# Co-opted boards and capital structure dynamics

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**Abstract**

This study examines the effects of co-opted directors and further tests the monitoring effectiveness of non-co-opted independent directors and co-opted independent directors on capital structure decisions. Employing a large sample of 2,548 US firms over the 1996-2015 period, we find strong evidence that co-opted boards exert a positive and significant influence on firms' financial leverage. We also find that, whereas co-opted independent directors are positively associated with financial leverage, non-co-opted independent directors have a negative influence on a firm's leverage ratio, suggesting that co-option weakens the effective monitoring, thereby increasing the firm's leverage ratio. Further analysis indicates that co-opted boards adjust towards target leverage levels at a faster speed, with a half-life within a year for book and market leverage. Lastly, our results show that the agency costs of managerial discretion and stockholder-bondholder conflicts arising from board co-option are important drivers of financial leverage relative to tax incentives. Our results are robust to alternative measures of board co-option, financial leverage, and endogeneity concerns.

**Keywords:** Co-opted boards; leverage; adjustment speed; tax benefits; financial crisis.

## 1. Introduction

Prior evidence documents that firms with a high proportion of independent directors should suffer fewer agency problems that distort corporate policy choices, while the converse may be the case for firms with a low proportion of independent directors (Jensen and Meckling, 1976; Chang, Chou and Huang, 2014). Thus, the preference for an outsider-dominated board as an effective monitoring mechanism is rooted in agency theory, which posits that CEOs are self-serving and, if not effectively monitored, may take decisions which may be detrimental to firm value (Jensen and Meckling, 1976). Board effectiveness measured as a board which comprises a majority of independent directors is therefore widely documented to be an effective and important corporate governance mechanism for optimal capital structure decisions (Morellec, 2004; Chang, Chou and Huang, 2014; Balsmeier et al., 2017).

Grounded in the above argument, numerous studies over the past decade have devoted enormous attention to the relationship between corporate governance characteristics and capital structure decisions (Morellec et al., 2012; Chang, Chou and Huang, 2014). These studies have focused on board size, CEO duality and board independence employing the traditional measure of board independence with mixed results (Jiraporn and Lee, 2018). However, little systematic attention has examined explicitly the effects of CEO influence in the selection and appointment of directors on capital structure choice. Yet, in practice, CEOs have a significant role and influence in the selection of all board members, including non-executive directors (Knippen et al., 2018). Cole et al. (2014) pointed out that CEOs exert considerable influence in the nomination process of board members and are more inclined to select directors who share similar views or have social ties with them. As a result, it is argued that such directors may not impose stringent monitoring on a CEO, supporting the notion that directors appointed with the CEO's involvement are likely to be co-opted[2], engendering agency conflicts between CEO and shareholders (Nguyen, 2012; Jiraporn and Lee, 2018). The above argument appears consistent with the conjecture by Morellec et al. (2012) and Chang, Chou and Huang (2014), who argue that agency conflicts may incentivise managers to adjust their leverage choices to their preferred targets to serve their personal interests irrespective of the effect on shareholder wealth.

In this study, we attempt to examine how CEO involvement in the selection of corporate boards may influence board monitoring effectiveness and capital structure decisions. More

[2] Co-option is defined as the ratio of directors appointed after the CEO assumes office (Coles et al., 2014)

specifically, we examine the effects of board co-option on capital structure decisions and speed with which co-opted boards adjust the firm leverage to target level. Furthermore, we test the monitoring effectiveness of non-co-opted independent directors and co-opted independent directors on capital structure decisions. We do so by using a panel data approach on US firms over the sample period 1996–2015 to address the above research objectives. Employing a large sample of 2,548 US firms, our evidence suggests that co-opted boards exert a positive and significant influence on firms' financial leverage. We also find that, whereas co-opted independent directors are positively associated with financial leverage, non-co-opted independent directors have a negative influence on a firm's leverage ratio, suggesting that co-option weakens the effective monitoring, thereby increasing the firm's leverage ratio. Further analysis indicates that co-opted boards adjust towards target leverage levels at a faster speed, with a half-life within a year for book and market leverage. Our results also show that the agency costs of managerial discretion and stockholder-bondholder conflicts arising from board co-option are important drivers of financial leverage relative to tax incentives. Lastly, the evidence suggests that increased uncertainty and vulnerability during the financial crisis induced CEOs in co-opted firms to develop strong risk aversion.

Our study makes several contributions to the extant literature. First, we extend the literature on the role of corporate boards, particularly, board monitoring effectiveness in determining a firm's leverage choice. Our findings suggest that board co-option leads to an increase in leverage whereas non-co-opted independent directors reduce a firm's leverage ratio. The findings demonstrate that board co-option weakens the monitoring effectiveness of the executive management, thereby leading to suboptimal financial policies that may not maximise shareholders' value. In contrast, non-co-opted independent directors appear to be effective monitors, which renders some support to the conclusion by Cole et al. (2014) that not all independent directors are effective monitors.

Second, our results support the agency explanation of capital structure choice. Thus, our results that co-opted boards lead to increased leverage ratios suggest that co-opted boards tend to exacerbate agency costs by weakening the boards' oversight role over executive management which allows senior managers to make risky corporate financial decisions that may affect shareholder value. Thus, this study therefore represents one of the first attempts to examine the extent to which board co-option affects the monitoring effectives of the board and corporate

financing decisions.

Third, and in contrast with other studies, we find that firms with co-opted boards adjust towards target leverage levels at a faster speed, with a half-life within a year for book and market leverage. Hence, our results suggest that co-opted boards engender agency conflicts and may incentivise managers to adjust their leverage choices at a faster speed to their preferred targets to serve their personal interests, irrespective of the effect on shareholder wealth. Thus, co-opted boards appear to be responsible for the speed at which firms make their capital structure adjustment.

Fourth, our additional analysis adds to the capital structure literature by isolating the strategic effect of tax benefits and unused debt capacity from other potential non-strategic effects that could confound our co-option inferences. We establish a tax channel of the trade-off and agency theory under which accumulation of leverage reduces the firm's cost of capital, thereby lessening the competitive risk faced by the firm and the strategic benefit of unused debt capacity (O'Brien, 2003; Klasa et al., 2018). In doing so, we demonstrate that the agency costs of managerial discretion and stockholder-bondholder conflicts arising from board co-option are important drivers of financial leverage relative to tax incentives.

Lastly, we use the 2007/08 financial crisis as an exogenous shock that may affect leverage to address any endogeneity issues. Given that co-opted directors allow CEOs to adopt corporate policies that reflect the CEOs' own risk aversion, strong risk aversion may decrease firm distress or risk through leverage reductions during the crisis periods (Danso et al., 2019). This risk-averse nature of CEOs ensures that they underinvest when firm vulnerability or uncertainty is high.

The rest of the paper proceeds as follows. Section 2 examines the relevant literature and hypotheses. Section 3 describes the data and methodology. Section 4 discusses the empirical results and other robustness tests. Section 5 summarises and outlines practical and theoretical implications of the findings.

## 2. Literature review and hypotheses development

### *2.1. Board monitoring: Co-opted boards and capital structure policy*

In the United States, corporate law mandates public firm operations to be steered by the board of directors (Eisenberg, 1976). Prior evidence suggests that firms usually appoint additional

independent directors to comply with the mandate that necessitates a majority of independent directors on the board (Linck et al., 2009; Balsmeier et al., 2017). The board of directors is accorded the formal authority to ratify management initiatives, evaluate managerial performance, and punish/reward management for non-achievement/achievement of desired targets (Fama and Jensen, 1983a; Baysinger and Hoskisson, 1990). Thus, the board of directors is a key component in the governance structure of a firm and play a critical role in monitoring management, safeguarding minority shareholders' rights, and advising top management ((Fama and Jensen, 1983b; He and Luo, 2018). Organisation and finance literature contends that, by possessing these powers, boards set the foundations for managerial decision making (e.g., Mizruchi, 1983; Coles et al., 2014; Chintrakarn et al., 2016). However, in practice, evidence suggests that boards may not be truly independent to effectively monitor the firm's operations because CEOs exercise considerable influence in the selection and appointment of the board members, making the board ineffective and prone to agency problems. To gain a better understanding of the monitoring effectiveness of corporate boards, this study follows Coles et al. (2014) and focuses on the fraction of board members appointed after the CEO assumed office. These board members are referred to as co-opted directors since they are more likely to show allegiance to the CEO who appointed them. Therefore, boards with a greater proportion of co-opted directors may tend to be ineffective monitors.

As applied to capital structure decisions, weak quality of board monitoring over executive management allows self-serving managers to adopt suboptimal capital structure policy to maximise their personal benefits (Chang, Chou and Huang, 2014). Thus, the connections or friendship ties between the directors and CEO may undermine the board's willingness and capacity to monitor and oversee CEO behaviours (Fracassi and Tate, 2012; Wilbanks et al., 2017). Thus, the greater the number of co-opted directors on the board, the more susceptible the board is to agency problems. This is because co-option leads to a heightened sense of trust and favourable interpretation of others' actions. Thus, co-option may lead to familiarity bias and undermine the quality of board monitoring and directors' fiduciary responsibilities (Linck et al., 2008; Bruynseels and Cardinaels, 2014), including board ineffectiveness in monitoring corporate strategy and key business decisions (Westphal, 1999; Fracassi and Tate, 2012). From this perspective, we expect that, where a board consists of a larger number of co-opted directors, the CEO is likely to adopt higher leverage policy, even beyond the optimal level, to engage in activities designed to protect their job security (Berger et al., 1997). Coles et al., 2014; Lim et al., 2020). Thus, board co-option may exacerbate the conflicts of interest between

shareholders and managers, leading to poor corporate financing choices. In line with the above discussions, we hypothesise that:

*Hypothesis 1: Firms with a higher proportion of co-opted directors have greater leverage.*

### *2.2. Board Independence: Co-opted boards and capital structure policy*

The effectiveness of a board in fulfilling its oversight responsibilities depends on how it is composed (Adams, Hermalin and Weisback, 2010). Research evidence supports the contention that competent monitoring is achieved by a board whose composition is dominated by independent directors (Zahra and Pearce, 1989; Dalton et al., 1998). Thus, a board with a high proportion of independent directors may also bolster the credibility of the firm to outside investors, reduce the cost of capital and increase firm value. In short, the effectiveness of the board to make good policy choices such as capital structure decisions to achieve the desired corporate outcomes is driven by the nature of the board and its composition (i.e., independent or friendly). Seminal papers (e.g., Fama, 1980; and Fama and Jensen, 1983a), suggest that independent directors are more effective at performing their role as advisors and monitors of the firm due to the stronger incentives to sustain their reputation. Moreover, the appointment of more independent directors on a firm's board may lessen the severity of agency conflicts (Lim et al, 2020). Simply, firms with more independent boards are better monitored. However, not all independent directors may be equally effective in their monitoring roles (Coles et al. 2014). In most cases, "co-opted but independent" directors may behave in a similar fashion as non-independent directors, whilst "non-co-opted and independent" directors may be more effective monitors (Lim et al., 2020). For instance, Faleye (2015) shows that firms that have fully independent boards where the CEO is the only employee director leads to a significant decrease in firm performance. Similarly, Cavaco et al. (2017) found the effect of board independence on firm performance to be vague due to opposing forces relating to the director nomination process and board functioning. In a recent paper, Lim et al. (2020) argued that creditors perceive co-opted directors as weaker monitors and therefore increase the firm's loan covenant intensity, regardless of whether these directors are independent or non-independent. If, indeed, lenders have such perceptions about co-option, then we expect that a higher proportion of "non-co-opted and independent" directors will be associated with less leverage. At the same time, a higher proportion of co-opted directors (independent or non-independent) should lead to greater debt accumulation. We therefore test the conjecture that the effects of

independent directors may vary when making corporate financial choices. Therefore, we hypothesise that:

*Hypothesis 2: Whereas firms with a higher proportion of co-opted independent directors may have greater leverage, firms with a higher proportion of non-co-opted independent directors have relatively less leverage.*

## 3. Methodology

### *3.1. Data*

We employ director data from the Institutional Shareholder Services (ISS) – (formerly RiskMetrics), executive data from ExecuComp, and financial/accounting data from the merged Center for Research in Security Prices (CRSP)/Compustat database spanning the period 1996 to 2015. We first match the CRSP/Compustat to ExecuComp's Annual Compensation dataset on FYEAR-GVKEY. To guarantee accuracy, we further match the compiled dataset to other ExecuComp datasets on YEAR, GVKEY, and EXECID. Further, we match FYEAR-GVKEY pairs from the CRSP/Compustat database to ISS "Directors Legacy" (for data before 2008) and "Directors" dataset (for 2008 onwards). To stand a chance of inclusion in the analysis, the following conditions must be satisfied: the TIC from Compustat must equal the TICKER row from ISS; the first six digits of NCUSIP from CRSP row equals CN6 from the "Directors Legacy" dataset or equals the first six digits of CUSIP (after filling it from the left with zeros such that it has nine digits) from the "Directors" dataset; FYEAR from Compustat equals YEAR row from ISS. Necessitating a match on both tickers and 6-digit CUSIPs mitigates issues of duplication for any FYEAR-GVKEY pair against the ISS row. The initial sample of firm-year observations comprised 25,891 observations on 2,548 firms. We further exclude financials (SIC codes 6000 to 6799), utilities (SIC codes 4900 to 4949) and firms incorporated outside the United States, leaving us with a final sample of 17,092 firm-year observations.

