Co-opted Boards

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Abstract

We propose a new measure to capture the extent of co-option of the board by the CEO and relate that measure to corporate outcomes. Based on the notion that CEOs are at least implicitly involved in the selection of new directors, we define *Co-option* as the proportion of the board comprised of directors who joined the board after the CEO assumed office. The CEO is likely to favor directors who have similar views or directors who have social ties or some other basis for affinity with the CEO. We find that as *Co-option* increases board monitoring intensity decreases (CEO turnover-performance sensitivity diminishes, CEO pay level increases, but CEO wealth-performance sensitivity is unaffected). Higher *Co-option* increases investment in firm-specific human capital and increases firm risk. Finally, Tobin's q increases in *Co-option*, particularly for firms with high human capital intensity. Our results are robust to using: a variety of controls, including board independence and size; fixed effects, IV, and other fixes for endogeneity including a natural experiment; and an alternative tenure-weighted measure of co-option. Additional results suggest that co-opted independent directors are not effective monitors. In contrast, the fraction of independent directors who are not co-opted is a more incisive measure of monitoring effectiveness than is board independence.

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1. Introduction

The board of directors of a firm plays a critical role in corporate governance. One view is that board monitoring of the CEO is more effective the larger is the fraction of independent directors on the board. In practice, however, CEOs are likely to exert considerable influence on the selection of board members. Finkelstein and Hambrick (1989) suggest that CEOs can co-opt the board by appointing "sympathetic" new directors, while Carl Icahn, activist investor, asserts quite directly (Business Week Online, 11/18/2005) that "members of the boards are cronies appointed by the very CEOs they're supposed to be watching." Perhaps CEOs favor such directors because they share similar views or social ties (Hwang and Kim (2009)) or there is some other basis for alignment with the CEO. Shivdasani and Yermack (1999) provide evidence that CEOs involved in the selection of new board members tend to appoint weaker monitors, such as affiliated and inside directors. Though NYSE/Nasdaq listing requirements adopted subsequent to the Sarbanes Oxley (SOX) Act of 2002 substantially reduced the direct influence of the CEO in the nominating process, CEOs can exert some influence on the board nomination process. At the very least, they approve the slate of directors, and this slate is almost always voted in by shareholders (Hermalin and Weisbach (1998), Cai, Garner, and Walkling (2009)).[1]

In this paper, we propose a new measure of board co-option based on the number of directors appointed after the CEO assumes office. Our measure, which we term *Co-option*, is defined as the ratio of the number of such new directors to total board size. The idea is that such new directors, regardless of whether they are classified as independent using traditional definitions, are more likely to assign their allegiance to the CEO because the CEO is involved in their initial appointment. Thus, our measure is likely to reflect the extent to which the CEO has

[1] Of course, CEO influence on the nomination process is substantially lower in the relatively few instances where directors are put up for election by dissident shareholders in proxy fights.

captured the board.

Co-option in principle can range from 0 to 1, with higher values indicating greater co-option and perhaps greater insulation of the management team from various efficiency pressures. In our sample, which is based on all firms from the RiskMetrics database over 1996-2007, mean *Co-option* is 0.48, suggesting that nearly half of board directors are friendly or potentially beholden to the CEO.

Is our measure of board co-option a useful way to understand corporate governance? We examine three classes of questions that relate to the benefits and costs of co-option. First, is board co-option associated with other mechanisms meant to align managerial incentives with shareholder interests? To address aspects of this first question, we examine the sensitivity of CEO turnover and CEO compensation to firm performance. Both are seen as mechanisms that can align managerial incentives with shareholder interests (Weisbach (1988) and Hartzell and Starks (2003)). We find that the sensitivity of CEO turnover to performance decreases with *Co-option*. CEO pay levels increase with *Co-option*, but there is no corresponding increase in the sensitivity of CEO wealth to firm performance that would have justified such higher pay as compensation for risk bearing. Board co-option is associated with less demanding CEO turnover and compensation policy, suggesting either that less-vigorous monitoring leads to greater entrenchment or that some possibly unobserved underlying firm characteristic, such as the presence of long-term growth options, begets an optimal organizational design that in multiple dimensions insulates management from efficiency pressures.

Second, is board co-option associated with vital aspects of firm investment policy? Several studies suggest that insulating managers can implement appropriate investment policy. For instance, DeAngelo and Rice (1983), Knoeber (1986), Stein (1988), and Bizjak, Brickley, and Coles (1993) argue that shielding managers from various pressures can encourage managers to invest in firm-specific human capital, in projects with long-term payoffs, and in riskier projects. To the extent that a captured board entrenches the CEO, co-option should also result in the same outcomes. Our proxies for such investment include within-industry heterogeneity, the ratio of R&D to assets, and firm-specific risk. For ease of exposition, we refer to these as proxies for human capital intensity (HCI). We find some evidence that these HCI proxies are positively associated with *Co-option*. This is consistent with the notion that at least some board co-option can allow managers to invest in ways they otherwise would not.

Third, is firm value related to board co-option? We test whether Tobin's q is related to *Co-option*. We argue in Section 2.5 that, if transaction costs to changing board structure are sufficiently large, firm value increases in co-option for firms with greater HCI. On the other hand, we predict a non-positive relation between firm value and co-option for firms with lower human capital intensity. Consistent with our line of reasoning, we find in our data that Tobin's q increases in *Co-option* for high–HCI firms. In contrast, we find little evidence of a relation between firm value and *Co-option* among other firms.

Our co-option measure is meant to capture affinity arising from the selection of directors and from subsequent proximity of directors to the CEO. Board independence continues to be seen as an important indicator of board monitoring.[2] That the logic for *Co-option* is in some ways distinct from that supporting board independence is manifested in evidence that our co-option measure empirically differs from board independence. For example, on average the proportion of independent directors on the board is 0.66, but on average half of all directors and half of all independent directors as well are co-opted, per our definition. Moreover, regressing

[2] See for example, Weisbach (1988), Byrd and Hickman (1992), Brickley, Coles, and Terry (1994), Dahya, McConnell, and Travlos (2002), Dahya and McConnell (2007), and Dahya, Dimitrov, and McConnell (2008).

Co-option on the fraction of independent directors yields a coefficient that differs from negative one (= -0.15, $p < 0.01$) and delivers poor fit ($R^2 = 0.006$). Given that board independence and *Co-option* differ in underlying logic and, at least at first glance, in empirical character, we include board independence as a control variable in a number of our empirical specifications. Including board independence generally does very little to reduce the explanatory power of *Co-option*. Moreover, we have the unexpected result that board independence itself has little power to explain board monitoring effectiveness, as measured by turnover-performance sensitivity, CEO compensation, and human capital intensity. If there were a statistical horse race between *Co-option* and board independence, *Co-option* would appear to be more successful. We find, furthermore, that independent directors appointed before the CEO assumed office ("Non-Co-opted Independents") are effective monitors. In contrast, directors appointed after the CEO assumed office, even if they are independent ("Co-opted Independents"), are not effective monitors.

Our results are robust to a variety of empirical approaches. First, the evidence is similar for an alternative definition of co-option, *Tenure-Weighted Co-option* (*TW Co-option*), which is defined as the number of director-years served under the current CEO by new directors divided by all director-years. This alternative measure accounts for co-option both through initial appointment and through the increase in influence of new directors through serving on the board alongside the current CEO and other directors. Second, our results are based on specifications that include a full set of control variables suggested by the prior literature. The objective is to isolate the effects of co-option by specifying the "appropriate" level of the dependent variable, absent the effects of co-option, and by removing the co-determinants of co-option and the other primary variable of interest. In this regard our analysis follows other empirical papers.[3]

Third, we employ several additional strategies to address concerns about causation and endogeneity. We use firm fixed effects to control for biases introduced by unobserved, firm-specific, time-invariant, omitted variables that are correlated with *Co-option*. Should it be the case that co-option causes firm performance, other firm governance characteristics, or investment policy, but not vice versa, we use a two-step procedure with the Murphy and Topel (1985) correction for standard errors to estimate the recursive system. To address the possibility that causation also flows the other direction, we also apply full 2SLS. In both approaches we predict *Co-option* in the first stage using whether the sitting CEO was hired from the outside as a "proper" (clean and relevant) instrument.

In a final attempt to address endogeneity, we use SOX and corresponding changes in NYSE and Nasdaq listing requirements for board independence to identify a subsample of our firms that were subject to an exogenous shock to board co-option. Firms that pre-SOX were not compliant with subsequent listing requirements for board independence chose to appoint new independent directors (Linck, Netter, and Yang, 2009), thereby increasing board co-option. To isolate the effects of an exogenous change in co-option, we apply a difference-in-differences approach to the four classes of observations defined by pre-SOX/post-SOX observations and whether the firm was compliant/non-compliant at the time of passage of SOX. We continue to find results on the effects of co-option that support the evidence described above. Overall, we find that our results are qualitatively similar after our best attempts to control for endogeneity.

