campbell et al. 2016), contrasting the impact of *%INDEP* on the adjustment speed of CEO inside debt at firms with high grow opportunities (High *MTBEQ* and High $Sale_{t+1}/Sales_t$) vs. firms with low grow opportunities (Low *MTBEQ* and Low $Sale_{t+1}/Sales_t$). In parentheses are *p*-values computed based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Appendix I provides variable definitions.

Panel A: Adjustment model

Dep. Var. = ΔInside debt $_t$	High MTBEQ (1)	Low MTBEQ (2)	High $Sale_{t+1}/Sales_t$ (3)	Low $Sale_{t+1}/Sales_t$ (4)
(1) Deviation $_{t-1}$ * %INDEP $_{t-1}$	-0.455***	0.696***	-0.110**	0.941***
	(0.000)	(0.009)	(0.044)	(0.000)
Deviation $_{t-1}$	-0.077***	-1.071***	-0.346***	-1.258***
	(0.000)	(0.000)	(0.000)	(0.000)
%INDEP $_{t-1}$	2.305**	-0.768	1.093	0.977
	(0.048)	(0.477)	(0.240)	(0.457)
CEO age $_{t-1}$	0.000	-0.023	0.003	-0.011
	(0.998)	(0.295)	(0.806)	(0.540)
CEO tenure $_{t-1}$	0.012	0.031*	-0.010	0.020
	(0.346)	(0.091)	(0.463)	(0.243)
Firm size $_{t-1}$	-0.190	-0.134	-0.022	-0.170
	(0.240)	(0.429)	(0.889)	(0.291)
Liquidity constraint $_{t-1}$	0.051	0.127	0.503*	0.031
	(0.880)	(0.572)	(0.083)	(0.918)
Tax loss carry forward $_{t-1}$	0.074	-0.137	0.009	-0.027
	(0.566)	(0.323)	(0.933)	(0.862)
Investment grade $_{t-1}$	0.073	0.345***	0.101	0.397***
	(0.306)	(0.000)	(0.147)	(0.000)
R&D / Sales $_{t-1}$	0.973	4.821	-2.236	1.797
	(0.607)	(0.271)	(0.260)	(0.633)
MTBAT $_{t-1}$	-0.216***	-0.104	-0.144	-0.194**
	(0.002)	(0.655)	(0.105)	(0.037)
Asset tangibility $_{t-1}$	-0.724	1.009	-0.742	1.464*
	(0.350)	(0.397)	(0.401)	(0.080)
Idiosyncratic risk $_{t-1}$	0.312**	0.423***	0.235*	0.526***
	(0.012)	(0.005)	(0.055)	(0.000)
Leverage $_{t-1}$	2.723***	1.010	2.614***	1.617***
	(0.000)	(0.131)	(0.000)	(0.005)
(1) *p*-value for coefficient equality test		0.000		0.000
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	3,118	3,016	3,082	3,008
Adjusted R-squared	0.261	0.330	0.149	0.337

Panel B: Mean and median values of *Deviation* for the subsamples

Deviation = Actual – optimal inside debt	High MTB	Low MTB	High $Sale_{t+1}/Sales_t$	Low $Sale_{t+1}/Sales_t$
Mean	-0.053	-0.501	-0.167	-0.384
Median	0.183	-0.142	0.084	-0.016

Table 6: Under- vs. over- levered firms

This table reports the estimation results from the adjustment model (Campbell et al. 2016), contrasting the impact of *%INDEP* on the adjustment speed of CEO inside debt at under- vs. over-levered firms. A firm is defined as over-levered if its debt ratio is above the optimal debt ratio and under-levered otherwise. In parentheses are *p*-values computed based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Appendix I provides variable definitions.

Panel A: Adjustment model

Dep. Var. = ΔInside debt $_t$	Under-levered (1)	Over-levered (2)
(1) Deviation $_{t-1}$ * %INDEP $_{t-1}$	-0.222***	0.563*
	(0.000)	(0.068)
Deviation $_{t-1}$	-0.238***	-0.980***
	(0.000)	(0.000)
%INDEP $_{t-1}$	1.490*	1.330
	(0.096)	(0.447)
CEO age $_{t-1}$	-0.010	-0.027
	(0.362)	(0.179)
CEO tenure $_{t-1}$	0.005	0.038*
	(0.669)	(0.070)
Firm size $_{t-1}$	-0.218	0.014
	(0.168)	(0.944)
Liquidity constraint $_{t-1}$	0.052	0.114
	(0.865)	(0.722)
Tax loss carry forward $_{t-1}$	0.130	-0.180
	(0.307)	(0.262)
Investment grade $_{t-1}$	0.122**	0.271***
	(0.049)	(0.009)
R&D / Sales $_{t-1}$	1.322	-5.001
	(0.514)	(0.257)
MTBAT $_{t-1}$	-0.066	-0.145
	(0.523)	(0.162)
Asset tangibility $_{t-1}$	-0.384	2.706***
	(0.610)	(0.010)
Idiosyncratic risk $_{t-1}$	0.298***	0.324*
	(0.007)	(0.059)
Leverage $_{t-1}$	2.191***	2.318***
	(0.000)	(0.000)
(1) *p*-value for coefficient equality test	0.040	
Firm FE	YES	YES
Year FE	YES	YES
Observations	3,358	2,098
Adjusted R-squared	0.119	0.360

Panel B: Mean and median values of *Deviation* for the subsamples

Deviation = Actual – optimal inside debt	Under-levered	Over-levered
Mean	-0.120	-0.529
Median	0.124	-0.119

Table 7: Overconfident vs. rational CEOs

This table reports the estimation results using the adjustment model (Campbell et al. 2016), contrasting the impact of *%INDEP* on the adjustment speed of CEO inside debt at firms led by overconfident CEOs (Holder67=1) vs. firms not led by overconfident CEOs (rational CEOs, Holder67 = 0). In parentheses are *p*-values computed based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Appendix I provides variable definitions..