### *3.2. Estimation method*

We divide the analysis into two sections. First, we assess the importance of board co-option on financial leverage by employing the static model of firm leverage with time-invariant firm-level effects. Specifically, we employed the following econometric model:

$$Leverage_{i,t} = \alpha + \beta Co - option_{i,t} + \beta X_{i,t} + \omega_i + \mu_t + \varepsilon_{i,t} \qquad (1)$$

Where *i* denotes the *i*th firm and *t* denotes fiscal year. Leverage is the firm-level measures of financial leverage as defined in Table 1, Co-option is the measure of directors appointed by the incumbent CEO by year *t*, X is the vector of the control variables employed in our analysis, α and β are parameters, $\omega_i$ is a firm-specific effect, and $\mu_t$ is a year fixed effect. All estimated standard errors are clustered at the firm level.

It is argued that changes in market conditions and shocks to income as well as new investments and business growth may push firms off their optimal capital structure levels. In an imperfect world with transaction costs, it is very costly to promptly adjust the capital structure to the optimal level (Myers, 1984). Rather, firms work their way back towards their target capital structure over time (see, e.g., Flannery and Rangan, 2006; Altuntas et al., 2015). Thus, in the second part of our analysis, we estimate a partial adjustment model of firm leverage:

$$Leverage_{i,t} - Leverage_{i,t-1} = \alpha + \lambda\left(Leverage_{i,t}^{**} - Leverage_{i,t-1}\right) + \varepsilon_{i,t} \qquad (2)$$

where $\text{Leverage}_{i,t}$ is the actual leverage of firm *i* in year *t*, $Leverage_{i,t}^{**}$ represents the sample average of the model described in Eq. (1) and can be interpreted as the firm's target or desired leverage level and λ is the adjustment parameter (where $0 < \lambda < 1$). Since firms' target leverage is unobservable, we model it as a function of observable firm-level factors, interaction effects between the firm- and industry-level factors as well as time-invariant firm-specific effects. Our econometric specification is given below:

$$Leverage_{i,t}^{**} = \beta Co - option_{i,t} + \beta_1 X_{i,t-1} + \beta_2 C_{c,t-1} + \beta_3 X_{i,t-1} \times C_{c,t-1} + \omega_i \qquad (3)$$

where $X_{i,t-1}$ is the set of one-year lagged firm-level variables from Eq. (1), $C_{c,t-1}$ is a specific one-year lagged industry-level factor, $X_{i,t-1} \times C_{c,t-1}$ are the industry-firm interaction effects, and $\omega_i$ is the firm-specific effect. To control for time-varying executive and control conditions, we follow Coles et al. (2014) and include the one-year lagged Board size, CEO age, CEO compensation and CEO tenure into the model.

According to the trade-off theory, $\beta = 0$, and the variation in $\text{Leverage}_{i,t}^{**}$, is nontrivial. Substituting Eq. (3) into the partial adjustment specification Eq. (2) and solving for $\text{Leverage}_{i,t}$ yields the following specification:

$$Leverage_{i,t} = \beta Co - option_{i,t} + (1-\lambda)Leverage_{i,t-1} + (\lambda\beta_1)X_{i,t-1} + (\lambda\beta_2)C_{c,t-1} + (\lambda\beta_3)X_{i,t-1} \times C_{c,t-1} + \lambda\omega_i + \varepsilon_{i,t} \qquad (4)$$

Where λ is the adjustment coefficient, and (1−λ) is the speed of adjustment. This dynamic panel model requires special treatment in short panels to avoid a biased adjustment speed estimate (Baltagi, 2008; Öztekin and Flannery, 2012). We find similar results using the two-step system generalised method of moments (GMM) (Blundell and Bond, 1998). Eq. (4) accounts for the potentially dynamic nature of the firm's capital structure and its unobserved heterogeneity.

### *3.3. Measurement of Variables*

#### *3.3.1. Firm Financial Leverage*

For our dependent variable, Leverage, we used four key measures: (i) Net book leverage, (ii) Net market leverage, (iii) Book leverage, (iv) Market leverage. This ensures that our results are robust and clearly reflect the actual changes in financial leverage. Table 1 provides a summary for measurement/definitions used in this study.

#### *3.3.2. Board Co-option*

Following Coles et al. (2014), our primary measure of Board co-option is captured by the number of directors elected after the CEO assumes office or by the incumbent CEO scaled by board size.

$$Co - option = \frac{Number\ of\ Co{-}opted\ directors_{i,t}}{Board\ size_{i,t}}$$

For robustness purposes, we also utilise the alternative measure of co-option, Tenure-Weighted Co-option ($Co - option_{TW}$). We capture this as the sum of the tenure of co-opted directors divided by the total tenure of all directors (Coles et al., 2014). Hence,

$$Co - option_{TW} = \frac{\sum_{i=1}^{Boardsize} Tenure_{i,t} \times Co{-}opted\ Dummy_{i,t}}{\sum_{i=1}^{Boardsize} Tenure_{i,t}}$$

where $Co - opted\ Dummy_{i,t}$ is equal to one if the director *i* is co-opted by year *t*, and zero otherwise. $Tenure_{i,t}$ denotes the tenure of the co-opted director *i* on the firm's board. This measure captures any increases in power or influence of co-opted directors on board decisions over time, as such directors work hand-in-hand with the CEO and other directors elected hitherto. Hence, the greater the tenure of co-opted directors, the stronger their influence on board decisions. Higher values of both co-option measures indicate stronger board co-option.

#### *3.3.3. Control variables*

In line with past empirical studies (Fosu et al., 2016; Danso et al., 2019), we controlled for firm-level, board- and CEO-specific variables that are likely to affect capital structure. These include firm size, Tobin's Q, return on assets, asset tangibility, earnings volatility, financial

constraints, investment, R&D intensity and a proxy for whether the firm pays common dividends. We also incorporate Board and CEO controls such as board size, CEO Duality/Board Chair, Compensation, CEO Tenure, CEO age, and gender. The incorporation of these board/executive controls addresses residual endogeneity concerns that board/executive characteristics may drive co-option (Knippen et al., 2018) as well as firm financing decisions (Chen, 2012; Fracassi, 2017) and thus cause a spurious association between financial leverage and manager sentiment. A summary of all key variables used in our main analyses and their descriptions is reported in Table 1.

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**INSERT TABLE 1 ABOUT HERE**

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## 4. Results and Discussion

### *4.1. Descriptive statistics and bivariate correlations*

Table 2 presents the descriptive statistics of the variables for our empirical analysis. The independent variables, Co-opted Directors and Tenure-weighted Co-option, have a mean value of 0.52 and 0.68 respectively. These variables range between 0 and 1, with higher values signifying stronger co-option. In general, they exhibit a low degree of variability, represented by a standard deviation of 0.32 and 0.33 respectively. We also report the four measures of our dependent variable (Leverage): (i) Net book leverage, (ii) Net market leverage, (iii) Book leverage, (iv),Market leverage; the mean values of these are 0.06, 0.05, 0.21 and 0.11 respectively. Regarding our control variables, we observe that the mean value of Size is 7.45. This variable has a minimum and maximum value of 2.86 and 13.59 respectively, signifying a fair degree of heterogeneity. The average value of ROA is 0.14, with a minimum and maximum value of -1.69 and 1.18 respectively, suggesting that some of the sample firms had experienced a negative performance.

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**INSERT TABLE 2 ABOUT HERE**

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In Table 3, we report the correlation between key variables in our model. We observe that the correlations between board co-option (Co-opted Directors and Co-option$_{TW}$) are high, indicating that both independent measures may capture a similar construct (Board co-option). Similarly, the correlation coefficients between our four leverage measures (NBLev, NMLev, BLev and MLev) are high, indicating that these dependent variables also capture similar information (Leverage). Regarding the control variables, the correlations among them appear low, indicating that multicollinearity is not an issue in this study. In general, the findings from both descriptive summary and the correlation matrix suggest that none of the variables suffer from any momentous biases (e.g., limited variation and heterogeneity or large outliers) that may plague our regression results.

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### *4.2. Board co-option and Leverage*

Table 4 shows the empirical results of the impact of board co-option on the four measures of leverage. Models 1 and 2 (3 and 4) report the results for net book leverage (net market leverage). The use of debt net of cash holdings accounts for the financial flexibility. The other models (5 and 6; 7 and 8) under book leverage and market leverage serve as robustness checks on the earlier models. All models incorporate firm fixed and year fixed effects. Under each leverage measure, the second model incorporates conventional capital structure, board, and CEO control variables.

Models 1-4 of the table document that board co-option has a positive and statistically significant impact on the net leverage at the 1% level. The estimated coefficients suggest that, economically, a rise in board co-option induces an increase in firm's ratio of total debt (net of cash holdings) per dollar of book (market) assets by 5.6 (1.9) cents, which represents a 19.31% (13.57%) increase relative to the sample standard deviation for net book (market) leverage of 0.29 (0.14). Hypothesis 1 is therefore supported. The results under the two other standard leverage measures (book leverage and market leverage) in models 5-8 provide strong support regarding the effects of the board co-option on capital structure choice. The results suggest that an increase in board co-option is accompanied by weak monitoring and poor advice, thereby leading firms to lever up by taking on more debt. Economically, the results show a 16.11% (12.73%) increase relative to the sample standard deviation of 0.18 (0.11).

The greater economic effect of board co-option on net leverage relative to that of total leverage suggests that board co-option does affect a firm's cash holdings. While the net leverage results are primarily driven by changes in debt financing, the results for total leverage incorporate the effect of cash holdings, thus suggesting that cash and debt play important roles in influencing competitive outcomes (O'Brien, 2003; Frésard, 2010). Furthermore, the presence of agency problems or the anticipation of future cash flows may also underline the differences in economic effect (Gamba and Triantis, 2008; Lartey et al., 2020). When board monitoring is weaker, the influx of free cash flow intensifies agency conflicts and gives the CEO more room for discretion (Acharya et al., 2007). Therefore, while Chintrakarn et al. (2016) contend that board co-option leads to significantly higher R&D investments, Jiraporn and Lee (2018) suggest that co-opted directors have a weaker propensity towards paying dividends and, even where firms paid dividends prior to their appointment, their presence significantly lowers dividend pay-outs.