The paper is arranged as follows. Section 2 lays out the motivation for the study and

[3] Parsons and Titman (2008) offer similar logic and use the same approach in the context of capital structure studies In the governance literature, also see Weisbach (1988), Borokhovich, Brunarski, and Parrino (1997), Core, Holthausen, and Larcker (1999), Huson, Parrino, and Starks (2001), Dahya, McConnell, and Travlos (2002), Hartzell and Starks (2003), Kang and Shivdasani (2005), Faleye (2007), and Core, Guay, and Larcker (2008).

develops the various hypotheses. Section 3 describes the data used in the study. Section 4 delineates what might be considered some of the costs of co-option, as manifested in the relation between *Co-option* and turnover-performance sensitivity, pay levels, and CEO wealth-performance sensitivity. Section 5 considers whether there may be salutary effects of co-option on investment policy. Section 6 explores the value implications of co-option. Section 7 examines the firm and CEO characteristics that are associated with board co-option and then addresses endogeneity concerns and various alternative explanations for our findings. Section 8 examines the relation between director co-option and independence and whether non-co-opted directors are likely to be effective monitors. Section 9 concludes.

2. Motivation, related literature, and hypotheses development

In this section, in order to motivate our main hypotheses, we discuss the related literature and outline the putative costs and benefits of co-option.

2.1. CEO turnover-performance sensitivity

One of the key functions of the board is to evaluate the CEO and to replace him if his performance is poor. While early studies find that the likelihood of CEO turnover decreases in firm performance, subsequent studies suggest that this relation between turnover and performance is weaker when the firm's governance is weaker.[4] Along similar lines, Hermalin and Weisbach (2003) suggest that turnover-performance sensitivity is weaker if the CEO captures the board. This implies that, for a given level of performance, CEOs of firms with more co-opted boards should be less likely to be fired. Thus, we expect that:

[4] See Coughlan and Schmidt (1985), Warner, Watts, and Wruck (1988), Weisbach (1988), Huson, Parrino, and Starks (2001), Dahya, McConnell, and Travlos (2002), Kang and Shivdasani (2005), and Kaplan and Minton (2008).

H1: ***All else equal, the sensitivity of CEO turnover to firm performance decreases with Co-option.***

2.2. CEO pay level

A second important function of the board is to set CEO pay. Many studies argue that entrenched CEOs and CEOs of firms with weaker monitoring receive greater pay (Borokhovich, Brunarski, and Parrino (1997), Core, Holthausen, and Larcker (1999), and Core, Guay, and Larcker (2008)). We extend this reasoning to argue that if co-opted boards are more sympathetic to the CEO, then CEO pay should increase with *Co-option*. This leads to our second hypothesis:

H2: ***All else equal, CEO pay increases with Co-option.***

2.3. CEO wealth-performance sensitivity (delta)

Given the importance of compensation in aligning managerial incentives with shareholder interests, we examine the impact of co-option on CEO wealth-performance sensitivity (WPS or "delta"). Hartzell and Starks (2003) show that the CEO's pay-performance sensitivity (PPS) is higher when there is greater institutional shareholding and argue that this is consistent with higher institutional holdings being good for shareholders. Faleye (2007) finds lower PPS for CEOs of firms with staggered boards and argues that staggered boards are associated with CEO entrenchment. Based on these papers, we expect that if co-option results in lower efficiency pressures on the management team, then wealth-performance sensitivity should decrease in co-option.[5] Formally stated:

[5]Empirically, the papers mentioned in this subsection use different methodologies to capture WPS. For example, Hartzell and Starks (2003) use WPS from new option grants only as the dependent variable. Coles, Lemmon, and Wang use WPS from the total portfolio of stock and option holdings. Falaye (2007) uses Aggarwal and Samwick (1999) type regressions of changes in annual pay on dollar returns and interprets the coefficient on returns as PPS. Our hypothesis is stated in terms of wealth performance sensitivity, but is equally applicable for pay-performance sensitivity. We report our main results using delta from the total CEO portfolio of stock and options (as in Coles et

H3: All else equal, CEO wealth-performance sensitivity decreases with Co-option.

2.4. Investment policy and asset composition

To this point, our discussion suggests that co-option is likely to be associated with less-intensive monitoring by the board. Nonetheless, there may be offsetting economic benefits to co-option and the resulting entrenchment of the CEO. One potential benefit of insulating management from external forces is that it allows the CEO to invest in firm-specific human capital. For instance, Burkart, Gromb, and Panunzi (1997) suggest that in firms where managerial initiative or investment in firm-specific human capital is important, it may be better to reduce the monitoring of the CEO and give the CEO more power. A second benefit of CEO entrenchment is that it may mitigate managerial myopia – CEOs can invest in projects that have long-term payoffs without worrying about being removed through takeovers (DeAngelo and Rice (1983) and Stein (1988)). Knoeber (1986) suggests that golden parachutes serve a similar purpose. A third benefit of CEO entrenchment is that it may provide incentives to managers to implement risky projects. Managers who are not entrenched may hesitate to take on risky projects because if the project fails they may be fired by the board. Further, since the manager is undiversified relative to shareholders, he will more likely avoid firm-specific risk. If the board is co-opted, however, this may be a lesser concern. In sum, if co-opted boards insulate the CEO from pressures to make short-term-oriented and avoid low-risk decisions, then higher co-option could lead to more investment in firm-specific human capital, in projects with long-term payoffs, and in those with risky payoffs.[6]

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al.) but, for robustness, we estimate Aggarwal-Samwick type regressions and find that those results are qualitatively similar to the results we report herein.

[6] Adams and Ferreira (2007) and Almazan and Suarez (2003) develop theoretical models to examine when it may be optimal to have a less independent board. Their terminology is "management-friendly" or "weaker" board.

H4: All else equal, investment in firm-specific human capital, investment in projects with long-term payoffs, and investment in projects with risky payoffs increase in Co-option.

2.5. Co-option and firm performance

We have hypothesized thus far that co-option is associated with both costs and benefits. What then would be the overall impact of co-option on firm value? If firms choose co-option optimally, if there are no transaction costs to altering co-option, and if suitable control variables are included in the regression specification, then there would be no obvious reason to observe a relation in the data between *Co-option* and firm performance (Demsetz and Lehn (1985)). A relation between performance and measured co-option can arise, however, in the presence of transaction costs.

Consider a world where there are two kinds of firms: low- and high-human-capital-intensity (HCI) firms. Assume a hump-shaped function between Tobin's q and board co-option holds for both high- and low-HCI firms (see Figure 1). Having chosen the other dimensions of the firm optimally, this would be the objective function that firms maximize in the absence of transaction costs. Intuitively, we expect that high-HCI firms will benefit more from co-option. Thus, for the reasons stated in Section 2.4, optimal co-option for high-HCI firms will be higher than that for low-HCI firms (this relation is confirmed in the data – see Section 7.1).

Suppose both high- and low-HCI firms choose their co-option optimally and that transaction costs to changing board structure are insignificant. In this case, deviations from optimal co-option are short-lived and random. Since any deviation from optimal co-option is detrimental to firm value, empirically the data would cluster locally around the two maxima. No clear relation between measured co-option and q would be observed in the data except for a line through essentially two data points, one at each maximum.

Now, suppose there are significant transaction costs to changing board co-option. In this world, there are likely to be long-lived deviations from optimal co-option within the bounds defined by the costs of adjusting to the optimum. Any prediction about the relation between co-option and firm value, therefore, will depend on where the majority of the firms will locate on the hump-shaped objective functions. For example, if firms, on average, have higher co-option than optimal (they are on the negatively sloped portion of the objective function), we expect to observe in the data a negative relation between co-option and firm value. On the other hand, if the majority of firms have lower-than-optimal co-option, we expect a positive relation between co-option and firm value.

How do the above arguments apply to high- and low-HCI firms? When the new CEO assumes that position, by definition, co-option is zero. Since optimal co-option is larger for high-HCI firms and it takes time to increase co-option, these firms are more likely to have co-option that is lower than optimal. We would therefore expect to observe a positive relation between *q* and *Co-option* for high-HCI firms. Since optimal co-option is smaller for low-HCI firms, co-option for such firms is more likely to be more evenly distributed around the optimum or co-option could even generally exceed the optimum. Thus, for low-HCI firms we would expect to observe a flatter or even negative relation between *q* and *Co-option*.

H5: ***All else equal, the relation between firm value and Co-option is positive in high-HCI firms and flat or negative in low-HCI firms.***

3. Data and summary statistics

Our starting point is the RiskMetrics database, which covers directors of S&P500, S&P MidCap, and S&P SmallCap firms over the period 1996-2007. Adjustments made to the

RiskMetrics data are described in the Appendix. For these firms, we obtain compensation data from Execucomp, accounting data from Compustat, and stock return data from CRSP. We exclude firms incorporated outside the U.S.