Panel A: Adjustment model

Dep. Var. = ΔInside debt $_t$	Holder67 = 1 (1)	Holder67 = 0 (2)
(1) Deviation $_{t-1}$ * %INDEP $_{t-1}$	-0.388***	0.817***
	(0.000)	(0.002)
Deviation $_{t-1}$	-0.214***	-1.205***
	(0.000)	(0.000)
%INDEP $_{t-1}$	1.254	0.049
	(0.268)	(0.966)
CEO age $_{t-1}$	0.006	-0.027
	(0.674)	(0.139)
CEO tenure $_{t-1}$	-0.006	0.026
	(0.666)	(0.203)
Firm size $_{t-1}$	-0.266*	-0.174
	(0.070)	(0.454)
Liquidity constraint $_{t-1}$	0.339	0.094
	(0.116)	(0.773)
Tax loss carry forward $_{t-1}$	0.034	-0.232
	(0.782)	(0.247)
Investment grade $_{t-1}$	0.160**	0.340***
	(0.016)	(0.001)
R&D / Sales $_{t-1}$	-2.566	7.085
	(0.163)	(0.170)
MTBAT $_{t-1}$	-0.124	-0.177
	(0.134)	(0.212)
Asset tangibility $_{t-1}$	-0.541	1.222
	(0.466)	(0.252)
Idiosyncratic risk $_{t-1}$	0.423***	0.485**
	(0.001)	(0.010)
Leverage $_{t-1}$	2.457***	3.106***
	(0.000)	(0.000)
(1) *p*-value for coefficient equality test	0.000	
Firm FE	YES	YES
Year FE	YES	YES
Observations	3,931	2,323
Adjusted R-squared	0.213	0.362

Panel B: Mean and median values of *Deviation* for the subsamples

Deviation = Actual – optimal inside debt	Holder67 = 1	Holder67 = 0
Mean	-0.178	-0.432
Median	0.061	0.004

Table 8: Endogeneity checks

This table reports the estimation results from three endogeneity checks. Columns (1) and (2) of Panel A replace the one-year-lagged values of *%INDEP* with the historical values of 2004 and 1996, respectively, before the start of the sample period. Column (3) of Panel A reports the estimation results from the dynamic GMM test. Panel B reports the estimation results from the 2SLS-IV method. The IVs are the industry average of the fraction of independent directors on the board and director sudden death. In parentheses are *p*-values computed based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Appendix I provides variable definitions.

Panel A: Using historical values of %INDEP and dynamic GMM

Dep. Var. = ΔInside debt $_t$	Using historical values of %INDEP		Dynamic GMM
	(1)	(2)	(3)
Inside debt $_{t-1}$ * %INDEP $_{2004}$	-0.255***		
	(0.000)		
Inside debt $_{t-1}$ * %INDEP $_{1996}$		-0.292***	
		(0.000)	
Deviation $_{t-1}$ * %INDEP $_{t-1}$			-0.484**
			(0.012)
Deviation $_{t-1}$	-0.242***	-0.228***	0.121
	(0.000)	(0.000)	(0.382)
ΔInside debt $_{t-1}$			-0.147***
			(0.000)
ΔInside debt $_{t-2}$			-0.0525**
			(0.020)
%INDEP $_{t-1}$	2.299	1.777	-0.336
	(0.757)	(0.814)	(0.825)
CEO age $_{t-1}$	-0.00699	-0.0105	0.00375
	(0.535)	(0.349)	(0.895)
CEO tenure $_{t-1}$	0.0110	0.0119	-0.0102
	(0.303)	(0.328)	(0.641)
Firm size $_{t-1}$	-0.222*	-0.240	-0.295*
	(0.066)	(0.111)	(0.059)
Liquidity constraint $_{t-1}$	0.162	0.188	0.592
	(0.392)	(0.429)	(0.186)
Tax loss carry forward $_{t-1}$	-0.0354	-0.149	-0.503**
	(0.720)	(0.277)	(0.027)
Investment grade $_{t-1}$	0.239***	0.243***	0.104
	(0.000)	(0.001)	(0.469)
R&D / Sales $_{t-1}$	0.581	1.829	-1.162
	(0.728)	(0.396)	(0.852)
MTBAT $_{t-1}$	-0.166**	-0.126	-0.132
	(0.016)	(0.153)	(0.136)
Asset tangibility $_{t-1}$	0.282	0.397	-1.541*
	(0.669)	(0.628)	(0.060)
Idiosyncratic risk $_{t-1}$	0.322***	0.501***	0.0114
	(0.001)	(0.000)	(0.941)
Leverage $_{t-1}$	2.079***	1.783***	0.336
	(0.000)	(0.000)	(0.612)
Industry FE	NO	NO	YES

Firm FE	YES	YES	NO
Year FE	YES	YES	YES
Observations	4,868	3,307	3,957
Adjusted R-squared	0.246	0.231	
AR(1) test (*p*-value)			(0.072)
AR(2) test (*p*-value)			(0.675)
Hansen over-identification test (*p*-value)			(0.995)