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### *4.3. Co-opted Independent directors versus non-co-opted independent directors and capital structure*

To test hypothesis 2, we examine whether independent directors who are co-opted by the CEO are different in monitoring effectiveness of financial leverage relative to other independent directors who are not co-opted. Prior evidence suggests that independent directors, with no ties to the firm other than their directorship, are highly effective in performing their oversight role of monitoring corporate policies to improve firm outcomes (e.g., Balsmeier et al., 2017; Lu and Wang, 2018). Lim et al. (2020) note that director co-option and independence as important board characteristics are not mutually exclusive and may overlap with each other. For instance, a group of the directors that have been captured in the measure of co-option may actually be independent, and the converse may be true. To test the monitoring effectiveness of independent and co-opted directors, we follow Coles et al.'s (2014) classification and categorise directors into two components, namely, co-opted independent directors and non-co-opted independent directors. The distinction between co-opted directors who are independent from directors and those who are not co-opted but independent is important to obtain further insights into the

effects of the monitoring role of co-opted boards *vis-a-vis* independent directors on capital structure decisions. Consequently, we measure "Co-opted Independent" as a percentage of independent directors on the board that have been elected after the incumbent CEO assumed office and "Non-Co-opted Independent" as a percentage of independent directors already serving on the board at the time the CEO assumed office.

The results reported in Table 5 show that co-opted independent directors ("Co-opted Independent") are associated with higher financial leverage, which is both statistically and economically significant. The results that co-opted independent directors (though independent of the CEO in the traditional and legal sense) increase financial leverage suggest that co-option weakens the effective monitoring, thereby exerting a positive influence on the firm's leverage ratio. This may be the case because co-opted directors are less likely to remove or punish CEOs (Coles et al., 2014; Chintrakarn et al., 2016), and may encourage more risk-taking with high potential payoffs, thereby increasing the firms' financial leverage. In contrast, the results (as reported in Table 5) show that "Non-Co-opted Independent" directors reduce financial leverage, with the effect being statistically and economically significant. The results may be explained by the argument that, when directors are not co-opted and possess a degree of permanence and independence, they have greater incentives and ability to provide the required monitoring and advisory services to management without fear of retribution. Such findings appear consistent with the argument by Lu and Wang (2018) which suggests that firms with more independent boards tend to use more equity-based rather than debt-based compensation, especially stock options, to promote managerial risk-taking. More importantly, Non-Co-opted Independent directors may serve as a more precise measure of the quality and effectiveness of internal monitoring relative to the conventional measure of board independence. Taken together, the findings suggest that independent directors who are not co-opted are effective monitors and reduce a firm's financial leverage, whereas co-opted independent directors are not and tend to increase the financial leverage of a firm. The results therefore provide strong support for hypothesis 2, indicating that not all independent directors are effective monitors and may influence corporate financial decisions differently.

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### *4.4 Board co-option and the speed of adjustment*

In Table 6, we present results of the extent and speed of adjustment by firms with co-opted boards towards the optimal capital structure. As discussed earlier, we expect firms with highly co-opted boards to have a higher cost of equity, hence co-opted firms may employ a lower degree of equity financing and may have a higher target leverage. We find firms with co-opted boards adjust faster to their target leverage ratios. This is particularly important given that past evidence suggests that market timing considerations may drive a firm's issuance of securities (see Alti, 2006; Hovakimian, 2004; 2006; 2011). Our results reveal that the coefficient of target leverage is positive and significant at the 1% level. The coefficient of the lagged leverage variables is positive and significant across all model specifications. The speed of adjustment parameter, $\lambda$, is measured based on Eqn. (7) as one minus the estimated coefficient of the lagged leverage variable. Under the conventional co-option models (1, 3, 6 and 8), the average speed of adjustment ranges between 0.206 and 0.710 (total debt net of cash holdings – book and market) and 0.726 and 0.888 (book leverage and market leverage). This indicates that, upon co-option of a firm's board, the firm closes, on average, between 21-71% (debt net of cash holdings) and 73-89% (book and market leverage) of the gap between current and desired leverage per year. The adjustment coefficient is high and provides a justification that the dynamics implied by our model are not rejected and that the firms adjust relatively quickly towards their target leverage ratios through board co-option. The high implied adjustment speed suggests that the typical firm removes more than half of the effect of a shock on its book and market leverage within a year upon board co-option.

In models 2, 4, 6 and 8, we capture the influence of co-option that occurs through time and tenure on the board. We find consistent results which show that the average speed of adjustment ranges between 0.203 and 0.709 (total debt net of cash holdings – book and market); and 0.725 and 0.887 (book leverage and market leverage). A probable explanation behind the high adjustment speed is that the cost associated with any deviations from the target leverage level outweighs the relative cost of adjusting the debt ratio, and that firms' leverage levels are persistent over time (Ozkan, 2001). Where the cost associated with disequilibrium exceeds the adjustment cost, the estimated adjustment coefficient should be close to zero (Gaud et al., 2005). Moreover, the swift adjustment towards the firm's capital ratio suggests that capital structure decisions are not driven by the pecking order or market timing theories when the firm's directors are co-opted (Lartey et al., 2020; Flannery and Rangan, 2006).

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### *4.5 Robustness test*

#### *4.5.1. Tenure-weighted Board co-option and Leverage (over time)*

To further strengthen the results documented in Table 4, we employed tenure-weighted board co-option to account for the likelihood that directors elected by the incumbent CEO become significantly co-opted through time and that their influence surges with their tenure on the board. Thus, it may be argued that co-option surges with CEO tenure and that our findings on co-option merely capture the effect of CEO tenure (Coles et al., 2014). Consequently, we employed an alternative measure of board co-option measured as the sum of the tenure of co-opted directors divided by the total tenure of all directors (Coles et al., 2014). This measure captures any increases in power or influence of co-opted directors on board decisions over time, as such directors work in tandem with the CEO and other directors elected hitherto. The results presented in Table 7 suggest that, the greater the tenure of co-opted directors, the stronger their influence on board decisions. Higher values of both co-option measures indicate stronger board co-option. The positive effect on leverage reinforces our main results that firms with a higher proportion of co-opted directors have greater leverage due to weaker internal monitoring, and such results appear persistence over time.

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#### *4.5.2. Does Board co-option drive new debt issues?*

To confirm whether board co-option drives new debt issues and consequently increases overall firm financial leverage, we test the relationship between board co-option and new debt issues. Kochhar and Hitt (1998) contend that, when board co-option is high, firms increase their borrowing, which may particularly increase the strategic benefit of unused debt capacity. To measure a firm's new debt issue, we first deduct the value of the firm's leverage value for the previous year (*t-1*) from the current year (*t*) leverage value. Further, we use the dummy variable, an indicator equal to one if the difference between the two values [*t-(t-1)*] is positive,

and zero otherwise, to proxy for the presence of new debt issues. The results reported in Table 8 remain positive and statistically significant at the 1% level, indicating that board co-option drives new debt issues and consequently the overall firm leverage. Overall, the results indicate that, where the power or influence of co-opted directors on board and firm decisions increases over time, the impact of board co-option on financial leverage is manifested through new debt issues.

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**INSERT TABLE 8 ABOUT HERE**

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### *4.6. Addressing potential endogeneity*

It may be argued that board co-option may be correlated with a variable that has been omitted from the analysis but that may partly determine leverage. For instance, firm performance or CEO power may drive both board co-option (Knippen et al., 2018) and the levels of financial leverage. Likewise, a firm with unused debt capacity may perceive board monitoring to be too rigorous, leading to its inability to access and utilise additional external funding. In other words, board co-option may not be the driver of leverage, but firms with excess debt capacity may be willing to accumulate further leverage. Also, where a CEO's past performance is driven by aggressive borrowing and high leverage, they may be inclined to favour board members that support their corporate objectives. Lastly, a measurement error in our co-option variable may influence the co-option-leverage nexus. The mismeasurement of a measure in an empirical model leads to inconsistent regression coefficients. If this is the case, the resulting coefficients may be biased due to endogeneity through omitted variables (unobserved heterogeneity), simultaneity (reverse causality), or measurement errors. In this section, we take extra steps to address any potential endogeneity issues and show that our findings remain robust.

We re-estimate our main models using a 2-step instrumental variable Generalised Method of Moments (GMM) approach (Blundell and Bond, 1998). To choose the instrument, we followed prior literature on the empirical determinants of board control and monitoring. Following Jiraporn and Lee (2018), we created a new co-option variable, co-option in the earliest year, by identifying the earliest year each firm entered the study sample and replacing each fiscal year's co-option value by the earliest year's value co-option. We contend that board co-option in the earliest year may not be driven by leverage choices in any of the successive years, thus

mitigating any chances of reverse causality. This new variable, co-option in the earliest year, is then utilised as the instrumental variable (IV) to estimate the GMM regression. We regress the board co-option measure on the firm-, executive- and board-level variables, and include the predicted variables in the second stage. The results are presented in Table 9. The coefficients for board co-option and the four variations of financial leverage are positive and significant at the 1% level across all the models. This suggests that the instruments are relevant, and the diagnostic tests also confirm the relevance and validity of the instruments[3]. The results corroborate our main findings in Table 4, suggesting that a higher degree of board co-option increases financial leverage as board co-option weakens effective monitoring of executive management.

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**INSERT TABLE 9 ABOUT HERE**

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### *4.7. Further tests*

#### *4.7.1 Tax gains/benefits as a potential channel for high leverage*

The evidence presented above indicates that board co-option leads a firm to increase in leverage ratio. However, a potential mechanism through which board co-option could result in the increase of firm leverage is grounded in the trade-off theory of capital structure, which posits that the rational firm will choose its optimal level of leverage by balancing the costs (e.g., bankruptcy costs) against the gains (e.g., tax gains/shield or reduction in agency costs) associated with debt accumulation (Lemmon and Zender, 2010; Lartey et al., 2020). Under the static trade-off theory, it is argued that firm financing policies are very importance since they affect the resources under a CEO's control (Stulz, 1990; Morellec 2004). However, the dynamic trade-off theory may incentivise firms to opt for new debt financing rather than issuing equity when the benefits of increased debt exceed the adjustment/transactions costs (Hovakimian and Li, 2011). As a result, firms that have unused debt capacity will aggressively re-balance their capital structure by accumulating more debt towards maximising the benefits of tax deductions on debt. In addition, the agency theory also suggests that, by accumulating

[3] The Hansen J-statistics p-values are all in excess of 0.1, implying that the over-identifying restrictions are valid (e.g., Baum et al., 2003). Also, the Kleibergen-Paap rk Wald F statistics, compared with the Stock-Yogo IV critical values, rule out weak instrument problems; they are all larger than the rule-of-thumb minimum of 10 (Baum, 2006).

debt, firms can benefit from external discipline mechanisms, which helps to mitigate the agency problems associated with free cash flows. Against this backdrop, the incentives for higher tax benefits could bias our findings that firms increase their financial leverage when board co-option increases. We therefore conduct several tests to assess whether higher tax benefits could confound our co-option-leverage inferences.

We therefore follow Klasa et al. (2018) and augment our baseline specification regressing net leverage on the board co-option indicator to incorporate interactions between the indicator and the firm's marginal tax rate (measured as in Blouin et al., 2010) and other proxies for the existence of non-debt tax shields (depreciation/assets, tax loss carry forwards/assets, and investment tax credits/assets). Table 10 reports the estimated models with control variables not reported for brevity. The coefficients on all interaction variables are statistically insignificant, indicating that the co-option effect on leverage is not due to tax benefits. Nevertheless, the significant impact of board co-option on financial leverage remains unchanged.