Our primary measure of annual compensation is CEO pay (Execucomp variable: *TDC1*). This includes the value of annual stock option grants, salary and bonus, value of annual restricted stock grants, other annual compensation, long-term incentive payouts, and all other total compensation. The Appendix briefly describes the changes in compensation data reporting pursuant to FASB 123R.

Our principal measure of co-option is based on the number of directors elected after the CEO takes office. We refer to such directors as "new" directors.

$$Co-option = \frac{\#\ new\ directors}{board\ size}$$

This variable ranges from 0 to 1, with higher values indicating greater co-option.

In some specifications, we use an alternative measure of director affinity, *Tenure-weighted Co-option* (*TW Co-option*) which is the proportion of director years served by directors appointed by the sitting CEO. Thus,

$$TW\ Co-option = \frac{\sum_{i=1}^{board\ size} Tenure_i \times New\ Director\ Dummy_i}{\sum_{i=1}^{board\ size} Tenure_i}$$

where $New\ Director\ Dummy_i$ equals 1 if the director is a new director, and equals 0 otherwise. This alternative measure accounts for the increase through time of influence of co-opted directors on board decisions as such directors work alongside the CEO and previously appointed directors. Again, this measure can vary from 0 to 1, with a higher value indicating greater co-option. *Co-option* is always greater than *TW Co-option*.

For each firm-year, RiskMetrics provides the date of the annual meeting and the slate of directors up for election. The directors on the slate almost always obtain sufficient support to be elected (Hermalin and Weisbach (1998) and Cai, Garner, and Walking (2009)). The majority of the sample firms hold their annual meeting during the first 3–4 months of the fiscal year. Thus, because these directors constitute the board for the majority of the fiscal year, we assign directors on the slate at the annual meeting in a given fiscal year as the directors for that year.

We define a CEO turnover event as a change in the identity of a CEO. For turnover regressions, we identify the board in place before the CEO was dismissed since this board is the one responsible for replacing the CEO. Thus the CEO turnover date relative to the meeting date is important for our purpose. Figure 2 illustrates the timeline. If a CEO turnover occurred after the annual meeting date, then the board that determined the replacement was the board elected for that year. That is, turnover and *Co-option* are measured contemporaneously. If a CEO turnover occurred before the annual meeting date, then the board responsible for replacing the CEO is the one elected in the previous year so we use the lagged value of *Co-option* in the turnover regression. In non-turnover years, since both the lagged and contemporaneous boards decide on the CEO's 'non-replacement,' we use the average of the lagged and contemporaneous values of *Co-option*. For regressions of CEO compensation, we use the contemporaneous co-option measure because this is based on the board that is in place for the majority of the year and also because performance-based pay (which is a significant component of overall pay) will be decided by the board at the end of the fiscal year.

Table 1 provides the summary statistics and the Appendix the detailed descriptions for the key variables used in the study. To minimize the influence of outliers, throughout the paper we winsorize all variables at the 1^{st} and 99^{th} percentiles. Table 1 presents statistics on the winsorized values. The average firm in the sample is large, with sales of $4.9 billion. This is not surprising, given that our sample is S&P 1500 firms. The average board has about 10 directors. *Co-option* has a mean value of 0.48 and average *Tenure-Weighted Co-option* is 0.32. The fraction of independent directors is 0.66. Thus, on average, although two-thirds of the directors are technically independent, nearly half of the board was selected after the CEO's appointment, and these new directors are therefore likely to be sympathetic to the CEO. *Co-option* and *TW Co-option* are similar to each other, with a correlation of 0.93 ($p < 0.01$), but are dissimilar to board independence ($\rho = -0.08$ and $\rho = -0.11$, respectively).

4. Co-option and Monitoring Intensity: Empirical Results

4.1. Results: CEO turnover-performance sensitivity

Our first hypothesis, H1, is that the sensitivity of CEO turnover to performance decreases with *Co-option*. To test this, we estimate the following logistic regression:

$$\begin{aligned} ln[Prob(Turnover)/(1 - Prob(Turnover))] = \alpha_0 + \alpha_1\, Co\text{-}option \times Performance + \alpha_2\, Co\text{-}option\; + \\ \alpha_3\, Performance + f(Controls) + \varepsilon_1. \end{aligned}$$

We use two definitions of *Turnover*: *All Turnover*, an indicator variable that equals one if the CEO has been replaced (and equals zero otherwise), and *Forced Turnover*, an indicator variable that equals one only if the departing CEO is less than 60 years old. The logic underlying our measure of co-option is most applicable for forced turnovers. Unfortunately, it is difficult to classify turnovers as forced or voluntary. Very often, even forced turnovers are reported to the press as voluntary. Nevertheless, we use an approximate classification scheme, similar to that used in other papers (such as Denis and Denis (1995)) to separate turnovers into forced or voluntary. If the CEO is 60 or older when he retires, we indicate the turnover as voluntary, otherwise the departure is forced.

Our proxy for performance is *Prior Abnormal Return*. For turnover years, this is measured as the stock returns in the year leading up to the actual date of CEO turnover minus the value-weighted market returns over that period. For non-turnover years, this is measured as the stock returns over the previous fiscal year minus the value-weighted market returns over that period. It is well-documented that, in practice, performance is negatively related to the likelihood of CEO turnover, or that α_3 is negative (Weisbach (1988), Warner, Watts, and Wruck (1988), and Parrino (1997)). Our hypothesis is that turnover-performance sensitivity is attenuated by *Co-option*, or that α_1 is positive. Control variables include: firm size; an age indicator variable that equals 1 if the CEO is between 64 and 66 years of age (this is used in the regression of *All Turnovers* to proxy for normal retirement, as in Murphy and Zimmerman (1993)); CEO tenure; CEO ownership; an indicator variable that equals 1 if the CEO has title of chairman also (henceforth CEO duality); outside director ownership; the governance index of Gompers, Ishii, and Metrick (2003, henceforth the GIM index); board size; an indicator variable that equals 1 if the firm has a female director on board; and industry (2-digit SIC) and year dummies.[7] These control variables are based on Adams and Ferreira (2008), Hwang and Kim (2008), Fich and Shivdasani (2007) and Dittmar and Mahrt-Smith (2007). Here and throughout the paper, all standard errors are adjusted for heteroskedasticity and firm-level clustering (Petersen (2009)).

Table 2 reports the results. In Models 1 and 2, *All Turnover* is the dependent variable. Model 1 uses industry and year fixed effects, while Model 2 uses firm and year fixed effects to control for any omitted firm-specific and time-invariant variables that are correlated with *Co-*

[7] For the four CEO-related variables, the values correspond to the departing CEO in the year of turnover.

option.[8] The coefficient on performance (α_3) is negative, implying that CEO turnover is sensitive to performance in a firm with *Co-option* = 0 (true for about 11% of the observations). Consistent with our hypothesis, the coefficient on the interaction term of *Co-option* and performance (α_1) is significantly positive, indicating that an increase in *Co-option* is associated with a decrease in the sensitivity of CEO turnover to firm performance. Using coefficient estimates from Model 2, the sensitivity of turnover to firm performance decreases by 0.29 (from –0.78 to –0.49) when *Co-option* increases from its 25th to 75th percentile value. This is economically meaningful in comparison to a turnover-performance sensitivity of –0.64 at the mean value of *Co-option* and the other right-hand-side variables.

In Models 3–6, we focus on forced turnover. Model 3 uses industry and year fixed effects, while Model 4 uses firm and year fixed effects.[9] Should intuition favor the tenure-weighted co-option measure, Model 5 uses *TW Co-option* as the independent variable. Finally, since we argue above that co-option and independence represent different aspects of board effectiveness, we augment the specification in Model 4 with board independence and, per Weisbach (1988), the product of board independence and prior performance to obtain Model 6. In all cases, we find that the sensitivity of turnover to performance decreases with board *Co-option (*or α_1 is significantly positive).[10] Including the board independence variables does not affect materially the magnitude or statistical significance of the co-option variables. In contrast,

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[8] Note that we omit industry dummies when we include firm fixed effects. Also, the number of observations is much lower in the firm-fixed-effects specifications because firms that never had a turnover during the sample period are excluded.

[9] In specifications involving forced turnover, we drop the CEO age dummy because forced turnover, by definition, is always zero when this dummy takes the value of 1.

[10] The results remain qualitatively similar when we use alternative classification schemes, such as defining the turnover as forced if the CEO is not in the "normal" retirement age of 64–66 when she departs.

the estimated coefficients on the independence variables are insignificantly different from zero.[11] Board *Co-option*, rather than board independence, has explanatory power for turnover-performance sensitivity.