Panel B: 2SLS-IV

Dep. Var. =	%INDEP $_{t-1}$	Deviation $_{t-1}$ * %INDEP $_{t-1}$	ΔInside debt $_t$
	First-stage		Second-stage
	(1)	(2)	(3)
IV.Industry_AVG $_{t-1}$	0.624***	-0.794	
	(0.000)	(0.110)	
IV.Sudden death $_{t-1}$	-0.002	-0.0564	
	(0.587)	(0.214)	
Deviation $_{t-1}$		0.576***	-0.283***
		(0.000)	(0.000)
Predicted_Deviation $_{t-1}$ * %INDEP $_{t-1}$			-0.300**
			(0.028)
Predicted_%INDEP $_{t-1}$			-1.789
			(0.513)
CEO age $_{t-1}$	0.000	0.004	-0.008
	(0.458)	(0.378)	(0.450)
CEO tenure $_{t-1}$	-0.000	0.003	0.014
	(0.806)	(0.422)	(0.181)
Firm size $_{t-1}$	0.003	0.085	-0.107
	(0.450)	(0.147)	(0.343)
Liquidity constraint $_{t-1}$	0.006*	-0.016	0.237
	(0.069)	(0.790)	(0.182)
Tax loss carry forward $_{t-1}$	-0.000	0.019	-0.027
	(0.958)	(0.539)	(0.777)
Investment grade $_{t-1}$	0.001	0.016	0.201***
	(0.339)	(0.568)	(0.000)
R&D / Sales $_{t-1}$	0.064	0.048	0.056
	(0.205)	(0.944)	(0.973)
MTBAT $_{t-1}$	-0.003**	0.060	-0.098
	(0.014)	(0.133)	(0.148)
Asset tangibility $_{t-1}$	-0.013	0.021	0.304
	(0.402)	(0.928)	(0.623)
Idiosyncratic risk $_{t-1}$	0.001	0.094	0.418***
	(0.588)	(0.116)	(0.000)
Leverage $_{t-1}$	0.004	-0.251	1.952***
	(0.628)	(0.272)	(0.000)
Firm FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	8,688	6,357	6,357
Adjusted R-squared	0.720	0.881	0.241
Under-identification *F*-statistic			70.411

Table 9: Control for Internal governance mechanisms

This table reports the estimation results using the adjustment model (Campbell et al. 2016). The E-Index (*E-index*) is the Entrenchment Index from Bebchuk et al. (2009). *Classified board* is a dummy that equals one if a firm has a classified board, and zero otherwise. *Co-Opt* is the number of co-opted directors over board size (Coles et al., 2014). In parentheses are *p*-values computed based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Appendix I provides variable definitions.

Dep. Var. = ΔInside debt $_t$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Deviation $_{t-1}$ * %INDEP $_{t-1}$								-0.376***
								(0.000)
%INDEP $_{t-1}$							0.642	1.178
							(0.414)	(0.207)
Deviation $_{t-1}$ * E-Index $_{t-1}$		-0.043						-0.039
		(0.114)						(0.275)
E-Index $_{t-1}$	0.203***	0.190***						0.204**
	(0.004)	(0.005)						(0.016)
Deviation $_{t-1}$ * Classified board $_{t-1}$				-0.063				0.048
				(0.401)				(0.460)
Classified board $_{t-1}$			0.052	0.035				-0.157
			(0.583)	(0.711)				(0.267)
Deviation $_{t-1}$ * Co-Opt $_{t-1}$						-0.043		0.182**
						(0.796)		(0.034)
Co-Opt $_{t-1}$					-0.067	-0.080		0.048
					(0.747)	(0.699)		(0.846)
Deviation $_{t-1}$	-0.410***	-0.276**	-0.407***	-0.391***	-0.407***	-0.395***	-0.398***	-0.149
	(0.000)	(0.016)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.185)
CEO age $_{t-1}$	-0.010	-0.011	-0.006	-0.006	-0.005	-0.005	-0.011	-0.004
	(0.359)	(0.345)	(0.602)	(0.585)	(0.620)	(0.631)	(0.303)	(0.753)
CEO tenure $_{t-1}$	0.014	0.014	0.009	0.009	0.012	0.012	0.013	0.011
	(0.224)	(0.217)	(0.428)	(0.414)	(0.417)	(0.409)	(0.206)	(0.514)
Firm size $_{t-1}$	-0.213*	-0.208*	-0.136	-0.142	-0.135	-0.137	-0.150	-0.127
	(0.089)	(0.098)	(0.236)	(0.219)	(0.241)	(0.236)	(0.155)	(0.376)
Liquidity constraint $_{t-1}$	0.174	0.178	0.308	0.313	0.309	0.306	0.236	0.250
	(0.331)	(0.327)	(0.107)	(0.107)	(0.105)	(0.105)	(0.183)	(0.189)
Tax loss carry forward $_{t-1}$	-0.060	-0.049	0.002	0.011	0.003	0.003	-0.034	0.004
	(0.550)	(0.627)	(0.986)	(0.910)	(0.974)	(0.973)	(0.712)	(0.972)
Investment grade $_{t-1}$	0.179***	0.180***	0.198***	0.198***	0.198***	0.197***	0.189***	0.192***
	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
R&D / Sales $_{t-1}$	1.091	1.223	-0.744	-0.772	-0.694	-0.717	-0.147	0.174
	(0.620)	(0.583)	(0.648)	(0.636)	(0.668)	(0.660)	(0.927)	(0.941)
MTBAT $_{t-1}$	-0.176***	-0.172***	-0.137**	-0.134**	-0.136**	-0.135**	-0.121**	-0.168**
	(0.006)	(0.007)	(0.022)	(0.026)	(0.022)	(0.025)	(0.042)	(0.018)
Asset tangibility $_{t-1}$	0.600	0.578	0.239	0.204	0.240	0.242	0.336	0.587
	(0.398)	(0.415)	(0.705)	(0.744)	(0.702)	(0.700)	(0.575)	(0.460)
Idiosyncratic risk $_{t-1}$	0.378***	0.387***	0.358***	0.365***	0.358***	0.356***	0.370***	0.411***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Leverage $_{t-1}$	2.261***	2.244***	2.038***	2.025***	2.039***	2.034***	2.078***	2.131***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	5,792	5,792	5,767	5,767	5,767	5,767	6,357	5,284
Adjusted R-squared	0.211	0.212	0.234	0.235	0.234	0.234	0.237	0.219