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**INSERT TABLE 10 ABOUT HERE**

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### *4.7.2 Financial crisis as a potential channel for high leverage*

In this section, we use the 2007/08 financial crisis as an exogenous shock that may affect leverage to address potential endogeneity issues. In the wake of the financial crisis, evidence suggests that firms that were managed by overconfident executives accumulated greater leverage, and this consequently made these firms more susceptible to shocks during the crisis (see e.g., Ho et al., 2016). Nonetheless, theory posits that CEOs are allowed to exercise their discretion to alter their firm risk by diversifying their activities and choosing investment projects or assets that will mitigate cash flow or earnings volatility (Chaivisuttangkun and Jiraporn, 2021). The presence of idiosyncratic risk ensures that CEOs develop strong risk aversion during difficult times (Panousi and Papanikolaou, 2012; Gormley and Matsa, 2016). This risk-averse nature of CEOs may lead to underinvestment when firm vulnerability or uncertainty is high (Danso et al., 2019). Consistent with this argument, this section builds on our baseline model to empirically test whether financial vulnerability as manifested during the 2007/08 financial crisis has any implications for the impact of board co-option on leverage. We augmented our baseline specification to include interactions between the co-option

measure and variables for pre-crisis, crisis and post-crisis periods. The results are reported in Table 11. We find that the estimated impact of board cop-option on financial leverage remains unchanged. However, the direction/relationship and statistical significance of the interaction variables appear dissimilar. The coefficient of the pre-crisis interaction is positive and statistically significant. This suggests that CEOs exhibited their excessive risk appetite during the pre-crisis era where firms were able to accumulate greater leverage under less stringent rules and requirements. Under the crisis model (3-4), the coefficient of the crisis interaction is negative but statistically significant, thus suggesting that executive risk aversion is particularly more pronounced during periods of financial vulnerability. Given that co-opted directors allow a CEO to adopt corporate policies that reflect the CEO's own risk aversion, strong risk aversion may decrease firm distress or risk through leverage reductions during the crisis period. Moreover, it may be argued that, during a crisis period, it is desirable to decrease firm risk. Therefore, in light of the shocks to credit markets, firms responded by cutting capital expenditures, reducing debt issuance, and relying on internal liquidity to achieve investment objectives (see Lartey et al., 2020). Under the post-crisis interaction, we find a positive but insignificant relationship. Plausible explanations for this finding can be attributed to the process of learning, adaptation and change that underlines lending/borrowing decisions and drives path-dependency. Therefore, there was a more strengthened co-option-leverage nexus post-crisis as lenders began considering their pre-crisis misconceptions and adverse crisis conditions in their post-crisis lending decisions (Danso et al., 2019). As such, although conditions improved, the insignificant coefficient indicates that, on average, following the lending and regulatory changes during the crisis, a firm with non-co-opted directors receives more loans compared to its co-opted counterparts. Our results remain unchanged when $\text{Co-option}_{TW}$ is used as a regressor in place of Co-option. Overall, the evidence suggests that increased uncertainty and vulnerability during the financial crisis induced CEOs in co-opted firms to develop strong risk aversion.

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**INSERT TABLE 11 ABOUT HERE**

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## 5. Conclusions

The economics of director appointment and corporate financial decisions are highly multifaceted relative to the conventional and broadly employed measures of corporate governance such as board independence. Director co-option, by means of commitment and homage to the CEO who is involved in the process of director selection, may inherently affect the directors' actions and discretion. Where directors are chosen by a CEO, they become more supportive of that CEO, regardless of whether they are legally or conventionally independent. In this study, we examine whether board co-option drives capital structure choice and further test the monitoring effectiveness of non-co-opted independent directors and co-opted independent directors on capital structure decisions.

Drawing on agency theory and using a variety of analytical approaches, we find that firms with co-opted boards exert a positive and significant influence on the firms' financial leverage. We also find co-opted independent directors to be positively and significantly associated with financial leverage, suggesting that co-option weakens the effective monitoring, thereby increasing a firm's leverage ratio. However, boards with a high proportion of non-co-opted independent directors have a negative influence on firms' leverage ratios, suggesting that non-co-opted independent directors appear to be effective monitors. The results therefore appear consistent with the conclusion drawn by Coles et al. (2014), indicating that not all independent directors are effective monitors. Our results show that independent directors tend to influence corporate financial decisions differently. Further analysis indicates that firms with co-opted boards adjust towards target leverage levels at a faster speed, with a half-life within a year for book and market leverage.

An important implication of our results is that board independence, a conventional measure of board effectiveness, appears not to be sufficient to measure board effectiveness. Our results demonstrate clearly that the impact of independent directors appears to vary from one group of independent directors to another, implying that not all independent directors are effective monitors. One plausible explanation is that independent boards may place more emphasis on monitoring managers while neglecting their advisory role (Coles et al., 2014). This clarification is consistent with finance theory on the role of boards, which predicts that board independence is not always in the best interests of stockholders, particularly where the board's advisory role is more important than its monitoring role. Consequently, Schmidt (2015) argues that board independence can decrease firm value. Another implication of our results is that firms with co-

opted boards adjust their capital structure towards target leverage levels at a faster speed, implying that a typical firm removes more than half of the effect of a shock on its book and market leverage within a year upon board co-option.

Despite the significant contributions of this study that co-opted boards exacerbate agency costs by weakening their oversight role over executive management and that independent directors vary in terms of their monitoring effectiveness in influencing capital structure decisions, more studies appear warranted. Future studies should examine the relationship between board co-option and corporate financial decisions on a cross-country basis.

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**Table 1: Description of variables**

| Variables | Description |
|---|---|
| ***Independent Variables*** | |
| Co-opted Directors | Co-opted Directors is captured by the number of directors elected after the CEO assumes office or by the incumbent CEO scaled by board size. |
| Tenure-weighted Co-option (Co-option$_{TW}$) | Tenure-Weighted Co-option is the sum of the tenure of co-opted directors divided by the total tenure of all directors. |
| ***Dependent Variables*** | |
| Net book leverage (NBLev) | Net book leverage is measured as the summation of the book value of long-term debt (DLTT) and debt in current liabilities (DLC) minus cash holdings (CHE) divided by book value of assets (AT). |
| Net market leverage (NMLev) | Net market leverage is the book value of long-term debt (DLTT) plus debt in current liabilities (DLC) minus cash holdings (CHE) divided by market value of assets (PRCC_F∗CSHO + AT - CEQ). |
| Book leverage (BLev) | Book leverage and Market leverage are analogously defined, except that cash holdings are not subtracted from total debt. (i.e., BLev = (DLTT + DLC)/AT) |
| Market leverage (MLev) | Cash holdings are not subtracted from the numerator - total debt. (i.e., MLev = (DLTT + DLC)/(PRCC_F∗CSHO + AT - CEQ)) |
| ***Firm Controls*** | |
| Firm size | Firm size is the natural logarithm of the book value of Total Assets. |
| Tobin's Q | Tobin's Q is the market value of assets divided by the book value of assets. It proxies for growth prospects. |
| Return on assets (ROA) | Return on assets is the operating income before depreciation divided by the book value of assets. It serves as a proxy for profitability and the availability of internal funds. |
| Asset Tangibility (Tangibility) | Tangibility is measured as the value of tangible assets scaled by total assets. |
| Earnings volatility | Earnings volatility is the standard deviation of a firm's return on assets over the previous five years (inclusion in the sample necessitates a firm to have at least three years of data during the prior five years). |
| Dividend | Dividend is a proxy for whether a firm pays common dividends (i.e. a variable equal to one if a firm pays common dividends, and zero otherwise). |
| Financial Constraint | Financial constraint is measured as firm's interest expenditures scaled by total assets. It proxies for a firm's capabilities of obtaining loans. |
| Investment | Investment is the net capital expenditure (capital expenditure minus depreciation) divided by the book value of total property, plant and equipment. |
| R&D Intensity | The ratio of R&D expenditures to total turnover. |
| ***Board & CEO Specific Controls*** | |
| Board Size | The natural logarithm of the total number of directors on the board as at the end of the fiscal year. |
| CEO Duality | Board Chair is an indicator variable equal to one if the CEO is also the chairperson of the board of directors as at the end of the first fiscal year. The dual role also proxies for CEO power as well as the difficulty and complexity of CEO's job. |
| CEO Compensation | The natural logarithm of CEOs total compensation over the fiscal year. The sum of salary, bonus, total value of restricted stock granted, total value of stock options granted (estimated using Black-Scholes), long-term incentive payouts, and other compensation. |
| CEO Tenure | CEO tenure is the natural logarithm of number of years the CEO has served in the position as at the end of the fiscal year. It is an additional proxy for CEO power. |
| CEO Age | Age is the natural logarithm of the CEO's age as at the end of the fiscal year. |
| Board Independence | The board independence as the fraction of outside directors on the board. |

The table presents the mnemonics and description of each dependent and independent variable used in this paper.

**Table 2: Descriptive statistics**

| | Mean | S.D. | Min. | Max. | 25th P | 50th P | 75th P | Observations |
|---|---|---|---|---|---|---|---|---|
| Co-opted Directors | 0.52 | 0.32 | 0.00 | 1.00 | 0.25 | 0.56 | 0.80 | 17092 |
| Co-option$_{TW}$ | 0.68 | 0.33 | 0.00 | 1.00 | 0.49 | 0.82 | 0.96 | 17092 |
| Co-opted - Indep | 0.36 | 0.26 | 0.00 | 1.00 | 0.14 | 0.33 | 0.57 | 17091 |
| NBLev | 0.06 | 0.29 | -0.95 | 2.66 | -0.12 | 0.10 | 0.26 | 17004 |
| NMLev | 0.05 | 0.14 | -0.54 | 1.10 | -0.04 | 0.04 | 0.13 | 17002 |
| BLev | 0.21 | 0.18 | 0.00 | 2.93 | 0.06 | 0.20 | 0.32 | 17029 |
| MLev | 0.11 | 0.11 | 0.00 | 1.10 | 0.02 | 0.09 | 0.17 | 17007 |
| Firm Size | 7.45 | 1.49 | 2.86 | 13.59 | 6.38 | 7.30 | 8.39 | 17091 |
| TobinQ | 1.78 | 1.67 | 0.02 | 78.42 | 0.94 | 1.35 | 2.06 | 17007 |
| ROA | 0.14 | 0.11 | -1.69 | 1.18 | 0.10 | 0.14 | 0.19 | 17038 |
| Tangibility | 0.26 | 0.21 | 0.00 | 0.98 | 0.10 | 0.20 | 0.36 | 17061 |
| Earnings vol | 0.04 | 0.04 | 0.00 | 0.79 | 0.01 | 0.03 | 0.05 | 15115 |
| Dividend | 0.53 | 0.50 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 17092 |
| Fin. Constraint | 0.16 | 0.18 | 0.00 | 12.23 | 0.09 | 0.15 | 0.19 | 16976 |
| Investment | -0.04 | 0.44 | -17.38 | 7.14 | -0.07 | 0.00 | 0.08 | 16920 |
| R&D Intensity | 0.05 | 0.07 | 0.00 | 1.13 | 0.00 | 0.03 | 0.07 | 11766 |
| Board Size | 4.12 | 0.13 | 3.50 | 4.55 | 4.03 | 4.11 | 4.20 | 15725 |
| CEO Duality | 0.86 | 0.35 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 15729 |
| CEO Compensation | 7.87 | 1.16 | -6.91 | 12.84 | 7.18 | 7.91 | 8.61 | 15429 |
| CEO Tenure | 1.74 | 0.76 | 0.00 | 3.14 | 1.39 | 1.79 | 2.30 | 15729 |
| CEO Age | 3.95 | 0.14 | 3.37 | 4.47 | 3.87 | 3.95 | 4.04 | 15705 |
| Board Indep. | 0.55 | 0.50 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 17092 |
| Observations | 17092 | | | | | | | |

The table presents the summary statistics for all variables used in our core capital structure assessment in Table 4. All variable definitions are in Table 1.