Note that in Models 1 and 2 the coefficient on the retirement-age dummy is positive and significant, which is consistent with prior literature (e.g., Murphy and Zimmerman (1993)). In terms of the other control variables, we find that CEO duality is significantly negatively related to CEO turnover (as in Goyal and Park (2002)) but the other governance variables generally are not consistently significant across the various specifications.

Overall, the results indicate that, consistent with H1, turnover-performance sensitivity is attenuated as *Co-option* increases.

4.2. CEO pay level

Our second hypothesis, H2, predicts that CEO pay increases with co-option. To test this, we estimate regressions of *CEO Pay* on *Co-option* and controls.

$$CEO\ Pay = \beta_0 + \beta_1\ Co\text{-}option + g(Controls) + \varepsilon_2.$$

Hypotheses H2 asserts that the coefficient on *Co-option* (β_1) will be positive. As mentioned earlier, a primary measure of CEO compensation is annual pay. The control variables, based on prior literature (see Murphy (1999) for a comprehensive review of CEO compensation), include firm size, firm performance (both stock and accounting), CEO tenure, governance variables, and industry and year dummies. We do not include CEO turnover years and require that the CEO's tenure be at least 1 year. This is because CEO pay in a turnover year might reflect compensation only for part of the year. Also, CEOs in their first year may receive

[11] The coefficients on the fraction of independent directors as well as the interaction term of this variable with performance are insignificant even when we do not include our co-option measures.

higher than average stock compensation (to align their incentives) and higher bonus (including signing bonuses). The dependent variable is the logarithm of annual compensation. We obtain similar results with raw compensation, but we use the logarithm because compensation is skewed.

Table 3 presents the results. For Model 1 the coefficient on *Co-option* is significantly positive, implying that CEO pay increases with co-option.[12] To infer economic significance, a coefficient of 0.355 on *Co-option* indicates that, by moving from zero to full co-option (*Co-option* = 1), CEO pay would increase by 36%. A less extreme measure of economic significance is the change in pay when *Co-option* increases from its 25th to 75th percentile value. In this case, we find that CEO pay increases by 20%. In Model 2, we employ firm fixed effects and again find both statistically and economically similar results. A CEO who moves from zero to full board co-option receives 23% higher pay. The results on *Co-option* are similar in economic and statistical terms when controlling for board independence (Model 4). Board independence, however, has little explanatory power. Finally, the results on *Co-option* are qualitatively similar, though significant at p = 0.10, when using tenure-weighted co-option (Model 3). In terms of control variables, we find that, as expected, firm size and performance are strongly positively associated with pay.[13] Overall, the evidence is consistent with CEO pay increasing in *Co-option*

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[12] Core, Holthausen, and Larcker (1999) find that CEO total pay is positively related to various board and CEO ownership characteristics that proxy for agency costs, including the proportion of the board composed of new outside (both independent and affiliated) directors. Their sample is limited to 495 firm-years over 1982-1984. Further, they examine only the CEO total pay, and do not consider the effect on pay-performance sensitivities, turnover performance sensitivities, human capital intensity, or *q*.

[13] As a robustness check, instead of using contemporaneous *Co-option* and *TW Co-option*, we also use the average of the contemporaneous and the lagged values, since the lagged board may also be partly responsible for CEO compensation. Our results are robust to this change. Further, in all cases above, our compensation variables are drawn directly from Execucomp. In the Appendix, we describe how the definition of certain compensation variables has changed following FASB 123R regulation. We therefore compute our own measures of value of options granted, value of cash compensation, and value of total pay. These measures are highly correlated with the measures reported in Execucomp, but arguably are more consistent across the time period of our study. For example, we calculate the Black-Scholes value of option grants for the entire time period based on the number of

(Hypothesis H2).

4.3. CEO pay-performance sensitivity

The sensitivity of CEO wealth to stock price (WPS), otherwise known as CEO delta (Core and Guay (2002)), is seen as aligning the incentives of managers with the interests of shareholders. Higher delta can mean that managers will work harder or more effectively because managers share gains and losses. Thus, we now examine the impact of *Co-option* on CEO wealth-performance sensitivity. The representative specification is

$$CEO\ Delta = \gamma_0 + \gamma_1\ Co\text{-}option + h(Controls) + \varepsilon_4.$$

We calculate delta using the approach of Core and Guay (2002) but with adjustments to Execucomp data as specified in the Appendix. We select control variables based on the recent prior literature on the determinants of delta (Core and Guay (1999) and Coles, Daniel, and Naveen (2006)).

Table 4 presents the results. In the three specifications that use *Co-option* on the right-hand side, the estimated coefficient is insignificant at conventional levels. In Model 3, the coefficient on *TW Co-option* is negative but significant only at the ten percent level. It appears that board co-option has little power to explain CEO incentive alignment, as represented by CEO delta. Note, however, that the coefficient on board independence is negative and significant (Model 4). This result, which is similar to the result in Coles, Lemmon, and Wang (2007), suggests that board monitoring and CEO delta could be substitutes in organization design.

We corroborate our results on CEO delta by using the approach of Aggarwal and

options granted, exercise price, maturity etc., whereas Execucomp reports the Black-Scholes value up to 2005, but reports the fair value, which may or may not be the Black-Scholes value, after 2005. In any case, the results with our measures of compensation are similar to those reported using Execucomp measures.

Samwick (1999), Garvey and Milbourn (2006), and Bizjak, Lemmon, and Naveen (2008). We regress change in CEO pay on: *Co-option*; *Co-option* interacted with performance; *Co-option* interacted with performance and a scaled ranking of riskiness of the firm; performance; *Co-option* interacted with the scaled ranking of riskiness of the firm; and controls. As in Table 4, the co-option measures have little explanatory power for CEO pay-performance sensitivity.

In sum, we find little evidence in support of the hypothesis (H3) that higher *Co-option* is associated with lower CEO wealth-performance sensitivity. CEO pay and WPS, however, cannot be viewed as independent of each other. CEOs would demand higher pay if greater risk is imposed on them in the form of higher WPS. Thus our finding that *Co-option* is associated with higher pay but not higher WPS is consistent with co-opted boards adopting more liberal compensation policies.

5. Co-option and Investment Policy: Empirical Results

Hypothesis H4 proposes that co-option is associated with investment policy and asset composition. In particular, we expect that greater co-option implements investment in: (i) firm-specific human capital; (ii) projects with long-term payoffs; and (iii) projects with greater firm-specific risk.

To proxy for the importance of firm-specific human capital, we use the logarithm of the intra-industry (2-digit SIC group) standard deviation of annual sales growth, as in Gillan, Hartzell, and Parrino (2006). The idea behind this variable is that firms in more homogeneous industries operate in similar product markets, have similar production technologies and, in general, are exposed to similar industry shocks. Thus, such industries should experience less cross-sectional variation in firm sales growth compared to heterogeneous industries. Also, Parrino (1997) argues that firms in homogeneous industries require less investment in firm-specific human capital as skills are relatively more transferable across firms within the same industry. Thus, the higher the variation in sales growth across firms within a given industry, the higher the heterogeneity of the industry, and the higher the investment in firm-specific human capital. Of course, we do not explicitly test Hypothesis H4 using variation in industry sales growth. The reasons are (a) that industry sales growth heterogeneity is relatively predetermined and (b) as an industry measure it is the same for all firms within an industry. We do, however, use this sales growth heterogeneity as an independent variable both alone and in an index of human-capital intensity (*HCI*) in later specifications that assess Hypothesis H5.

As an alternative proxy for firm-specific human capital, we use R&D/Assets, as suggested in Titman and Wessels (1988), Agrawal and Knoeber (1996), Raheja (2005), Coles, Daniel, and Naveen (2008), and Ferreira, Ferreira, and Raposo (2010). We also use R&D/Assets to proxy for projects with long-term payoffs at the firm level.

Lastly, we proxy for firm-specific risk using the logarithm of the residual variance from firm-level time-series regressions (estimated for each fiscal year) of daily excess stock returns on the Fama-French (1993) factors. For ease of exposition, we henceforth refer to all three measures as proxies for human-capital intensity.

To test the hypotheses that greater investment in human capital is associated with greater *Co-option* (H4), we use only the last two variables, R&D/Assets and firm-specific risk.

$$Human\ Capital\ Intensity = \Phi_0 + \Phi_1\ Co\text{-}option + i(Controls) + \varepsilon_5$$

Per H4, we expect $\Phi_1 > 0$. Our selection of control variables is consistent with prior literature (e.g., Coles et al. (2006)).