Table 10: Control for the monitoring roles of blockholders and institutional investors

This table reports the estimation results using the adjustment model (Campbell et al. 2016). *Block* is ownership by investors who own 5% of the company outstanding shares and above. *IO* is institutional ownership. In parentheses are *p*-values computed based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Appendix I provides variable definitions.

Dep. Var. = ΔInside debt $_{t}$	(1)	(2)	(3)	(4)	(5)
Deviation $_{t-1}$ * %INDEP $_{t-1}$					-0.330**
					(0.011)
%INDEP $_{t-1}$					0.373
					(0.633)
Deviation $_{t-1}$ * Block $_{t-1}$		-0.314			-0.166
		(0.139)			(0.284)
Block $_{t-1}$	0.052	-0.049			0.053
	(0.858)	(0.867)			(0.863)
Deviation $_{t-1}$ * IO $_{t-1}$				-0.166	0.164
				(0.167)	(0.228)
IO $_{t-1}$			-0.559	-0.581	-0.434
			(0.241)	(0.218)	(0.333)
Deviation $_{t-1}$	-0.398***	-0.375***	-0.398***	-0.316***	-0.279***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CEO age $_{t-1}$	-0.010	-0.010	-0.008	-0.007	-0.008
	(0.311)	(0.317)	(0.408)	(0.472)	(0.466)
CEO tenure $_{t-1}$	0.012	0.012	0.011	0.011	0.011
	(0.219)	(0.235)	(0.278)	(0.253)	(0.287)
Firm size $_{t-1}$	-0.149	-0.148	-0.181*	-0.172	-0.168
	(0.160)	(0.170)	(0.089)	(0.117)	(0.133)
Liquidity constraint $_{t-1}$	0.239	0.251	0.246	0.245	0.245
	(0.179)	(0.162)	(0.175)	(0.178)	(0.177)
Tax loss carry forward $_{t-1}$	-0.034	-0.028	-0.024	-0.019	-0.021
	(0.711)	(0.758)	(0.784)	(0.833)	(0.820)
Investment grade $_{t-1}$	0.189***	0.185***	0.200***	0.205***	0.199***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
R&D / Sales $_{t-1}$	-0.097	-0.158	-0.149	-0.036	-0.380
	(0.951)	(0.921)	(0.927)	(0.982)	(0.817)
MTBAT $_{t-1}$	-0.123**	-0.124**	-0.153***	-0.142**	-0.144**
	(0.040)	(0.040)	(0.009)	(0.022)	(0.021)
Asset tangibility $_{t-1}$	0.322	0.293	0.246	0.245	0.237
	(0.592)	(0.624)	(0.678)	(0.686)	(0.700)
Idiosyncratic risk $_{t-1}$	0.369***	0.366***	0.383***	0.402***	0.397***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Leverage $_{t-1}$	2.076***	2.023***	2.090***	2.030***	2.047***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Observations	6,357	6,357	6,296	6,296	6,296
Adjusted R-squared	0.237	0.238	0.239	0.242	0.244

Internet Appendix to "CEO Inside Debt and Board Independence"

This online appendix provides additional results to supplement the evidence in the manuscript, entitled "CEO Inside Debt and Board Independence."

Table 1: CEO bargaining power and the adjustment speed

This table reports the estimation results from the partial adjustment model, contrasting the impact of *%INDEP* on the adjustment speed of CEO inside debt at firms with high vs. low CEO bargaining power. Firms with *Payslice* = 1 (*Payslice* > median value of the sample in a given year) and *Top25* = 1 are classified as firms with high CEO bargaining power, and as low otherwise (*Payslice* = 0 and *Top25* = 0) . *Payslice* is the fraction of the aggregate compensation of the top five executives captured by the CEO (Bebchuk et al. 2011). *Top25* is an indicator that equals one if the CEO's total compensation is in the top 25% of the sample in a given year (Humphery-Jenner et al. 2016). In parentheses are *p*-values computed based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Appendix I provides variable definitions.