## Table 3: Correlation matrix

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Co-opted Directors | 1.00 | | | | | | | | | | | | | | | | | | | | | |
| 2 | Co-option$_{TW}$ | 0.94* | 1.00 | | | | | | | | | | | | | | | | | | | | |
| 3 | Co-opted-Indep | 0.88* | 0.79* | 1.00 | | | | | | | | | | | | | | | | | | | |
| 4 | NBLev | 0.08* | 0.10* | -0.10* | 1.00 | | | | | | | | | | | | | | | | | | |
| 5 | NMLev | 0.05* | 0.06* | -0.07* | 0.92* | 1.00 | | | | | | | | | | | | | | | | | |
| 6 | BLev | 0.04* | 0.04* | -0.05* | 0.84* | 0.82* | 1.00 | | | | | | | | | | | | | | | | |
| 7 | MLev | 0.03* | 0.04* | -0.05* | 0.79* | 0.90* | 0.88* | 1.00 | | | | | | | | | | | | | | | |
| 8 | Size | 0.09* | 0.12* | -0.02* | 0.33* | 0.29* | 0.26* | 0.23* | 1.00 | | | | | | | | | | | | | | |
| 9 | Tobin Q | -0.05* | -0.07* | 0.03* | -0.29* | -0.23* | -0.16* | -0.32* | -0.09* | 1.00 | | | | | | | | | | | | | |
| 10 | ROA | 0.02 | 0.02* | -0.01 | 0.02 | -0.03* | -0.08* | -0.20* | 0.10* | 0.32* | 1.00 | | | | | | | | | | | | |
| 11 | Tangibility | 0.04* | 0.04* | -0.06* | 0.37* | 0.36* | 0.23* | 0.26* | 0.12* | -0.12* | 0.13* | 1.00 | | | | | | | | | | | |
| 12 | Earnings vol | -0.04* | -0.05* | 0.02 | -0.23* | -0.19* | -0.06* | -0.08* | -0.28* | 0.17* | -0.25* | -0.02* | 1.00 | | | | | | | | | | |
| 13 | Dividend | 0.12* | 0.15* | -0.08* | 0.25* | 0.19* | 0.12* | 0.07* | 0.34* | -0.08* | 0.18* | 0.15* | -0.23* | 1.00 | | | | | | | | | |
| 14 | Fin. Constraint | -0.02* | -0.02 | 0.02 | 0.02* | 0.03* | 0.04* | 0.04* | 0.06* | -0.01 | -0.12* | -0.19* | 0.00 | -0.03* | 1.00 | | | | | | | | |
| 15 | Investment | 0.02 | 0.02* | -0.03* | 0.07* | 0.08* | 0.02 | 0.01 | 0.06* | 0.06* | 0.14* | 0.23* | -0.10* | 0.09* | -0.06* | 1.00 | | | | | | | |
| 16 | R&D Intensity | -0.08* | -0.09* | 0.06* | -0.43* | -0.39* | -0.19* | -0.26* | -0.26* | 0.25* | -0.37* | -0.29* | 0.45* | -0.29* | 0.09* | -0.13* | 1.00 | | | | | | |
| 17 | Board Size | -0.15* | -0.15* | 0.05* | 0.08* | 0.09* | 0.06* | 0.09* | -0.13* | -0.07* | -0.06* | 0.10* | 0.05* | 0.02 | -0.01 | 0.03 | -0.02 | 1.00 | | | | | |
| 18 | CEO Duality | -0.02 | -0.01 | 0.04* | -0.01 | -0.01 | 0.00 | 0.02 | -0.02 | -0.06* | -0.04* | -0.03* | -0.02 | -0.01 | 0.01 | -0.05* | 0.01 | 0.11* | 1.00 | | | | |
| 19 | CEO Compensation | -0.01 | 0.00 | 0.05* | 0.09* | 0.06* | 0.12* | 0.05* | 0.50* | 0.07* | 0.09* | -0.07* | -0.10* | 0.10* | 0.04* | -0.02 | -0.02 | -0.03* | 0.17* | 1.00 | | | |
| 20 | CEO Tenure | -0.14* | -0.12* | 0.18* | -0.02 | -0.03* | -0.03 | -0.04* | 0.08* | 0.02 | 0.04* | -0.01 | -0.05* | 0.05* | -0.03* | -0.00 | -0.02 | 0.17* | 0.26* | 0.15* | 1.00 | | |
| 21 | CEO Age | -0.15* | -0.14* | 0.14* | 0.05* | 0.05* | 0.03* | 0.04* | 0.02 | -0.09* | -0.02 | 0.03* | -0.01 | 0.09* | -0.02 | -0.00 | -0.09* | 0.80* | 0.12* | 0.09* | 0.27* | 1.00 | |
| 22 | Board Indep. | -0.04* | -0.06* | 0.06* | -0.03* | -0.02* | 0.00 | 0.00 | -0.05* | -0.01 | -0.02* | -0.03* | 0.02* | -0.07* | -0.02 | -0.02* | 0.04* | 0.05* | -0.00 | -0.02 | 0.03* | 0.02 | 1.00 |

The table presents the unconditional correlation coefficient between any pair of variables. All variables are as described in Table 1. * Indicates significance at 1%.

**Table 4: Co-option on leverage**

| | NBLev | | NMLev | | BLev | | MLev | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Co-opted Directors | 0.057*** | 0.056*** | 0.018*** | 0.019*** | 0.018*** | 0.029*** | 0.010*** | 0.014*** |
| | (0.014) | (0.013) | (0.003) | (0.006) | (0.004) | (0.009) | (0.003) | (0.004) |
| Firm Size | | 0.044*** | | 0.020*** | | 0.031*** | | 0.015*** |
| | | (0.004) | | (0.002) | | (0.002) | | (0.001) |
| Tobin's Q | | -0.030*** | | -0.004** | | -0.002 | | -0.011*** |
| | | (0.006) | | (0.002) | | (0.004) | | (0.002) |
| ROA | | -0.140* | | -0.092*** | | -0.262*** | | -0.175*** |
| | | (0.078) | | (0.028) | | (0.056) | | (0.025) |
| Tangibility | | 0.508*** | | 0.194*** | | 0.138*** | | 0.082*** |
| | | (0.042) | | (0.018) | | (0.028) | | (0.015) |
| Earnings vol | | -0.196 | | -0.107 | | 0.270** | | 0.079 |
| | | (0.148) | | (0.065) | | (0.106) | | (0.053) |
| Dividend | | 0.010 | | -0.001 | | -0.003 | | -0.010*** |
| | | (0.009) | | (0.004) | | (0.007) | | (0.003) |
| Fin. Constraint | | 0.474*** | | 0.200*** | | 0.207*** | | 0.128*** |
| | | (0.067) | | (0.033) | | (0.040) | | (0.024) |
| Investment | | -0.027*** | | -0.009** | | -0.019*** | | -0.010*** |
| | | (0.009) | | (0.004) | | (0.007) | | (0.003) |
| R&D Intensity | | -0.222* | | -0.132*** | | -0.072 | | -0.121*** |
| | | (0.126) | | (0.050) | | (0.071) | | (0.031) |
| Board Size | | 0.026 | | -0.049 | | -0.123 | | -0.114 |
| | | (0.321) | | (0.137) | | (0.227) | | (0.106) |
| Board Indep. | | 0.088*** | | 0.038*** | | 0.052*** | | 0.023*** |
| | | (0.018) | | (0.008) | | (0.012) | | (0.006) |
| CEO Duality | | 0.005 | | 0.011 | | -0.019 | | 0.000 |
| | | (0.022) | | (0.010) | | (0.014) | | (0.007) |
| CEO Compensation | | 0.005 | | 0.002 | | 0.004 | | 0.001 |
| | | (0.006) | | (0.002) | | (0.003) | | (0.001) |
| CEO Tenure | | 0.009* | | 0.000 | | 0.006 | | 0.000 |
| | | (0.006) | | (0.003) | | (0.004) | | (0.002) |
| CEO Age | | -0.122 | | -0.014 | | 0.046 | | 0.056 |
| | | (0.275) | | (0.117) | | (0.197) | | (0.091) |
| Constant | 0.029*** | -0.218 | 0.041*** | 0.018 | 0.202*** | 0.176 | 0.105*** | 0.203** |
| | (0.009) | (0.271) | (0.002) | (0.116) | (0.003) | (0.183) | (0.002) | (0.088) |
| Firm effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *N* | 17004 | 15256 | 17002 | 15256 | 17029 | 15256 | 17007 | 15256 |
| r2 | 0.468 | 0.651 | 0.500 | 0.676 | 0.374 | 0.534 | 0.440 | 0.641 |
| N_clust | 1887 | 1693 | 1887 | 1693 | 1887 | 1693 | 1887 | 1693 |

This table provides the estimation results of the effect of Co-Option on measures of leverage. Standard errors robust to heteroscedasticity and clustering at firm level are given in parentheses. Significance indicators: * p < 0.10, ** p < 0.05, *** p < 0.

**Table 5: The influence of "Non-co-opted and independent" vs. "Co-Opted but independent" directors on leverage**

| | NBLev | | NMLev | | BLev | | MLev | | NBLev | | NMLev | | BLev | | MLev | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
| Non-Co-opted-Indep | -0.060*** | -0.067*** | -0.017*** | -0.024*** | -0.016*** | -0.033*** | -0.009*** | -0.018*** | | | | | | | | |
| | (0.017) | (0.016) | (0.004) | (0.007) | (0.006) | (0.011) | (0.003) | (0.005) | | | | | | | | |
| Co-opted-Indep | | | | | | | | | 0.068*** | 0.060*** | 0.019*** | 0.018*** | 0.012*** | 0.026*** | 0.009*** | 0.015*** |
| | | | | | | | | | (0.020) | (0.016) | (0.004) | (0.007) | (0.006) | (0.011) | (0.003) | (0.006) |
| Firm Size | | 0.044*** | | 0.020*** | | 0.031*** | | 0.016*** | | 0.045*** | | 0.021*** | | 0.031*** | | 0.016*** |
| | | (0.004) | | (0.002) | | (0.002) | | (0.001) | | (0.004) | | (0.001) | | (0.002) | | (0.001) |
| Tobin's Q | | -0.031*** | | -0.004** | | -0.002 | | -0.011*** | | -0.024*** | | -0.001 | | -0.002 | | -0.010*** |
| | | (0.006) | | (0.002) | | (0.004) | | (0.002) | | (0.005) | | (0.001) | | (0.003) | | (0.001) |
| ROA | | -0.139* | | -0.092*** | | -0.262*** | | -0.175*** | | -0.211*** | | -0.106*** | | -0.273*** | | -0.180*** |
| | | (0.078) | | (0.028) | | (0.056) | | (0.025) | | (0.068) | | (0.024) | | (0.051) | | (0.022) |
| Tangibility | | 0.504*** | | 0.192*** | | 0.136*** | | 0.081*** | | 0.512*** | | 0.186*** | | 0.129*** | | 0.073*** |
| | | (0.042) | | (0.018) | | (0.028) | | (0.015) | | (0.040) | | (0.017) | | (0.027) | | (0.014) |
| Earnings vol | | -0.195 | | -0.107 | | 0.271** | | 0.078 | | -0.399*** | | -0.157*** | | 0.137* | | 0.044 |
| | | (0.147) | | (0.065) | | (0.106) | | (0.054) | | (0.116) | | (0.048) | | (0.079) | | (0.036) |
| Dividend | | 0.010 | | -0.001 | | -0.003 | | -0.010*** | | 0.010 | | -0.001 | | -0.004 | | -0.010*** |
| | | (0.009) | | (0.004) | | (0.007) | | (0.003) | | (0.009) | | (0.004) | | (0.006) | | (0.003) |
| Fin. Constraint | | 0.474*** | | 0.200*** | | 0.206*** | | 0.128*** | | 0.460*** | | 0.196*** | | 0.193*** | | 0.121*** |
| | | (0.066) | | (0.032) | | (0.040) | | (0.023) | | (0.065) | | (0.031) | | (0.038) | | (0.023) |
| Investment | | -0.027*** | | -0.009** | | -0.019*** | | -0.010*** | | -0.032*** | | -0.010*** | | -0.019*** | | -0.010*** |
| | | (0.009) | | (0.004) | | (0.007) | | (0.003) | | (0.009) | | (0.004) | | (0.007) | | (0.003) |
| R&D Intensity | | -0.226* | | -0.133*** | | -0.074 | | -0.122*** | | -0.253** | | -0.145*** | | -0.062 | | -0.126*** |
| | | (0.125) | | (0.049) | | (0.071) | | (0.031) | | (0.118) | | (0.046) | | (0.067) | | (0.028) |
| Board Size | | 0.052 | | -0.040 | | -0.108 | | -0.106 | | -0.038 | | -0.103 | | -0.049 | | -0.119 |
| | | (0.320) | | (0.137) | | (0.227) | | (0.106) | | (0.306) | | (0.126) | | (0.206) | | (0.098) |
| Board Indep. | | 0.089*** | | 0.038*** | | 0.052*** | | 0.023*** | | 0.098*** | | 0.042*** | | 0.056*** | | 0.025*** |
| | | (0.018) | | (0.008) | | (0.012) | | (0.006) | | (0.018) | | (0.008) | | (0.012) | | (0.006) |
| CEO Duality | | 0.005 | | 0.011 | | -0.020 | | -0.000 | | 0.007 | | 0.011 | | -0.022* | | -0.001 |
| | | (0.022) | | (0.010) | | (0.014) | | (0.007) | | (0.020) | | (0.009) | | (0.013) | | (0.006) |
| CEO Compensation | | 0.005 | | 0.002 | | 0.004 | | 0.001 | | 0.004 | | 0.001 | | 0.005 | | 0.001 |
| | | (0.006) | | (0.002) | | (0.003) | | (0.001) | | (0.005) | | (0.002) | | (0.003) | | (0.001) |
| CEO Tenure | | 0.010* | | 0.000 | | 0.006 | | 0.000 | | 0.006 | | -0.002 | | 0.003 | | -0.002 |
| | | (0.006) | | (0.003) | | (0.004) | | (0.002) | | (0.005) | | (0.002) | | (0.004) | | (0.002) |
| CEO Age | | -0.149 | | -0.023 | | 0.031 | | 0.049 | | -0.060 | | 0.036 | | -0.014 | | 0.063 |
| | | (0.275) | | (0.117) | | (0.197) | | (0.091) | | (0.261) | | (0.107) | | (0.177) | | (0.083) |
| Constant | 0.080*** | -0.169 | 0.057*** | 0.034 | 0.218*** | 0.200 | 0.114*** | 0.214** | 0.006 | -0.212 | 0.036*** | 0.043 | 0.203*** | 0.109 | 0.103*** | 0.192** |
| | (0.007) | (0.270) | (0.002) | (0.116) | (0.002) | (0.181) | (0.001) | (0.087) | (0.016) | (0.267) | (0.003) | (0.111) | (0.005) | (0.174) | (0.003) | (0.084) |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Firm effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *N* | 17003 | 15255 | 17001 | 15255 | 17028 | 15255 | 17006 | 15255 | 17003 | 15772 | 17001 | 15772 | 17028 | 15772 | 17006 | 15772 |
| r2 | 0.467 | 0.651 | 0.500 | 0.677 | 0.374 | 0.534 | 0.440 | 0.641 | 0.467 | 0.652 | 0.500 | 0.675 | 0.374 | 0.529 | 0.440 | 0.636 |
| N_clust | 1887 | 1693 | 1887 | 1693 | 1887 | 1693 | 1887 | 1693 | 1887 | 1750 | 1887 | 1750 | 1887 | 1750 | 1887 | 1750 |