Panel A of Table 5 reports the results using R&D/Assets as the dependent variable and

Panel B reports the results using firm-specific risk as the dependent variable. For R&D/Assets the results are mixed. Model 1 suggests that R&D/Assets increases with *Co-option*. The estimated coefficient is both statistically and economically significant. Based on the estimates, as *Co-option* increases from its 25th percentile value to its 75th percentile value, there is a corresponding increase in R&D/Assets by 0.008. This represents an increase of 31% relative to the mean R&D/Assets of 0.026. In Models 2–4, we include firm fixed effects and no longer find a significant relation between R&D/Assets and *Co-option*. This is not very surprising, however, as R&D/Assets exhibits very little within-firm, time-series variation.

Panel B reports the results using firm-specific risk as the dependent variable. We find a positive association between *Co-option* and firm-specific risk in all models. This relation is both statistically and economically significant. Based on the coefficient estimates in Model 1, an increase in *Co-option* from its 25th percentile value to its 75th percentile value translates into an increase in firm-specific risk by 10%. Model 2, which includes firm fixed effects, and Model 4, which controls for board independence and firm fixed effects, yield similar estimates of the effect of *Co-option*, though the estimated coefficients are significant at the ten percent level. In contrast, the estimated coefficient on *TW Co-option* is insignificant (Model 3).

For both R&D/Assets and firm-specific risk, the coefficients on the control variables are generally consistent with earlier studies. Most prominent is that board independence has very little explanatory power. In sum, *Co-option* explains firm-specific risk better than it does R&D intensity. Overall, there is some evidence that suggests that board co-option encourages investment in projects with longer term payoffs and investment in firm-specific human capital.

6. Co-option and Firm Value

Supposing the presence of non-trivial transaction costs, Hypothesis H5 predicts that firm value will increase with *Co-option* for high-HCI firms, and will decrease or perhaps be unaffected for low-HCI firms. To test this, we use Tobin's q as a proxy for firm value. Specifically, q is defined as book assets minus book equity plus market value of equity all divided by book assets.[14] For the primary independent variable, similar to other studies that have used factor analysis (for example, Coles, Daniel, and Naveen (2008)), for each firm-year observation in our sample, we compute a factor score based on our measure of industry heterogeneity, R&D/assets, and firm-specific risk. The factor score for a firm-year observation is a linear combination of the transformed (to standard normal) values of these three variables. We term the resulting factor score *Human-Capital Intensity*, or *HCI*. Control variables are as in Coles et al. (2008). We estimate the following equation for the HCI factor and, for robustness (though not reported), separately for each of the three proxies for human capital intensity.

$$q = \lambda_0 + \lambda_1\, \textit{Co-option} \times \textit{Human Capital Intensity} + \lambda_2\, \textit{Co-option} + \lambda_3\, \textit{Human Capital Intensity} + j(\textit{Controls}) + \varepsilon_6$$

Note that the effect of *Co-option* on q is $\lambda_1 \times$ *Human capital intensity proxy* $+ \lambda_2$. To test our hypotheses, we evaluate this effect at high and low values of the proxy for human capital intensity. In particular, we choose the 25th and 75th percentile values of the proxy and evaluate the effect of *Co-option* on q at these 2 points. While we have no prediction regarding λ_1 or λ_2, we expect that $\lambda_1 \times \textit{Human capital intensity proxy}^{\text{25th percentile}} + \lambda_2$ is zero or significantly negative

[14] The use of q as a proxy for firm value, as well as its calculation, is consistent with much of the literature. Because we do not have data on replacement cost of assets or market value of debt, our formulation is only an approximation. But our measure does avoid the *ad hoc* assumptions about depreciation and inflation rates that some other measures of q require. Erickson and Whited (2006) argue that simple measures of q do at least as well as more complicated measures. Chung and Pruitt (1994) find that the market-to-book ratio explains at least 96.6 percent of the variability of the Tobin's q of Lindenberg and Ross (1981).

while λ_1 $\times$*Human capital intensity proxy*$^{75\text{th percentile}}$ + λ_2 is significantly positive. The same arguments apply to the coefficients associated with *TW Co-option*. We also apply the same test when controlling for the same construct based on board independence.

Table 6 presents the coefficient estimates and compound tests described just above. The four specifications vary in the use of firm fixed effects, co-option measure employed, and whether the model controls for board independence. In all four specifications the compound test based on the 75$^{\text{th}}$ percentile of *HCI* yields a positive and significant effect on Tobin's *q* of board co-option. The effect is economically significant as well. For example, based on Model 1, $HCI^{75th\ percentile} \times \lambda_1 + \lambda_2 = 0.28$. Setting all other variables to their medians, increasing *Co-option* from the 25$^{\text{th}}$ to the 75$^{\text{th}}$ percentile increases Tobin's *q* by 0.15. Compare this figure to 1.95, the average Tobin's *q* in the sample.

For robustness we estimate Models 1 and 2 but replace *HCI* with each of the three individual components, that is, industry sales growth heterogeneity, R&D intensity, and firm-specific risk. In untabulated results, we find that all six estimates of the $HCI^{75th\ percentile} \times \lambda_1 + \lambda_2$ are positive. One is significant at the 0.01 level, four are significant at the 0.05 level, and one is significant at the 0.10 level.

Based on Model 4 of Table 6, including board independence and its interaction with *HCI* does not affect the power of *Co-option* and its interaction with *HCI*. Moreover, for high-HCI firms it appears that increasing board independence actually is associated with a decline in Tobin's *q*: $HCI^{75th\ percentile} \times \varsigma_1 + \varsigma_2 = -0.35$, with $p(F) < 0.05$. This is consistent with Coles, Daniel, and Naveen (2008), who find that *q* decreases in board independence for high R&D firms.

Across the four specifications in Table 6, the signs on the other control variables are largely consistent with prior literature. Leverage and board size are generally negatively related to q while intangible assets and contemporaneous and lagged ROA are positively related.

Overall, the results in this section are consistent with Hypothesis H5. For high-HCI firms, there is a positive relation between *Co-option* and firm value. For other firms, generally there is no relation between *Co-option* and value.

7. Endogeneity, alternative interpretations, and other robustness checks

7.1. Firm characteristics and board co-option

To explore potential determinants of board co-option and to frame further consideration of endogeneity concerns, in this subsection we examine the extent to which firm characteristics have power to "explain" *Co-option*. Intuitively, we expect that co-option will be higher in firms where the potential benefits are highest, such as in firms in heterogeneous industries, in high R&D firms, and in firms with high firm-specific risk.

Hermalin and Weisbach (1998) provide the basis for understanding other economic forces that determine the level of co-option. They model CEO pay and board composition as the outcome of a bargaining game between the CEO and the board and predict that as the CEO's bargaining power increases vis-à-vis the board, the board becomes less independent. We extend their logic and examine whether board co-option increases as the CEO's bargaining power increases. To the extent that the CEO's bargaining power increases with his tenure as the CEO, his added position as the chairman of the board (CEO duality), his prior performance, and his ownership, we expect that *Co-option* will increase in these variables. Further, Shivdasani and Yermack (1999) suggest that CEOs of small firms may be more involved with board selection even if they are not a member of the nominating committee. We thus expect that *Co-option* will decrease in firm size.

Finally, we use *Outside CEO,* an indicator variable that equals 1 if the CEO is appointed from outside the firm, as an instrument for *Co-option*. The idea is that externally appointed CEOs are more likely to make top-management and board changes relative to internally appointed CEOs. Figure 3 shows that this notion is confirmed in the data. *Co-option* is higher for CEOs appointed from outside the firm versus those from inside the firm and the difference is similar across the full spectrum of CEO tenure. Thus, *Outside CEO* is likely to satisfy the first requirement, relevance, for a "proper" or "valid" instrument. Further, there is no *ex-ante* reason to believe that turnover-performance sensitivity, pay, delta, proxies for human capital intensity, or *q* will be affected by whether or not the CEO was an external candidate at the time of his appointment. Thus, *Outside CEO* appears to be clean, which is the second requirement for a proper instrument.[15]

Consequently, we estimate the following regression:

$$
\begin{aligned}
\textit{Co-option} = {} & \eta_0 + \eta_1\,\textit{Outside CEO} + \eta_2\,\textit{Human capital intensity} + \eta_3\,\textit{Return} \\
& + \eta_4\,\textit{Lagged Return} + \eta_5\,\textit{ROA} + \eta_6\,\textit{Lagged ROA} + \eta_7\,\textit{CEO duality} \\
& + \eta_8\,\textit{CEO Tenure} + \eta_9\,\textit{CEO Ownership} + \eta_{10}\,\textit{Firm Size}
\end{aligned}
$$