Dep. Var. = Inside debt $_t$	Payslice = 1	Payslice = 0	Top25 = 1	Top25 = 0
	(1)	(2)	(3)	(4)
(1) Inside debt $_{t-1}$ * %INDEP $_{t-1}$	-0.308***	0.522*	-0.443***	0.076
	(0.000)	(0.073)	(0.000)	(0.441)
Inside debt $_{t-1}$	0.772***	0.124	0.937***	0.473***
	(0.000)	(0.618)	(0.000)	(0.000)
CEO age $_{t-1}$	0.019	-0.000	-0.004	0.019
	(0.222)	(0.969)	(0.850)	(0.146)
CEO tenure $_{t-1}$	-0.004	0.021	0.024	0.009
	(0.804)	(0.268)	(0.233)	(0.472)
Firm size $_{t-1}$	-0.124	-0.331	-0.103	-0.252*
	(0.495)	(0.103)	(0.633)	(0.074)
Liquidity constraint $_{t-1}$	-0.168	-0.166	-0.012	-0.229
	(0.570)	(0.498)	(0.967)	(0.264)
Tax loss carry forward $_{t-1}$	-0.198	-0.302**	-0.198	-0.222**
	(0.194)	(0.028)	(0.357)	(0.027)
Investment grade $_{t-1}$	0.107	0.246***	0.060	0.125*
	(0.227)	(0.005)	(0.470)	(0.097)
R&D/Sales $_{t-1}$	-3.440	2.798	-0.123	0.330
	(0.130)	(0.284)	(0.953)	(0.914)
MTBAT $_{t-1}$	0.184	0.021	0.225*	0.053
	(0.155)	(0.809)	(0.081)	(0.482)
Asset tangibility $_{t-1}$	0.642	-1.586*	-0.502	0.433
	(0.509)	(0.060)	(0.700)	(0.555)
Idiosyncratic risk $_{t-1}$	-0.040	0.107	-0.209	0.105
	(0.792)	(0.473)	(0.209)	(0.340)
Leverage $_{t-1}$	-0.414	-0.385	-0.236	-0.530
	(0.425)	(0.489)	(0.791)	(0.178)
(1) *p*-value for coefficient equality test	0.027		0.472	
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	2,919	2,520	1,555	4,643
Adjusted R-squared	0.681	0.736	0.792	0.697

Table 2: Financially unconstrained vs. constrained firms

This table reports the estimation results from the partial adjustment model, contrasting the impact of *%INDEP* on the adjustment speed of CEO inside debt at financially unconstrained firms (KZ=0, SA=0, and DIV=0) vs. financially constrained firms (KZ=1, SA=1, and DIV=1). In columns (1) and (2), firms are partitioned into KZ=0, if the firm's Kaplan and Zingales (KZ) index is below the sample median in the given year, and into KZ = 1 if above the sample median. In columns (3) and (4), firms are partitioned into SA=0, if the firm's Size-Age (SA) index of Hadlock and Pierce (2010) is below the sample median in the given year, and into SA=1 if above the sample median. In columns (5) and (6), firms are partitioned into DIV=0 if the firm pays dividends during the year, and into DIV=1 if the firm does not pay dividends. In parentheses are *p*-values computed based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Appendix I provides variable definitions.

Dep. Var. = Inside debt $_t$	KZ = 0 (1)	KZ = 1 (2)	SA = 0 (3)	SA = 1 (4)	DIV = 0 (5)	DIV = 1 (6)
(1) Inside debt $_{t-1}$ * %INDEP $_{t-1}$	-0.255***	0.650***	-0.230***	0.801***	-0.180*	0.390
	(0.000)	(0.009)	(0.000)	(0.000)	(0.054)	(0.158)
Inside debt $_{t-1}$	0.766***	-0.007	0.719***	-0.138	0.716***	0.046
	(0.000)	(0.974)	(0.000)	(0.361)	(0.000)	(0.833)
CEO age $_{t-1}$	0.016	0.004	0.015	0.009	0.003	0.029
	(0.233)	(0.823)	(0.204)	(0.710)	(0.780)	(0.336)
CEO tenure $_{t-1}$	0.003	0.021	0.022*	0.003	0.022**	-0.036
	(0.812)	(0.188)	(0.085)	(0.889)	(0.043)	(0.217)
Firm size $_{t-1}$	-0.009	-0.143	-0.274*	-0.137	-0.135	-0.169
	(0.959)	(0.389)	(0.088)	(0.383)	(0.314)	(0.468)
Liquidity constraint $_{t-1}$	-0.153	-0.217	-0.319	-0.007	0.036	-0.293
	(0.665)	(0.293)	(0.191)	(0.973)	(0.869)	(0.348)
Tax loss carry forward $_{t-1}$	-0.070	-0.294**	-0.279**	-0.114	-0.202*	-0.274
	(0.635)	(0.014)	(0.028)	(0.418)	(0.051)	(0.234)
Investment grade $_{t-1}$	0.106	0.134	0.141*	0.100	0.161**	-0.018
	(0.155)	(0.129)	(0.076)	(0.226)	(0.011)	(0.891)
R&D/Sales $_{t-1}$	-0.457	-7.387**	5.220*	-1.185	1.699	0.980
	(0.886)	(0.019)	(0.054)	(0.579)	(0.474)	(0.677)
MTBAT $_{t-1}$	0.134	0.119	0.165	0.095	0.0831	0.510***
	(0.139)	(0.244)	(0.108)	(0.267)	(0.235)	(0.000)
Asset tangibility $_{t-1}$	1.723	0.828	0.820	-0.123	0.195	0.920
	(0.274)	(0.239)	(0.357)	(0.905)	(0.763)	(0.498)
Idiosyncratic risk $_{t-1}$	0.095	-0.030	0.073	-0.077	0.175*	-0.355*
	(0.439)	(0.831)	(0.538)	(0.596)	(0.063)	(0.056)
Leverage $_{t-1}$	0.054	-0.814*	-0.927*	-0.153	-0.573	-0.291
	(0.917)	(0.075)	(0.054)	(0.738)	(0.156)	(0.673)
(1) *p*-value for coefficient equality test	0.004		0.000		0.112	
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Observations	2,779	2,806	3,389	2,928	4,904	1,387
Adjusted R-squared	0.716	0.674	0.703	0.719	0.694	0.738

Table 3: High vs. low growth firms

This table reports the estimation results from the partial adjustment model, contrasting the impact of *%INDEP* on the adjustment speed of CEO inside debt at firms with high grow opportunities (High *MTBEQ* and High $Sale_{t+1}/Sales_t$) vs. firms with low grow opportunities (Low *MTBEQ* and Low $Sale_{t+1}/Sales_t$). Firms are partitioned into High vs. Low subsamples based on the median value of the variables in the given year. *MTBEQ* is the ratio of the market-to-book value of equity. In parentheses are *p*-values computed based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Appendix I provides variable definitions.