This table provides the estimation results of the effect of "Non-Co-opted but independent" vs. "Co-Opted but independent" directors on leverage. Standard errors robust to heteroscedasticity and clustering at firm level are given in parentheses. Significance indicators: * p < 0.10, ** p < 0.05, *** p < 0.0

**Table 6: Co-option on leverage – partial adjustment model**

| | NBLev | | NMLev | | BLev | | MLev | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Co-opted Directors | 0.050*** | | 0.024*** | | 0.039*** | | 0.022*** | |
| | (0.018) | | (0.009) | | (0.014) | | (0.007) | |
| $Co\text{-}Option_{TW}$ | | 0.049*** | | 0.015*** | | 0.031*** | | 0.012*** |
| | | (0.018) | | (0.009) | | (0.012) | | (0.003) |
| $Leverage_{t-1}$ | 0.794*** | 0.796*** | 0.290*** | 0.291*** | 0.274*** | 0.275*** | 0.112*** | 0.113*** |
| | (0.024) | (0.024) | (0.012) | (0.012) | (0.025) | (0.025) | (0.011) | (0.011) |
| Firm Size | 0.138*** | 0.138*** | 0.076*** | 0.076*** | 0.110*** | 0.109*** | 0.051*** | 0.050*** |
| | (0.034) | (0.034) | (0.014) | (0.014) | (0.029) | (0.029) | (0.011) | (0.011) |
| Tobin's Q | -0.009 | -0.009 | 0.007*** | 0.007*** | 0.004 | 0.003 | -0.007*** | -0.007*** |
| | (0.007) | (0.006) | (0.003) | (0.003) | (0.007) | (0.007) | (0.002) | (0.002) |
| ROA | -0.188** | -0.193** | -0.152*** | -0.155*** | -0.275*** | -0.272*** | -0.200*** | -0.199*** |
| | (0.085) | (0.084) | (0.036) | (0.036) | (0.067) | (0.067) | (0.030) | (0.030) |
| Tangibility | 0.122*** | 0.125*** | 0.058*** | 0.059*** | -0.035 | -0.033 | 0.009 | 0.010 |
| | (0.026) | (0.026) | (0.015) | (0.015) | (0.024) | (0.024) | (0.014) | (0.015) |
| Earnings vol | -0.082 | -0.082 | -0.138** | -0.148** | 0.178* | 0.211** | 0.021 | 0.037 |
| | (0.116) | (0.122) | (0.062) | (0.063) | (0.097) | (0.101) | (0.048) | (0.049) |
| Dividend | 0.007 | 0.008 | 0.001 | 0.002 | 0.002 | 0.003 | -0.006** | -0.006* |
| | (0.006) | (0.006) | (0.003) | (0.003) | (0.005) | (0.005) | (0.003) | (0.003) |
| Investment | -0.004 | -0.004 | -0.000 | -0.000 | -0.015* | -0.014 | -0.006* | -0.006* |
| | (0.005) | (0.005) | (0.002) | (0.002) | (0.009) | (0.009) | (0.003) | (0.003) |
| R&D Intensity | 0.139 | 0.134 | 0.003 | 0.001 | 0.030 | 0.025 | -0.069* | -0.072* |
| | (0.093) | (0.093) | (0.036) | (0.036) | (0.066) | (0.067) | (0.038) | (0.037) |
| Fin. Constraint | 0.140*** | 0.140*** | 0.071*** | 0.070*** | 0.107*** | 0.110*** | 0.081*** | 0.082*** |
| | (0.037) | (0.037) | (0.021) | (0.022) | (0.031) | (0.031) | (0.018) | (0.019) |
| Board Size | -0.049 | -0.053 | -0.054 | -0.049 | -0.028 | -0.023 | 0.042 | 0.051 |
| | (0.269) | (0.268) | (0.156) | (0.157) | (0.281) | (0.279) | (0.138) | (0.138) |
| $Size_{t-1}$ | -0.133*** | -0.132*** | -0.072*** | -0.072*** | -0.101*** | -0.101*** | -0.047*** | -0.046*** |
| | (0.035) | (0.035) | (0.014) | (0.014) | (0.030) | (0.030) | (0.011) | (0.011) |
| $TobinQ_{t-1}$ | 0.001 | 0.002 | -0.000 | 0.000 | 0.008* | 0.008* | 0.002 | 0.002 |
| | (0.005) | (0.005) | (0.002) | (0.002) | (0.005) | (0.005) | (0.001) | (0.001) |
| $ROA_{t-1}$ | 0.118* | 0.115* | 0.038 | 0.036 | 0.130** | 0.131** | 0.043* | 0.043* |
| | (0.065) | (0.065) | (0.028) | (0.028) | (0.055) | (0.055) | (0.022) | (0.023) |
| $Fin.\ Constraint_{t-1}$ | 0.156*** | 0.153*** | 0.193*** | 0.193*** | 0.724*** | 0.721*** | 0.394*** | 0.393*** |
| | (0.050) | (0.049) | (0.029) | (0.029) | (0.051) | (0.050) | (0.030) | (0.030) |
| $Co\text{-}opted\ Directors_{t-1}$ | -0.033* | -0.035** | -0.018** | -0.012 | -0.031** | -0.026* | -0.014** | -0.007 |
| | (0.017) | (0.017) | (0.008) | (0.008) | (0.014) | (0.014) | (0.007) | (0.007) |
| CEO Duality | 0.013 | 0.012 | 0.028*** | 0.029*** | -0.010 | -0.011 | 0.019** | 0.019** |
| | (0.019) | (0.019) | (0.010) | (0.011) | (0.017) | (0.017) | (0.010) | (0.010) |
| CEO Compensation | -0.003 | -0.003 | -0.002 | -0.002 | 0.000 | 0.000 | -0.001 | -0.001 |
| | (0.004) | (0.004) | (0.002) | (0.002) | (0.003) | (0.003) | (0.002) | (0.002) |
| CEO Tenure | -0.043 | -0.043 | -0.038 | -0.036 | 0.040 | 0.043 | 0.003 | 0.006 |
| | (0.053) | (0.053) | (0.027) | (0.027) | (0.042) | (0.042) | (0.023) | (0.023) |
| CEO Age | 0.128 | 0.130 | 0.122 | 0.110 | 0.149 | 0.150 | 0.102 | 0.094 |
| | (0.214) | (0.217) | (0.175) | (0.181) | (0.350) | (0.345) | (0.210) | (0.209) |
| Board Indep. | 0.010 | 0.011 | 0.010 | 0.010 | 0.006 | 0.007 | 0.006 | 0.007 |
| | (0.011) | (0.011) | (0.006) | (0.006) | (0.010) | (0.010) | (0.006) | (0.006) |
| $Board\ Size_{t-1}$ | 0.002 | 0.002 | 0.000 | 0.000 | 0.002 | 0.002 | 0.001 | 0.001 |
| | (0.002) | (0.002) | (0.001) | (0.001) | (0.002) | (0.002) | (0.001) | (0.001) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CEO $Age_{t-1}$ | -0.103 | -0.100 | -0.095 | -0.088 | -0.136 | -0.142 | -0.160 | -0.160 |
| | (0.175) | (0.177) | (0.147) | (0.153) | (0.282) | (0.278)s | (0.172) | (0.172) |
| CEO $Compensation_{t-1}$ | 0.004 | 0.004 | 0.003 | 0.004 | -0.000 | -0.000 | 0.001 | 0.001 |
| | (0.004) | (0.004) | (0.002) | (0.002) | (0.004) | (0.004) | (0.002) | (0.002) |
| CEO $Tenure_{t-1}$ | 0.041 | 0.041 | 0.031 | 0.028 | -0.023 | -0.026 | 0.002 | -0.001 |
| | (0.043) | (0.043) | (0.022) | (0.022) | (0.034) | (0.034) | (0.018) | (0.018) |
| Constant | -0.023 | -0.025 | 0.038 | 0.037 | 0.043 | 0.035 | 0.051 | 0.046 |
| | (0.205) | (0.205) | (0.113) | (0.114) | (0.198) | (0.197) | (0.100) | (0.100) |
| Firm effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *N* | 13832 | 13832 | 13832 | 13832 | 13832 | 13832 | 13832 | 13832 |
| r2 | 0.905 | 0.905 | 0.882 | 0.881 | 0.801 | 0.801 | 0.836 | 0.835 |
| N_clust | 1655 | 1655 | 1655 | 1655 | 1655 | 1655 | 1655 | 1655 |