[15] We are aware of two papers that relate CEO type (i.e., insider or outsider) to firm outcomes. While the primary focus in Huson, Malatesta, and Parrino (2004) is on overall performance changes around CEO turnover, one of their findings is that performance improvements are higher when the CEO comes from outside. They argue that this is because an outsider will not be appointed unless he or she is better than an inside candidate. But this argument may not be entirely correct – if firms are acting optimally, we can only state that an externally appointed CEO in a given firm will be better than possible internal candidates *at that same firm*. By the same token, an internally appointed candidate in a given firm will have to be better than possible external candidates for *that same firm*. Thus, there is no reason to expect that an externally appointed CEO at a given firm is better than an internally appointed CEO *at another firm*. Even absent this argument, the Huson et al. paper does not suggest any link between outsider status and level of performance, CEO pay, pay-performance sensitivity, or turnover-performance sensitivity, etc. Second, Murphy and Zabojnik (2007) argue that increased demand for general skills (as opposed to firm-specific skills) drives both the demand for outsiders and the level of pay. While an implication is that outside CEOs receive higher pay, there is no theoretical reason to believe that outside CEOs have systematically different pay-performance or turnover-performance sensitivities, and, if anything, outside CEOs are hired in industries that place less value on human capital intensity. For these economic reasons we believe that our instrument for *Co-option* satisfies both requirements for a proper instrument.

$$+ k(Controls) + \varepsilon_7$$

Except for stock returns and ROA (where we include both contemporaneous and lagged values), all independent variables are lagged. We expect that η_1 through η_9 will be positive while η_{10} will be negative. We exclude firm-years with a CEO turnover event in the current or prior year and require that the CEO's tenure be at least 2 years because the firm performance measures in such years will not reflect the performance of the current CEO, and hence the CEO's bargaining power, correctly. In all specifications we use as a right-hand-side variable the *HCI* factor, which aggregates industry sales growth heterogeneity, R&D intensity, and firm-specific risk.

Table 7 presents the results. Specifications vary in the use of firm fixed effects (Models 2, 4, and 6) versus industry fixed effects (Models 1, 3, 5), whether the dependent variable is *Co-option* (Models 1, 2, 5, and 6) or *TW Co-option* (Models 3 and 4), and whether the specification controls for board independence (Models 5 and 6). Note first that the estimated coefficient on *HCI* is significant in the three specifications that use industry fixed effects (Models 1, 3, 5) but not in the three specifications that use firm fixed effects. The reason is that *HCI* tends be stable through time for a given firm ($\rho(HCI_t, HCI_{t-1}) = 0.85$). Consistent with Hermalin and Weisbach, we find strong evidence that our proxies for increased CEO bargaining power (CEO duality and CEO tenure) are positively associated with *Co-option*. The strong effect of CEO tenure is seen in univariate form in Figure 4. Surprisingly, we find little evidence that firm performance and CEO ownership are important determinants of *Co-option*. Further, as suggested in Shivdasani and Yermack (1999), we find some evidence that firm size is negatively associated with *Co-option*. Also, consistent with our prediction, we find that *Outside CEO* is significant across all specifications at the $p = 0.01$ level or better. *Outside CEO* is associated with greater *Co-option*. The addition of *Outside CEO* in the *Co-option* regression increases the R^2 by 10%. Consistent with the univariate comparison in Figure 3, as an instrument for *Co-option*, *Outside CEO*, satisfies the requirement of relevance (F = 27.9). Finally, Models 5 and 6 suggest that there is a strong positive relation between board independence and *Co-option*, a result that suggests that an increase in board independence may be rendered less effective by an increase in board co-option.

Overall our results are consistent with co-option varying predictably with economic factors, particularly investment in human capital intensity and increased CEO bargaining power.

7.2. Remedies for endogeneity

One reflection of the potential presence of endogeneity and causation problems is reasoning that places co-option measures on both the right- and left-hand sides in regression specifications. Our specifications include several outcome variables (turnover, pay, delta, R&D/Assets, firm-specific risk, and *q*) with the key explanatory variable being *Co-option*. *Co-option* itself is a function of several variables. For example, for the outcome 'CEO Pay', our equations are:

Co-option = f(CEO power, human capital intensity, ….) (1)

CEO Pay = f(*Co-option*, ……) (2)

In this setting, endogeneity could arise due to at least three reasons. We explain below the econometric and modeling approaches we adopt to tackle endogeneity.

(i) When we have an unobserved (and hence omitted), time-invariant, firm-specific variable in equation 2 that is correlated with *Co-option*, this would cause the error term in the outcome equation to be correlated with *Co-option*, rendering OLS invalid. For example, an omitted factor affecting CEO pay could be corporate culture that typically provides generous CEO pay packages and allows the CEO to co-opt the board. Because we do not observe corporate culture, a regression of pay on *Co-option* suffers from endogeneity problems. This problem can be resolved using firm fixed effects specifications. In Tables 2–6, we include results using firm fixed effects, and in large part our inferences are similar to those obtained under OLS.

(ii) Endogeneity problems also arise under certain circumstances in a recursive system. A recursive system is one in which outcomes such as CEO pay depend on *Co-option*, but *Co-option*, in turn, does not depend on pay. In such systems, endogeneity problems can arise: (a) if there is a common omitted factor that predicts both pay and *Co-option*; or (b) if the omitted factor that predicts pay is correlated with the omitted factor that predicts *Co-option*.[16] We believe the regressions involving turnover, pay, and delta can be classified as recursive systems because we have no clear reason to believe that higher pay or lower turnover-performance sensitivity or lower delta enhance the ability of the CEO to co-opt the board. In the case of *q*, given the bargaining story of Hermalin and Weisbach (1998), it is possible that there could be reverse causality. That is, higher *q* could lead to higher co-option in high *HCI* firms, although (in untabulated results) we do not find a relation between stock and accounting performance and *Co-option* for high HCI firms. For R&D/Assets and firm-specific risk, however, causality runs both ways because, as we have shown in Section 7.1, *Co-option* depends on the human-capital-intensity factor, so using a recursive system is inappropriate.

One appropriate econometric approach for a recursive system is to use a two-step estimation procedure. We use Model 1 of Table 7 to obtain the predicted value of *Co-option*. Recall that the instrument we employ is '*Outside CEO*' dummy. In the second step, we replace *Co-option* by its predicted value and re-estimate our base-case regressions. The standard errors from this two-step estimation are biased because we use the predicted (rather than actual) values

[16] The omitted factors here need not be firm-specific or time invariant as in (i). Of course, if there are no omitted factors or the omitted factors are uncorrelated, OLS is appropriate (Kennedy, 1997, p. 164).

of *Co-option* (Murphy and Topel (1985)), so we correct for this bias in the second step.[17]

In Table 8, the column titled "Base-Case" provides a calculation of the economic effect of change in a co-option measure using the "base-case" specifications in Tables 2–6. The economic effects from the same specifications re-estimated using the two-step procedure are provided in the second-to-last column of the table. For example, the second row of Table 8 shows how pay changes as *Co-op*tion increases from its 25th percentile value to its 75th percentile value. Based on the estimates reported for Model 1 in Table 3, we find that the CEO pay increases by 19.5% (statistically significant at $p = 0.01$) as *Co-option* increases from its 25th to 75th percentile value. When we re-estimate using the two-step estimation described above, we find the corresponding effect is 59.3% ($p < 0.01$). As can be seen from the table, we find that our results using the two-step method for the recursive model are generally similar to the base-case results, although the results on CEO delta are now stronger.

(iii) If both outcome and *Co-option* are jointly determined in a simultaneous system, then we face endogeneity problems regardless of whether there are omitted variables. We employ instrumental variables regression to address this problem. Specifically, we use two-stage least squares (2SLS) where we instrument for *Co-option* using the *Outside CEO* dummy. Recall that some of our regressions have both *Co-option* and *Co-option* interacted with either performance (Table 2) or firm-specific human capital intensity (Table 6). If *Co-option* is endogenous, then interaction terms that include *Co-option* are also endogenous. Thus we instrument for interaction terms including *Co-option* using interaction terms of *Outside CEO* with the corresponding variables. The primary distinction between 2SLS and two-step approach described above is that the predicted value in the two-step procedure does not depend on the exogenous variables in the

[17] We cannot apply the two-step procedure to the turnover model because our first step regression of co-option is estimated only for firm-years where both turnover and lagged turnover are zero.

outcome regression (because of the assumption that there is no reverse causality), whereas the predicted value in the 2SLS approach is based on all the exogenous variables in the system (assuming reverse causality).

The results are provided in the last column of Table 8. For brevity, we again report economic magnitudes. The figures in column 3 indicate that the results often are qualitatively in line with our hypotheses. Overall, in terms of signs, significance, and economic magnitude, the application of econometric remedies for endogeneity reinforces confidence in the validity of the results reported in Tables 2–6.