Dep. Var. = Inside debt $_t$	High MTBEQ	Low MTBEQ	High $Sale_{t+1}/Sales_t$	Low $Sale_{t+1}/Sales_t$
	(1)	(2)	(3)	(4)
(1) Inside debt $_{t-1}$ * %INDEP $_{t-1}$	-0.461***	0.541**	-0.135**	0.835***
	(0.000)	(0.028)	(0.022)	(0.000)
Inside debt $_{t-1}$	0.936***	0.056	0.668***	-0.170
	(0.000)	(0.787)	(0.000)	(0.359)
CEO age $_{t-1}$	0.015	-0.004	0.0203	0.008
	(0.214)	(0.861)	(0.122)	(0.644)
CEO tenure $_{t-1}$	0.015	0.032*	-0.009	0.019
	(0.244)	(0.079)	(0.489)	(0.270)
Firm size $_{t-1}$	-0.186	-0.140	-0.028	-0.161
	(0.252)	(0.405)	(0.861)	(0.322)
Liquidity constraint $_{t-1}$	-0.235	-0.176	0.238	-0.280
	(0.479)	(0.435)	(0.411)	(0.360)
Tax loss carry forward $_{t-1}$	-0.091	-0.308**	-0.148	-0.192
	(0.469)	(0.026)	(0.166)	(0.224)
Investment grade $_{t-1}$	-0.010	0.259***	0.024	0.314***
	(0.886)	(0.006)	(0.728)	(0.001)
R&D/Sales $_{t-1}$	2.071	6.129	-1.245	3.033
	(0.277)	(0.159)	(0.528)	(0.409)
MTBAT $_{t-1}$	0.031	0.154	0.099	0.061
	(0.670)	(0.513)	(0.276)	(0.525)
Asset tangibility $_{t-1}$	-0.907	0.780	-0.908	1.141
	(0.241)	(0.507)	(0.304)	(0.160)
Idiosyncratic risk $_{t-1}$	-0.055	0.0620	-0.102	0.198
	(0.632)	(0.664)	(0.395)	(0.175)
Leverage $_{t-1}$	0.170	-1.667**	0.157	-0.795
	(0.705)	(0.013)	(0.735)	(0.176)
(1) *p*-value for coefficient equality test	0.001		0.001	
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	3,118	3,016	3,082	3,008
Adjusted R-squared	0.813	0.683	0.709	0.697

Table 4: Under- vs. over- levered firms

This table reports the estimation results from the partial adjustment model, contrasting the impact of *%INDEP* on the adjustment speed of CEO inside debt at under- vs. over-levered firms. A firm is defined as over-levered if its debt ratio is above the optimal debt ratio and under-levered otherwise. The optimal debt ratio is the fitted value from regressing the market debt ratio on firm size (the natural logarithm of total assets), profitability (Income before extraordinary items + Interest expense + Income taxes)/Total assets), the MTB ratio ((Book liabilities + the market value of equity)/Total assets), Depreciation (Depreciation and amortization/Total assets), Asset tangibility (Net PPE/Total assets), the R&D ratio (Research and development expenses/Total assets; missing R&D expenses are set to zero), the R&D dummy that equals one if R&D expenses = 0, and zero otherwise, and the median industry debt ratio for the firm's Fama and French (1997) industry (Flannery and Ragan 2006; Faulkender et al. 2012). The market debt ratio = Total book debt (Long-term debt + Notes payable)/(Total book debt + The number of shares outstanding * share price at the fiscal year-end). In parentheses are *p*-values computed based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Appendix I provides variable definitions.

Dep. Var. = Inside debt $_t$	Under-levered (1)	Over-levered (2)
(1) Inside debt $_{t-1}$ * %INDEP $_{t-1}$	-0.246***	0.535**
	(0.000)	(0.044)
Inside debt $_{t-1}$	0.778***	0.046
	(0.000)	(0.838)
CEO age $_{t-1}$	0.007	-0.009
	(0.542)	(0.663)
CEO tenure $_{t-1}$	0.006	0.037*
	(0.607)	(0.078)
Firm size $_{t-1}$	-0.225	-0.031
	(0.161)	(0.872)
Liquidity constraint $_{t-1}$	-0.200	-0.189
	(0.512)	(0.549)
Tax loss carry forward $_{t-1}$	-0.021	-0.365**
	(0.868)	(0.021)
Investment grade $_{t-1}$	0.048	0.181*
	(0.441)	(0.080)
R&D/Sales $_{t-1}$	2.325	-3.906
	(0.253)	(0.370)
MTBAT $_{t-1}$	0.162	0.120
	(0.130)	(0.269)
Asset tangibility $_{t-1}$	-0.554	2.277**
	(0.462)	(0.030)
Idiosyncratic risk $_{t-1}$	-0.036	-0.050
	(0.740)	(0.760)
Leverage $_{t-1}$	-0.189	-0.377
	(0.722)	(0.556)
(1) *p*-value for coefficient equality test	0.007	
Firm FE	YES	YES
Year FE	YES	YES
Observations	3,358	2,098
Adjusted R-squared	0.667	0.709

Table 5: Overconfident CEO

This table reports the estimation results from the partial adjustment model, contrasting the impact of *%INDEP* on the adjustment speed of CEO inside debt at firms led by overconfident CEOs (Holder67=1) vs. firms not led by overconfident CEOs (Holder67=0). Columns (1) and (2) report results for firms with overconfident CEOs and non-overconfident CEOs, respectively. In parentheses are *p*-values computed based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Appendix I provides variable definitions.