The table reports the estimates based on the partial adjustment model of leverage defined in Eq. (4). Standard errors robust to heteroscedasticity and clustering at industry level are given in parentheses. Significance indicators: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table 7: Robustness Check: Tenure-weighted board co-option and leverage**

| | NBLev | | NMLev | | BLev | | MLev | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (9) | (10) | (12) |
| Co-Option$_{TW}$ | 0.064*** | 0.053*** | 0.020*** | 0.016*** | 0.020*** | 0.027*** | 0.012*** | 0.012*** |
| | (0.015) | (0.012) | (0.003) | (0.005) | (0.004) | (0.008) | (0.003) | (0.004) |
| Firm Size | | 0.045*** | | 0.020*** | | 0.031*** | | 0.016*** |
| | | (0.004) | | (0.001) | | (0.002) | | (0.001) |
| Tobin's Q | | -0.024*** | | -0.001 | | -0.002 | | -0.009*** |
| | | (0.005) | | (0.001) | | (0.003) | | (0.001) |
| ROA | | -0.211*** | | -0.106*** | | -0.274*** | | -0.180*** |
| | | (0.068) | | (0.024) | | (0.051) | | (0.022) |
| Tangibility | | 0.517*** | | 0.188*** | | 0.131*** | | 0.074*** |
| | | (0.040) | | (0.017) | | (0.027) | | (0.014) |
| Earnings vol | | -0.404*** | | -0.158*** | | 0.135* | | 0.043 |
| | | (0.117) | | (0.048) | | (0.079) | | (0.036) |
| Dividend | | 0.011 | | -0.001 | | -0.004 | | -0.010*** |
| | | (0.009) | | (0.004) | | (0.006) | | (0.003) |
| Fin. Constraint | | 0.460*** | | 0.196*** | | 0.193*** | | 0.122*** |
| | | (0.065) | | (0.032) | | (0.038) | | (0.023) |
| Investment | | -0.032*** | | -0.010*** | | -0.019*** | | -0.010*** |
| | | (0.009) | | (0.004) | | (0.007) | | (0.003) |
| R&D Intensity | | -0.246** | | -0.143*** | | -0.059 | | -0.124*** |
| | | (0.119) | | (0.046) | | (0.068) | | (0.028) |
| Board Size | | -0.056 | | -0.108 | | -0.059 | | -0.123 |
| | | (0.307) | | (0.126) | | (0.207) | | (0.098) |
| Board Indep. | | 0.098*** | | 0.042*** | | 0.056*** | | 0.025*** |
| | | (0.018) | | (0.008) | | (0.012) | | (0.006) |
| CEO Duality | | 0.006 | | 0.011 | | -0.023* | | -0.001 |
| | | (0.020) | | (0.009) | | (0.013) | | (0.006) |
| CEO Compensation | | 0.003 | | 0.001 | | 0.004 | | 0.001 |
| | | (0.005) | | (0.002) | | (0.003) | | (0.001) |
| CEO Tenure | | 0.007 | | -0.001 | | 0.004 | | -0.001 |
| | | (0.005) | | (0.002) | | (0.004) | | (0.002) |
| CEO Age | | -0.037 | | 0.042 | | -0.002 | | 0.069 |
| | | (0.261) | | (0.107) | | (0.178) | | (0.084) |
| _cons | 0.015 | -0.214 | 0.037*** | 0.043 | 0.198*** | 0.102 | 0.102*** | 0.194** |
| | (0.012) | (0.267) | (0.002) | (0.111) | (0.003) | (0.174) | (0.002) | (0.084) |
| Firm effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *N* | 17004 | 15773 | 17002 | 15773 | 17029 | 15773 | 17007 | 15773 |
| r2 | 0.469 | 0.652 | 0.501 | 0.675 | 0.375 | 0.530 | 0.441 | 0.636 |
| N_clust | 1887 | 1750 | 1887 | 1750 | 1887 | 1748 | 1887 | 1750 |

This table provides the estimation results of the effect of Co-Option weighted by tenure on measures of leverage. Standard errors robust to heteroscedasticity and clustering at firm level are given in parentheses. Significance indicators: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table 8: Robustness Check: Board co-option and new debt issues**

| | NBLev | | NMLev | | BLev | | MLev | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Co-opted Directors | 0.054*** | | 0.020*** | | 0.029*** | | 0.017*** | |
| | (0.014) | | (0.006) | | (0.009) | | (0.005) | |
| $Co\text{-}Option_{TW}$ | | 0.054*** | | 0.017*** | | 0.028*** | | 0.014*** |
| | | (0.013) | | (0.006) | | (0.009) | | (0.004) |
| Firm Size | 0.041*** | 0.040*** | 0.019*** | 0.019*** | 0.027*** | 0.027*** | 0.013*** | 0.013*** |
| | (0.004) | (0.004) | (0.001) | (0.001) | (0.002) | (0.002) | (0.001) | (0.001) |
| Tobin's Q | -0.032*** | -0.031*** | -0.008*** | -0.007*** | -0.006* | -0.006* | -0.011*** | -0.011*** |
| | (0.005) | (0.005) | (0.002) | (0.002) | (0.003) | (0.003) | (0.002) | (0.002) |
| ROA | -0.068 | -0.090 | -0.027 | -0.033 | -0.172*** | -0.170*** | -0.118*** | -0.120*** |
| | (0.073) | (0.074) | (0.025) | (0.025) | (0.059) | (0.060) | (0.021) | (0.022) |
| Tangibility | 0.461*** | 0.461*** | 0.165*** | 0.165*** | 0.109*** | 0.112*** | 0.069*** | 0.070*** |
| | (0.042) | (0.042) | (0.018) | (0.018) | (0.029) | (0.028) | (0.016) | (0.016) |
| Earnings vol | -0.197 | -0.327** | -0.090 | -0.117** | 0.211** | 0.230** | 0.015 | 0.009 |
| | (0.150) | (0.148) | (0.060) | (0.057) | (0.102) | (0.103) | (0.047) | (0.044) |
| Dividend | 0.010 | 0.010 | -0.002 | -0.002 | -0.005 | -0.004 | -0.010*** | -0.010*** |
| | (0.010) | (0.010) | (0.004) | (0.004) | (0.007) | (0.007) | (0.003) | (0.003) |
| Fin. Constraint | 0.339*** | 0.333*** | 0.136*** | 0.135*** | 0.168*** | 0.171*** | 0.103*** | 0.103*** |
| | (0.067) | (0.067) | (0.032) | (0.033) | (0.038) | (0.038) | (0.022) | (0.022) |
| Investment | -0.025*** | -0.026*** | -0.006** | -0.006** | -0.011** | -0.010** | -0.007** | -0.007** |
| | (0.009) | (0.009) | (0.003) | (0.003) | (0.005) | (0.005) | (0.003) | (0.003) |
| R&D Intensity | -0.383*** | -0.373*** | -0.142*** | -0.142*** | -0.065 | -0.066 | -0.095*** | -0.095*** |
| | (0.126) | (0.125) | (0.046) | (0.045) | (0.074) | (0.073) | (0.029) | (0.029) |
| Board Size | 0.275 | 0.264 | 0.088 | 0.086 | 0.018 | 0.007 | -0.061 | -0.064 |
| | (0.332) | (0.331) | (0.135) | (0.134) | (0.218) | (0.218) | (0.103) | (0.103) |
| Board Indep. | 0.084*** | 0.084*** | 0.038*** | 0.038*** | 0.053*** | 0.053*** | 0.024*** | 0.024*** |
| | (0.020) | (0.020) | (0.008) | (0.008) | (0.012) | (0.012) | (0.006) | (0.006) |
| CEO Duality | 0.014 | 0.014 | 0.010 | 0.010 | -0.017 | -0.017 | -0.000 | -0.000 |
| | (0.023) | (0.023) | (0.010) | (0.010) | (0.013) | (0.013) | (0.007) | (0.007) |
| Compensation | 0.008 | 0.008 | 0.002 | 0.002 | 0.006** | 0.006** | 0.002* | 0.002* |
| | (0.006) | (0.006) | (0.002) | (0.002) | (0.003) | (0.003) | (0.001) | (0.001) |
| CEO Tenure | 0.001 | 0.001 | -0.003 | -0.003 | 0.001 | 0.001 | -0.003 | -0.003 |
| | (0.006) | (0.006) | (0.003) | (0.003) | (0.004) | (0.004) | (0.002) | (0.002) |
| CEO Age | -0.318 | -0.306 | -0.125 | -0.124 | -0.069 | -0.059 | 0.015 | 0.018 |
| | (0.287) | (0.286) | (0.116) | (0.115) | (0.191) | (0.191) | (0.089) | (0.089) |
| Constant | -0.434 | -0.422 | -0.087 | -0.079 | 0.067 | 0.067 | 0.152* | 0.157* |
| | (0.277) | (0.276) | (0.114) | (0.114) | (0.171) | (0.171) | (0.084) | (0.084) |
| Firm effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *N* | 14149 | 9148 | 14148 | 9147 | 14149 | 9148 | 14148 | 9147 |
| r2 | 0.651 | 0.652 | 0.684 | 0.684 | 0.533 | 0.533 | 0.642 | 0.642 |
| N_clust | 1692 | 1094 | 1692 | 1094 | 1692 | 1094 | 1692 | 1094 |

The table reports the estimates of the effects of board co-option on new debt issues. Standard errors robust to heteroscedasticity and clustering at firm level are given in parentheses. Significance indicators: * p < 0.10, ** p < 0.05, *** p < 0.01