(iv) As the basis for a natural experiment, we exploit the rules proposed in 2002 by the Nasdaq and NYSE, requiring all listed firms to have a majority of independent directors on their board (a more detailed timeline is available in Chhaochharia and Grinstein (2007)). This imposed an exogenous shock to board structure and, hence, to *Co-option* for firms that were not already in compliance at the time these requirements were imposed. Since these rules were adopted shortly after the passage of SOX, we refer to the period following the proposal of the new stock exchange rules (2002–2007) as the post-SOX period. Pre-SOX non-compliant firms were required to increase board independence after implementation of the new listing requirements. This is equivalent to an exogenous increase in *Co-option* as noncompliant firms brought new independent directors onto the board (Linck, Netter, and Yang (2009)).[18]

We allow for the possibility that SOX and associated changes in the environment affect the sensitivity of the dependent variable to co-option through avenues other than the change in

[18] We are particularly grateful to the referee for suggesting this specific line of attack and for shaping some of the other aspects of our approach to ameliorating endogeneity concerns.

listing requirements for board independence.[19] To isolate the effect of co-option ("clean" effect), we use a difference-in-difference approach that involves estimating our base-case specification for 4 subsamples partitioned by pre-SOX (1997-2001) and post-SOX (2002–2007) and by whether or not the firm was compliant in 2001 with soon-to-be-imposed board independence listing requirement.

Panel A of Table 9 provides a 2×2 representation of the data, with the clean subsample of primary interest being in the lower right-hand cell. That cell contains firms facing the exogenous shock to co-option. Note that the coefficient for this subsample represents the combined effect of both co-option and SOX on the variable of interest. The other cells acknowledge the possibility of bias due to the standard set of reasons that give rise to the endogeneity problem. We allow that bias of the estimate of the effect of co-option on the dependent variable differs by whether the firm was compliant (superscript C) or not compliant (superscript NC) pre-SOX, though we do restrict Bias^C to be the same both pre- and post-SOX.

To connect this approach directly to the data, for purposes of illustration consider the estimated relation between CEO *Pay* and *Co-option* (Hypothesis 2 and Table 3). When we adjust the regression specification used in Table 3 to account for variation across the four subsamples, we estimate:

$$\begin{aligned} Pay = \beta_0 &+ \beta_1\, Co\text{-}option + \beta_2\, PreSOX \times Co\text{-}option + \beta_3\, Compliant \times Co\text{-}option \\ &+ \beta_4\, PreSOX \times Compliant \times Co\text{-}option + g(Controls) + \varepsilon_8 \end{aligned}$$

[19] Other SOX regulations were likely to have affected monitoring but not co-option directly. For example, under SOX and the associated exchange provisions: complete independence was mandated for the compensation, audit, and monitoring committees; a director with financial expertise was required on the audit committee; in addition to their regular sessions, boards were required to meet without management; CEO/CFO certification of accounting statements was required; and there was a general increased media scrutiny on all firms. Thus, for both compliant and non-compliant firms, there is an additional effect on the estimated coefficient through channels other than through board structure/co-option changes.

PreSOX is an indicator variable that equals 1 if the year is 2001 or earlier, and equals 0 otherwise. *Compliant* is an indicator variable that equals 1 if the firm was already in compliance in 2001, and equals 0 otherwise. The controls include, in addition to the control variables from Table 3, the interaction of *PreSOX*, *Compliant*, and *PreSOX* × *Compliant* with each of the control variables. Essentially, using a pooled specification, we are able to extract the estimates that would result from estimating the sub-samples separately. The effect of *Co-option* on CEO pay is:

$$\partial Pay/\partial Co\text{-}option = \beta_1 + \beta_2\, PreSOX + \beta_3\, Compliant + \beta_4\, PreSOX \times Compliant.$$

Panel B of Table 9 maps these coefficients to the various components of the 2×2 design. Subtracting the first from the second cell in the top row yields SOX = - (β_2 + β_4). Subtracting the bottom cell from the top cell in the right-hand column gives Bias^{C} = β_3. Following the same approach yields Bias^{C} - Bias^{NC} = β_3 + β_4, Bias^{NC} = - β_4, and Clean = β_1+ β_2 + β_4.

The first two columns of Panel C of Table 9 recapitulate our hypotheses and reproduce the relevant estimates from the base-case specifications. The third column reports our estimate of Clean = β_1+ β_2 + β_4 for the regressions of *Pay* on *Co-option* and the analogous coefficients for the other experiments. For pay level, the estimated coefficient using the clean subsample has the same sign (+) and significance level ($p < 0.01$) as the coefficient reported in Model 1 of Table 3. Higher co-option implies higher CEO pay. In general, for pay level, dismissal, and delta, the estimated effects of *Co-option* using this exogenous shock are consistent with our hypotheses.[20] Indeed, the result on delta is now statistically significant, albeit at the 10% level. In contrast, the clean effects of *Co-option* on investment policy and *Tobin's q* in some cases are weaker than the

[20] We report results from "All turnovers" rather than "Forced Turnovers" in this table because forced turnover specifications cannot be estimated correctly because of collinearity issues given the small number of forced turnovers in the sub-samples.

estimated effects from the base-case specifications.

Other tests in Panel C of Table 9 indicate that in general the other avenues through which SOX might affect the influence of co-option are statistically negligible. In some cases, endogeneity biases Bias^{C} and Bias^{NC} are significant. In general the tests do not reject the null hypothesis that the endogeneity biases are equal across the pre-SOX compliant and noncompliant samples. That these biases in some instances are significantly different from zero suggests that restricting the analysis to a subsample with a clean source of identification is useful in providing reliable, unbiased estimates of the effects in question.

7.3. Additional robustness tests

In this subsection, we discuss the results of additional robustness checks

7.3.1. Is Co-option capturing the effect of CEO tenure?

Figure 4 depicts how *Co-option* increases over the CEO's tenure. It is possible that CEO power also increases with tenure. Thus, CEO tenure may be correlated with both power and *Co-option* and it is possible that our results on the effect of *Co-option* are merely due to the positive association between *Co-option* and CEO tenure. To rule out this possibility, we would want to control for CEO tenure, but since CEO tenure and *Co-option* are correlated, we need a proxy for tenure that is unrelated to *Co-option*.[21] Thus, we first estimate a regression of CEO tenure on *Co-option* and obtain the residual. The residual now no longer proxies for *Co-option*, but is likely to be a reasonable proxy for power. In all our specifications in Tables 2–4, we include residual tenure and necessary interactions (interactions of residual tenure with performance in the turnover regressions). We find that all our results on *Co-option* remain even after controlling for

[21] Note that we already include CEO tenure in most of our specifications. We do not, however, include any interaction terms that include tenure.

residual CEO tenure. Residual tenure, on the other hand, does not appear to be associated with greater CEO entrenchment. It has no effect on turnover-performance sensitivity and has a negative effect on pay and delta.

7.3.2. Is Co-option capturing the effect of director inexperience?

Another possibility is that our measures of co-option reflect the inexperience of new directors, as reflected by the average tenure of directors on the board. Higher *Co-option* could mean that there are several new directors and these new directors are less experienced (at least in that firm). They may not be sympathetic to the CEO, but perhaps they are slower to react to poor performance and more ready to award high pay. Average director tenure, thus, is correlated with *Co-option* as well as with director inexperience. To disentangle these two effects, we estimate the residual from a regression of average director tenure on *Co-option* then include it along with necessary interactions of this residual term. We find that residual average director tenure has no consistent effect on CEO turnover-performance sensitivity or CEO pay or CEO delta. The estimated effects of *Co-option* on the dependent variables persist, however, even after controlling for residual average director tenure.

7.3.3. Is Co-option capturing the effect of the "Involved CEO" variable of Shivdasani-Yermack?

Shivdasani and Yermack (1999) construct an indicator variable, *Involved CEO*, which equals 1 if the firm has a nominating committee and the CEO is part of the committee or if the firm has no nominating committee. In the latter instance, the presumption is that if there is no nominating committee the CEO will be actively involved in director selection. Following the 2002 NYSE and the NASDAQ listing requirements for completely independent nominating committees, the Shivdasani-Yermack measure should, by definition, be zero for all firms.

Consistent with this, we find that the mean of *Involved CEO* drops from about 56% in 1998 (the first year for which RiskMetrics has data on sub-committees) to 0.6% in 2007, and the correlation between *Co-option* and *Involved CEO* over the full time interval is only 0.13. Nevertheless, it is possible that our co-option variable does not provide additional explanatory power relative to *Involved CEO*. As with CEO tenure, *Involved CEO* is likely to be positively associated with both *Co-option* and CEO power. To remove the impact of *Co-option* on *Involved CEO*, we estimate a logit model of *Involved CEO*, with *Co-option* being the regressor, and obtain the residual. We include this residual along with the usual interactions in all specifications in Tables 2–4. While the effect of residual *Involved CEO* on CEO entrenchment is mixed, our results on the co-option measures are quantitatively similar except for slightly weaker results on CEO turnover.