Dep. Var. = Inside debt $_{t}$	Holder67 = 1	Holder67 = 0
	(1)	(2)
(1) Inside debt $_{t-1}$ * %INDEP $_{t-1}$	-0.416***	0.740***
	(0.000)	(0.001)
Inside debt $_{t-1}$	0.807***	-0.138
	(0.000)	(0.481)
CEO age $_{t-1}$	0.026*	-0.006
	(0.074)	(0.756)
CEO tenure $_{t-1}$	-0.004	0.025
	(0.750)	(0.221)
Firm size $_{t-1}$	-0.283*	-0.202
	(0.056)	(0.386)
Liquidity constraint $_{t-1}$	0.020	-0.213
	(0.924)	(0.518)
Tax loss carry forward $_{t-1}$	-0.163	-0.411**
	(0.181)	(0.040)
Investment grade $_{t-1}$	0.064	0.247**
	(0.334)	(0.014)
R&D/Sales $_{t-1}$	-1.359	7.865
	(0.458)	(0.120)
MTBAT $_{t-1}$	0.170*	0.096
	(0.051)	(0.501)
Asset tangibility $_{t-1}$	-0.754	0.939
	(0.313)	(0.369)
Idiosyncratic risk $_{t-1}$	0.006	0.106
	(0.960)	(0.571)
Leverage $_{t-1}$	-0.531	0.390
	(0.211)	(0.569)
(1) *p*-value for coefficient equality test	0.000	
Firm FE	YES	YES
Year FE	YES	YES
Observations	3,931	2,323
Adjusted R-squared	0.709	0.715

Table 6: Endogeneity checks

This table reports the estimation results from three endogeneity tests for the partial adjustment model. Columns (1) and (2) replace the lagged values of *%INDEP* with the historical values before the start of the sample period. Column (3) reports the estimation results from the dynamic GMM test. Columns (4) and (5) report the estimation results from the first- and second-stage of the 2SLS-IV test, respectively. The IVs are the industry average of the fraction of independent directors on the board and director sudden death. In parentheses are *p*-values computed based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Appendix I provides variable definitions.

Dep. Var. = Inside debt $_{t}$	Using historical values of %INDEP		Dynamic GMM	2SLS-IV 1st stage	2SLS-IV 2nd stage
	(1)	(2)	(3)	(4)	(5)
Inside debt $_{t-1}$ * %INDEP $_{2004}$	-0.315***				
	(0.000)				
Inside debt $_{t-1}$ * %INDEP $_{1996}$		-0.340***			
		(0.000)			
Inside debt $_{t-1}$ * %INDEP $_{t-1}$			-0.499*		
			(0.083)		
Predicted_Inside debt $_{t-1}$ * %INDEP $_{t-1}$					-0.315**
					(0.045)
Inside debt $_{t-1}$	0.801***	0.808***	1.006***	0.586***	0.730***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inside debt $_{t-2}$			0.054*		
			(0.050)		
IV.Industry_AVG $_{t-1}$				-1.464***	
				(0.004)	
IV.Sudden death $_{t-1}$				-0.056	
				(0.186)	
CEO age $_{t-1}$	0.010	0.007	-0.030	0.013	0.012
	(0.365)	(0.564)	(0.296)	(0.122)	(0.280)
CEO tenure $_{t-1}$	0.012	0.014	0.028	0.006	0.016
	(0.253)	(0.250)	(0.207)	(0.168)	(0.118)
Firm size $_{t-1}$	-0.236*	-0.251*	-0.174	0.077	-0.131
	(0.050)	(0.092)	(0.394)	(0.127)	(0.246)
Liquidity constraint $_{t-1}$	-0.106	-0.069	0.344	-0.154	-0.082
	(0.573)	(0.773)	(0.389)	(0.234)	(0.638)
Tax loss carry forward $_{t-1}$	-0.201**	-0.312**	-0.436**	-0.076	-0.214**
	(0.040)	(0.021)	(0.031)	(0.174)	(0.019)
Investment grade $_{t-1}$	0.159**	0.165**	0.137	-0.035*	0.103*
	(0.017)	(0.029)	(0.351)	(0.061)	(0.072)
R&D / Sales $_{t-1}$	1.577	2.736	8.819	0.551	0.979
	(0.347)	(0.208)	(0.124)	(0.421)	(0.549)
MTBAT $_{t-1}$	0.089	0.124	0.232**	0.200*	0.198**
	(0.213)	(0.175)	(0.050)	(0.073)	(0.015)
Asset tangibility $_{t-1}$	0.080	0.247	-0.883	-0.066	0.118
	(0.904)	(0.766)	(0.176)	(0.769)	(0.849)
Idiosyncratic risk $_{t-1}$	-0.028	0.152	-0.027	-0.118*	0.012
	(0.770)	(0.200)	(0.860)	(0.096)	(0.893)
Leverage $_{t-1}$	-0.463	-0.736	-1.743**	-1.713*	-0.985**