**Table 9: Addressing Endogeneity using two-step GMM: Co-option and leverage:**

| | NBLev | | | | NMLev | | | | BLev | | | | MLev | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (9) | (10) | (3) | (4) | (11) | (12) | (5) | (6) | (13) | (14) | (7) | (8) | (15) | (16) |
| Co-opted Directors | 0.122*** | 0.110*** | | | 0.173*** | 0.154*** | | | 0.144*** | 0.118*** | | | 0.084*** | 0.050*** | | |
| | (0.044) | (0.035) | | | (0.019) | (0.032) | | | (0.017) | (0.026) | | | (0.010) | (0.012) | | |
| Co-Option$_{TW}$ | | | 0.167*** | 0.127*** | | | 0.151*** | 0.160*** | | | 0.126*** | 0.122*** | | | 0.074*** | 0.051*** |
| | | | (0.040) | (0.034) | | | (0.018) | (0.041) | | | (0.015) | (0.033) | | | (0.009) | (0.014) |
| Firm Size | | -0.010 | | -0.034 | | -0.001 | | -0.009 | | 0.014** | | 0.007 | | 0.008*** | | 0.005 |
| | | (0.019) | | (0.024) | | (0.007) | | (0.009) | | (0.006) | | (0.007) | | (0.003) | | (0.003) |
| Tobin's Q | | 0.054** | | 0.090** | | 0.025*** | | 0.039*** | | 0.024*** | | 0.034*** | | -0.004 | | 0.001 |
| | | (0.022) | | (0.035) | | (0.009) | | (0.014) | | (0.007) | | (0.011) | | (0.003) | | (0.005) |
| ROA | | -1.060*** | | -1.523*** | | -0.477*** | | -0.653*** | | -0.529*** | | -0.661*** | | -0.307*** | | -0.364*** |
| | | (0.288) | | (0.403) | | (0.116) | | (0.161) | | (0.093) | | (0.123) | | (0.043) | | (0.058) |
| Tangibility | | 0.700*** | | 0.813*** | | 0.311*** | | 0.353*** | | 0.276*** | | 0.309*** | | 0.163*** | | 0.176*** |
| | | (0.123) | | (0.150) | | (0.048) | | (0.058) | | (0.040) | | (0.047) | | (0.019) | | (0.022) |
| Earnings vol | | -2.102*** | | -1.661*** | | -0.866*** | | -0.718*** | | -0.353* | | -0.221 | | -0.199** | | -0.152* |
| | | (0.633) | | (0.636) | | (0.252) | | (0.250) | | (0.208) | | (0.205) | | (0.097) | | (0.091) |
| Dividend | | -0.180*** | | -0.230*** | | -0.075*** | | -0.094*** | | -0.053** | | -0.067** | | -0.033*** | | -0.039*** |
| | | (0.064) | | (0.088) | | (0.025) | | (0.034) | | (0.021) | | (0.028) | | (0.009) | | (0.012) |
| Investment | | -0.082*** | | -0.081*** | | -0.028*** | | -0.029*** | | -0.036*** | | -0.035*** | | -0.015*** | | -0.015*** |
| | | (0.022) | | (0.024) | | (0.008) | | (0.009) | | (0.008) | | (0.008) | | (0.003) | | (0.004) |
| R&D Intensity | | -0.152 | | -0.523 | | -0.180 | | -0.319** | | -0.071 | | -0.179 | | -0.166*** | | -0.212*** |
| | | (0.344) | | (0.380) | | (0.136) | | (0.149) | | (0.103) | | (0.113) | | (0.049) | | (0.052) |
| Fin. Constraint | | 0.187 | | 0.167 | | 0.083 | | 0.074 | | 0.072 | | 0.068 | | 0.054* | | 0.052 |
| | | (0.231) | | (0.255) | | (0.089) | | (0.099) | | (0.071) | | (0.079) | | (0.032) | | (0.036) |
| Board Size | | 1.209*** | | 1.272*** | | 0.528*** | | 0.554*** | | 0.404*** | | 0.415*** | | 0.223*** | | 0.229*** |
| | | (0.371) | | (0.427) | | (0.141) | | (0.164) | | (0.114) | | (0.131) | | (0.050) | | (0.057) |
| Board Indep. | | 0.162 | | 0.207* | | 0.077** | | 0.094** | | 0.077** | | 0.090*** | | 0.043*** | | 0.049*** |
| | | (0.099) | | (0.108) | | (0.038) | | (0.042) | | (0.032) | | (0.035) | | (0.014) | | (0.015) |
| CEO Duality | | -0.254** | | -0.325** | | -0.087** | | -0.113** | | -0.084** | | -0.104*** | | -0.027* | | -0.036** |
| | | (0.108) | | (0.127) | | (0.041) | | (0.048) | | (0.033) | | (0.038) | | (0.014) | | (0.016) |
| CEO Compensation | | 0.019 | | 0.008 | | 0.007 | | 0.003 | | 0.011 | | 0.008 | | 0.004 | | 0.003 |
| | | (0.023) | | (0.023) | | (0.009) | | (0.009) | | (0.007) | | (0.007) | | (0.003) | | (0.003) |
| CEO Tenure | | 0.448*** | | 0.470*** | | 0.166*** | | 0.174*** | | 0.128*** | | 0.134*** | | 0.052*** | | 0.054*** |
| | | (0.104) | | (0.129) | | (0.040) | | (0.050) | | (0.032) | | (0.039) | | (0.014) | | (0.017) |
| CEO Age | | 0.358 | | 0.607* | | 0.075 | | 0.166 | | 0.056 | | 0.133 | | -0.020 | | 0.011 |
| | | (0.256) | | (0.315) | | (0.099) | | (0.122) | | (0.086) | | (0.103) | | (0.039) | | (0.046) |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Constant | -0.212*** | -0.936*** | -0.242*** | -1.109*** | -0.085*** | -0.360*** | -0.097*** | -0.425*** | -0.053*** | -0.274*** | -0.064*** | -0.324*** | -0.033*** | -0.117*** | -0.039*** | -0.138*** |
| | (0.023) | (0.200) | (0.027) | (0.286) | (0.010) | (0.077) | (0.012) | (0.111) | (0.008) | (0.062) | (0.010) | (0.088) | (0.005) | (0.027) | (0.006) | (0.038) |
| Firm Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 16518 | 14718 | 17518 | 14717 | 16517 | 14718 | 17517 | 14717 | 16518 | 14718 | 17518 | 14717 | 16517 | 14718 | 17517 | 14717 |
| N_clust | 1376 | 950 | 1411 | 1272 | 1376 | 950 | 1411 | 1272 | 1376 | 950 | 1411 | 1272 | 1376 | 950 | 1411 | 1272 |
| K-P WF statistic | 46.006 | 13.169 | 43.280 | 19.429 | 45.930 | 13.169 | 43.196 | 19.429 | 46.006 | 13.169 | 43.280 | 19.429 | 45.930 | 13.169 | 43.196 | 19.429 |
| K-P LM statistic | 72.134 | 24.067 | 68.371 | 17.511 | 71.988 | 24.067 | 68.209 | 17.511 | 72.134 | 24.067 | 68.371 | 17.511 | 71.988 | 24.067 | 68.209 | 17.511 |
| Hansen J statistic | 1.811 | 2.265 | 1.322 | 1.590 | 1.316 | 1.972 | 0.850 | 1.378 | 2.848 | 1.354 | 9.803 | 0.908 | 1.955 | 0.671 | 1.462 | 0.406 |
| Hansen J p-value | 0.178 | 0.132 | 0.250 | 0.207 | 0.251 | 0.160 | 0.357 | 0.240 | 0.102 | 0.244 | 0.102 | 0.341 | 0.162 | 0.413 | 0.227 | 0.524 |

This table presents the two-stage GMM estimation results of the effects of co-option on leverage. Standard error robust to heteroscedasticity and clustering at firm level are given in parentheses. Significance indicators: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table 10: Co-option and tax/debt benefits/implications**

| | Net Book Leverage | | | | | Net Market Leverage | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Co-opted Directors | 0.061*** | 0.061*** | 0.061*** | 0.057*** | 0.087*** | 0.021*** | 0.014 | 0.019*** | 0.018*** | 0.029*** |
| | (0.015) | (0.023) | (0.017) | (0.014) | (0.026) | (0.007) | (0.010) | (0.007) | (0.006) | (0.011) |
| Marginal Tax Rate | -0.253* | | | | -0.152 | -0.174 | | | | -0.106** |
| | (0.151) | | | | (0.115) | (0.108) | | | | (0.079) |
| Co-opted × Marginal Tax Rate | -0.247 | | | | -0.467** | -0.208 | | | | -0.381 |
| | (0.240) | | | | (0.232) | (0.169) | | | | (0.156) |
| Depreciation | | 0.705* | | | 1.020** | | 0.222*** | | | 0.362* |
| | | (0.383) | | | (0.472) | | (0.165) | | | (0.209) |
| Co-opted × Depreciation | | -0.182 | | | -0.638 | | 0.066 | | | -0.136 |
| | | (0.489) | | | (0.523) | | (0.216) | | | (0.239) |
| Tax Loss Carry Forward | | | 0.074*** | | 0.033* | | | 0.027*** | | 0.012* |
| | | | (0.016) | | (0.022) | | | (0.009) | | (0.011) |
| Co-opted × Tax Loss Carry Forward | | | -0.114 | | -0.078 | | | -0.045 | | -0.034 |
| | | | (0.034) | | (0.042) | | | (0.016) | | (0.020) |
| Investment Tax Credit | | | | -0.115 | -0.302* | | | | -0.117 | -0.211** |
| | | | | (0.327) | (0.226) | | | | (0.149) | (0.089) |
| Co-opted × Investment Tax Credit | | | | 1.096 | 1.898 | | | | 0.781 | 1.224 |
| | | | | (1.633) | (1.124) | | | | (0.745) | (0.446) |
| Constant | 0.033*** | 0.004 | 0.023** | 0.028*** | -0.006 | 0.045*** | 0.034*** | 0.039*** | 0.041*** | 0.029*** |
| | (0.010) | (0.016) | (0.011) | (0.009) | (0.020) | (0.004) | (0.007) | (0.005) | (0.004) | (0.008) |
| Firm Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *N* | 17002 | 16972 | 11997 | 16958 | 11964 | 17002 | 16972 | 11997 | 16956 | 11964 |
| r2 | 0.469 | 0.474 | 0.502 | 0.470 | 0.510 | 0.505 | 0.505 | 0.535 | 0.501 | 0.545 |
| N_clust | 1887 | 1883 | 1643 | 1886 | 1639 | 1887 | 1883 | 1643 | 1886 | 1639 |

This table presents the estimation results of the recognition of tax benefits on co-option-leverage nexus. Standard errors robust to heteroscedasticity and clustering at firm level are given in parentheses. Significance indicators: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table 11: Co-Option and leverage: Does financial crisis matter?**

| | NBLev | NMLev | NBLev | NMLev | NBLev | NMLev |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Co-opted Directors | 0.080*** | 0.018*** | 0.066*** | 0.022*** | 0.053*** | 0.013*** |
| | (0.025) | (0.002) | (0.029) | (0.001) | (0.021) | (0.001) |
| Pre-crisis | -0.201*** | -0.053*** | | | | |
| | (0.034) | (0.012) | | | | |
| Co-option × Pre-crisis | 0.139*** | 0.021*** | | | | |
| | (0.049) | (0.002) | | | | |
| Crisis | | | 0.089*** | 0.034*** | | |
| | | | (0.022) | (0.010) | | |
| Co-option × Crisis | | | -0.031 | -0.009 | | |
| | | | (0.034) | (0.015) | | |
| Post-crisis | | | | | -0.245*** | -0.078*** |
| | | | | | (0.029) | (0.012) |
| Co-option × Post-crisis | | | | | 0.076 | 0.014 |
| | | | | | (0.060) | (0.026) |
| Firm Size | 0.035*** | 0.019*** | 0.044*** | 0.020*** | 0.039*** | 0.018*** |
| | (0.006) | (0.002) | (0.008) | (0.003) | (0.007) | (0.003) |
| Tobin's Q | -0.024*** | -0.001 | -0.021*** | -0.000 | -0.020*** | -0.000 |
| | (0.006) | (0.001) | (0.006) | (0.002) | (0.006) | (0.002) |
| ROA | -0.283*** | -0.113*** | -0.205* | -0.104*** | -0.213** | -0.106*** |
| | (0.105) | (0.030) | (0.105) | (0.037) | (0.102) | (0.036) |
| Tangibility | 0.401*** | 0.171*** | 0.507*** | 0.184*** | 0.447*** | 0.165*** |
| | (0.051) | (0.025) | (0.070) | (0.031) | (0.067) | (0.031) |
| Earnings vol | -0.548*** | -0.222*** | -0.395** | -0.154** | -0.315* | -0.127** |
| | (0.145) | (0.057) | (0.178) | (0.067) | (0.164) | (0.064) |
| Dividend | 0.048*** | -0.002 | 0.011 | -0.001 | 0.008 | -0.002 |
| | (0.015) | (0.006) | (0.016) | (0.007) | (0.016) | (0.007) |
| Fin. Constraint | 0.236*** | 0.189*** | 0.472*** | 0.201*** | 0.531*** | 0.221*** |
| | (0.071) | (0.032) | (0.097) | (0.044) | (0.103) | (0.048) |
| Investment | -0.011 | -0.009** | -0.030** | -0.009* | -0.030** | -0.010* |
| | (0.007) | (0.004) | (0.014) | (0.005) | (0.015) | (0.005) |
| R&D Intensity | -0.898*** | -0.145** | -0.234 | -0.139** | -0.322* | -0.169** |
| | (0.187) | (0.057) | (0.173) | (0.068) | (0.172) | (0.068) |
| Board Size | -0.441 | 0.134*** | -0.130 | -0.139 | -0.107 | -0.123 |
| | (0.417) | (0.035) | (0.449) | (0.191) | (0.433) | (0.188) |
| Board Indep | 0.084** | 0.041*** | 0.092** | 0.039*** | 0.078** | 0.035** |
| | (0.033) | (0.012) | (0.037) | (0.015) | (0.034) | (0.014) |
| CEO Duality | -0.009 | 0.013 | 0.003 | 0.010 | -0.002 | 0.008 |
| | (0.033) | (0.012) | (0.036) | (0.016) | (0.033) | (0.015) |
| CEO Compensation | 0.005 | -0.000 | 0.002 | 0.000 | -0.003 | -0.001 |
| | (0.007) | (0.002) | (0.010) | (0.003) | (0.008) | (0.003) |
| CEO Tenure | 0.000 | -0.003 | 0.008 | -0.001 | 0.008 | -0.001 |
| | (0.008) | (0.003) | (0.009) | (0.004) | (0.009) | (0.004) |
| CEO Age | 0.383 | -0.148*** | 0.022 | 0.067 | 0.009 | 0.056 |
| | (0.358) | (0.031) | (0.382) | (0.162) | (0.370) | (0.160) |

| | | | | | | |
|---|---|---|---|---|---|---|
| _cons | 0.086 | -0.127 | -0.158 | 0.063 | -0.027 | 0.101 |
| | (0.394) | (0.094) | (0.435) | (0.184) | (0.413) | (0.178) |
| Firm effect | Yes | Yes | Yes | Yes | Yes | Yes |
| *N* | 15774 | 15774 | 15774 | 15774 | 15774 | 15774 |
| r2 | 0.412 | 0.565 | 0.662 | 0.683 | 0.683 | 0.692 |
| N_clust | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 |

This table presents the estimation results of the recognition of the crisis effect on the co-option-leverage nexus. Standard errors robust to heteroscedasticity and clustering at firm level are given in parentheses. Significance indicators: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$