	(0.208)	(0.114)	(0.022)	(0.078)	(0.018)
Industry FE	NO	NO	YES	NO	NO
Firm FE	YES	YES	NO	YES	YES
Year FE	YES	YES	YES	YES	YES
Observations	4,868	3,307	5,037	6,357	6,357
Adjusted R-squared	0.697	0.684		0.928	0.702
AR(1) test (*p*-value)			(0.032)		
AR(2) test (*p*-value)			(0.772)		
Hansen over-identification test (*p*-value)			(0.985)		
Under-identification *F*-statistic					59.604

Table 7: Control for Internal governance mechanisms

This table reports the estimation results from the partial adjustment model. The E-Index (*E-index*) is the Entrenchment Index from Bebchuk et al. (2009). *Classified board* is a dummy that equals one if a firm has a classified board, and zero otherwise. *Co-Opt* is the number of co-opted directors over board size (Coles et al., 2014). In parentheses are *p*-values computed based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Appendix I provides variable definitions.

Dep. Var. = Inside debt $_t$	(1)	(2)	(3)	(4)
Inside debt $_{t-1}$ * %INDEP $_{t-1}$				-0.293***
				(0.000)
Inside debt $_{t-1}$ * E-Index $_{t-1}$	-0.042*			-0.038
	(0.056)			(0.166)
Inside debt $_{t-1}$ * Classified boards $_{t-1}$		-0.062		0.026
		(0.271)		(0.609)
Inside debt $_{t-1}$ * Co-Opt $_{t-1}$			0.013	0.068
			(0.858)	(0.282)
Inside debt $_{t-1}$	0.723***	0.609***	0.588***	0.834***
	(0.000)	(0.000)	(0.000)	(0.000)
CEO age $_{t-1}$	0.005	0.010	0.010	0.015
	(0.677)	(0.385)	(0.396)	(0.228)
CEO tenure $_{t-1}$	0.015	0.010	0.010	0.016
	(0.178)	(0.386)	(0.391)	(0.229)
Firm size $_{t-1}$	-0.217*	-0.163	-0.147	-0.147
	(0.087)	(0.159)	(0.201)	(0.311)
Liquidity constraint $_{t-1}$	-0.080	0.048	0.066	-0.054
	(0.674)	(0.808)	(0.739)	(0.773)
Tax loss carry forward $_{t-1}$	-0.183*	-0.138	-0.142	-0.159
	(0.083)	(0.159)	(0.148)	(0.122)
Investment grade $_{t-1}$	0.103*	0.124**	0.126**	0.097
	(0.084)	(0.038)	(0.035)	(0.122)
R&D / Sales $_{t-1}$	2.115	0.145	0.135	1.288
	(0.347)	(0.928)	(0.934)	(0.587)
MTBAT $_{t-1}$	0.058	0.091	0.089	0.107
	(0.390)	(0.148)	(0.171)	(0.149)
Asset tangibility $_{t-1}$	0.413	0.042	0.060	0.363
	(0.560)	(0.947)	(0.924)	(0.641)
Idiosyncratic risk $_{t-1}$	0.073	0.049	0.051	0.020
	(0.407)	(0.607)	(0.590)	(0.839)
Leverage $_{t-1}$	-0.069	-0.274	-0.190	-0.652*
	(0.896)	(0.584)	(0.741)	(0.082)
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	5,792	5,767	5,767	5,284
Adjusted R-squared	0.698	0.692	0.691	0.695

Table 8: Control for the monitoring roles of blockholders and institutional investors

This table reports the estimation results from the partial adjustment model. *Block* is ownership by investors who own 5% of the company outstanding shares and above. *IO* is institutional ownership. In parentheses are *p*-values computed based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Appendix I provides variable definitions.

Dep. Var. = Inside debt $_t$	(1)	(2)	(3)
Inside debt $_{t-1}$ * %INDEP $_{t-1}$			-0.311**
			(0.017)
Inside debt $_{t-1}$ * Block $_{t-1}$		-0.143	-0.061
		(0.331)	(0.583)
Inside debt $_{t-1}$ * IO $_{t-1}$	-0.143		0.119
	(0.269)		(0.321)
Inside debt $_{t-1}$	0.675***	0.613***	0.726***
	(0.000)	(0.000)	(0.000)
CEO age $_{t-1}$	0.010	0.005	0.010
	(0.359)	(0.632)	(0.362)
CEO tenure $_{t-1}$	0.012	0.013	0.013
	(0.234)	(0.204)	(0.208)
Firm size $_{t-1}$	-0.198*	-0.162	-0.178
	(0.067)	(0.132)	(0.112)
Liquidity constraint $_{t-1}$	-0.029	0.003	-0.022
	(0.872)	(0.989)	(0.905)
Tax loss carry forward $_{t-1}$	-0.171*	-0.175*	-0.183**
	(0.062)	(0.067)	(0.045)
Investment grade $_{t-1}$	0.126**	0.115**	0.120**
	(0.027)	(0.042)	(0.035)
R&D / Sales $_{t-1}$	0.873	0.700	0.712
	(0.591)	(0.663)	(0.664)
MTBAT $_{t-1}$	0.106*	0.100	0.113*
	(0.088)	(0.109)	(0.079)
Asset tangibility $_{t-1}$	0.058	0.126	0.065
	(0.925)	(0.835)	(0.917)
Idiosyncratic risk $_{t-1}$	0.075	0.061	0.058
	(0.389)	(0.485)	(0.502)
Leverage $_{t-1}$	-0.340	-0.153	-0.416
	(0.310)	(0.746)	(0.211)
Firm FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	6,296	6,357	6,296
Adjusted R-squared	0.699	0.701	0.700