8. The Effects of Co-option on Board Independence

Board independence has been widely used in the corporate governance literature as a measure of board monitoring (for a review, see Adams, Hermalin, and Weisbach (2010)) . In contrast, our co-option measures are meant to capture affinity arising from the selection of directors and from subsequent proximity to the CEO. Here we examine empirically how our primary co-option measure differs from board independence. In doing so, the intent also is to explore the extent to which the notions of co-option and independence overlap or can be combined. For example, are independent directors who are co-opted by the CEO effective monitors, or is it the case that only non-co-opted independent directors are effective?

First, in terms of differences between co-option and independence, the Pearson correlation between the fraction of independent directors, Fraction Independent, and *Co-option* is statistically significant but small in magnitude, at -0.08. Second, as Tables 2–6 reveal, board independence does little to displace the explanatory power of our co-option measures. Moreover, the estimated parameters on board independence generally are insignificant. Third, as Figure 4 indicates, as CEO tenure increases *Co-option* increases but Fraction Independent remains more or less constant. In this regard, as CEO tenure increases, the increase in fraction of the board comprised of independent directors who joined the board *after* the CEO (*Co-opted Independent*) is offset by a decrease in fraction of the board comprised of independent directors who were on the board *before* the CEO joined (*Non-Co-opted Independent*). This suggests that CEOs are replacing independent directors who are already on the board before they take over as CEO with new independents. Thus, while on the surface it appears that board independence is high, the character of the board, as represented by *Co-option*, changes in favor of the CEO. Our results to this point indicate that directors (independent or otherwise) recruited after the CEO took office are sympathetic to the CEO. It is possible, therefore, that only independent directors already on the board before the CEO took office are able or disposed to be truly effective monitors.

To examine this more closely, we estimate our base-case specifications with our co-option measure replaced by *Co-opted Independent* (Table 10, Panel A) and by *Non-co-opted Independent* (Panel B). All six specifications in both Panels include firm and year fixed effects. It is too unwieldy to report the coefficients on all control variables, so for each model we report the coefficients only on the variables of special interest.

From Panel A of Table 10, it can be seen that the results on turnover and pay are similar to the results using *Co-option*. In particular, *Co-opted Independent* is associated with attenuated turnover-performance sensitivity, higher pay, and lower delta. It appears that co-opted directors are not vigorous or effective monitors of the CEO even if they are independent in the legal sense.

Panel B examines the effect of non-co-opted independent directors on various outcomes. We find that *Non-Co-opted Independent* is associated with more substantial turnover-performance sensitivity. Perhaps it is non-co-opted independent directors that drive the influential result reported first in Weisbach (1988) that CEO turnover becomes more sensitive to firm performance the higher is the fraction of independent directors on the board. Moreover, higher *Non-Co-opted Independent* is associated with significantly lower pay but the relation with delta is tenuous. Overall, these results are consistent with non-co-opted directors being effective monitors. These results suggest that not all independent directors are the same. Differentiating among independent directors by whether or not they are co-opted appears to be a more incisive way to explain monitoring intensity of the board. Independent directors whose selection was influenced by the CEO appear to be more sympathetic to the CEO. On the other hand, non-co-opted independent directors are likely to be effective monitors. The representation of non-co-opted independent directors on the board appears to be a sharper measure of monitoring effectiveness than is aggregate board independence.

9. Conclusions

In this study, we depart from traditional measures of board independence and propose a new measure that reflects the effect of the CEO's influence on the board. Our measure of board co-option is the fraction of the board comprised of directors appointed after the CEO assumes office. Our reasoning is based on studies that suggest that CEOs have great influence in picking board members and that board members, regardless of whether they are independent in the legal sense, are more sympathetic to the CEO if they are appointed after the CEO assumed office (Mace(1971), Lorsch and MacIver(1989), Shivdasani and Yermack(1999)). We provide evidence on the benefits, costs, and value implications of such co-option.

In terms of CEO wealth, we find that the sensitivity of CEO turnover to performance decreases with *Co-option*. CEO pay increases with *Co-option*, but the sensitivity of CEO wealth to firm performance is unaffected. In terms of investment policy and asset composition, we find some evidence that higher *Co-option* incentivizes managers to invest more in firm-specific human capital, in projects with long-term payoffs, and in projects with greater firm-specific risk. Based on transaction-costs arguments, we expect to find a relation between *Co-option* and Tobin's *q*. Consistent with our predictions, we find a positive relation between *q* and *Co-option* in high human capital intensity firms. In contrast there is no relation between *q* and *Co-option* in other firms.

Testing robustness, the results are similar for an alternative measure of CEO-director affinity, *Tenure-Weighted Co-option*. Moreover, our empirical results are robust to a wide variety of approaches to potential concerns about endogeneity. The results and conclusions generally are unchanged by the use of: a wide variety of control variables, including the traditional measure of board independence; firm fixed effects; two-stage estimation in a recursive system; instrumental variables; and a subsample in which changes in NYSE and Nasdaq listing requirements cause an exogenous increase in *Co-option* which serves as a clean source of identification.

Our measures of board co-option are conceptually and empirically distinct from the traditional measure of board effectiveness, the representation of independent directors on the board. Nonetheless, when applying our definition of co-option to board independence, whether an independent director is co-opted or not appears to be an important distinction. We find that the fraction of independent directors who joined before the CEO appears to be a good measure of monitoring intensity of the board. In contrast, independent directors who joined after the CEO appear to be weak monitors.

In sum, our approach, analysis, and results add to the literature on CEO involvement in director selection, shed further light on the factors affecting the make-up of the board, and illuminate observable consequences of organization design.

Appendix

A.1. Variable definitions

The governance data used in this study are from RiskMetrics (formerly Investor Responsibility Research Center or IRRC) for the period 1996-2007. Compensation data are from Execucomp, accounting data are from Compustat, and stock return data are from CRSP. Our sample consists of a maximum of 14690 firm-years. The actual number of observations used in the various regressions could be smaller depending on data availability and the specifications used. Data items prefixed by the word "data" are as defined in Compustat. With the introduction of data in the Xpressfeed format, Compustat switched to mnemonics to define these variables. The translation from data item numbers to the corresponding mnemonic codes is provided in http://wrds.wharton.upenn.edu/support/docs/xpf/compann_translation.xls.

A.1.1. Governance-related variables

Variable	***Definition***
New director	Director who joined the board after the CEO joined the firm
Board size	Total number of directors on the board
Co-option	Number of new directors / Board size
TW Co-option (Tenure-Weighted Co-option)	Number of director years served since the CEO assumed that position divided by the number of years served on the board by all directors (excluding the CEO)
Co-opted Independent	Number of new independent directors / Board size
Non-Co-opted Independent	Number of independent directors who joined before the CEO assumed office / Board size
Fraction Independent	Number of independent directors / Board size = Co-opted Independent + Non-Co-opted Independent
Female director	= 1 if board has a female director; = 0 otherwise (available from 1997)
Outside director ownership	Cumulative share ownership of outside directors (available from 1998)
GIM index	Governance index as defined in Gompers, Ishii, and Metrick (2003)
Average director tenure	Average tenure of all directors on board

A.1.2. CEO-related variables

Variable	***Definition***
CEO pay	Sum of all annual payments (Execucomp: TDC1)
CEO cash compensation	Sum of salary and bonus (Execucomp: TCC)
CEO pay change	Change in CEO total pay

CEO delta	Expected dollar change in CEO wealth for a 1% change in stock price (using entire portfolio of stocks and options) computed as in Core and Guay (2002)
CEO vega	Expected dollar change in CEO wealth for a 0.01 change in stock return volatility (using entire portfolio of options) computed as in Guay (1999)
CEO6466	= 1 if 64 ≤ CEO Age ≤ 66; = 0 otherwise
CEO tenure	Tenure as CEO of the firm = fiscal year end date minus date joined as CEO
CEO ownership	Shares held by the CEO / Number of shares outstanding
CEO duality	= 1 if CEO is also the Chairman; = 0 otherwise
Outside CEO	= 1 if the CEO was not employed at the firm before he became the CEO; = 0 otherwise
Involved CEO	= 1 if the firm has no nominating committee, or if the firm has a nominating committee and the CEO is a member; = 0 otherwise
All Turnover	= 1 if the identity of the CEO changes; = 0 otherwise
Forced Turnover	= 1 if the departing CEO was younger than 60 years of age; = 0 otherwise
Below-median compensation dummy	= 1 if the CEO compensation is below the median compensation of his peer group; = 0 otherwise. Peer groups are formed as in Bizjak et al. (2008).

A.1.3. Firm-level variables

Variable	Definition	Data Item
Return	Stock return over the fiscal year	RET variable in Execucomp
Dollar return	Lagged market capitalization × stock return	$(data25_{t-1} \times data199_{t-1}) \times RET_t$
Tobin's *q* (Market-to-book)	Market value of assets / Book value of assets	(data6 – data60 + data199×data25)/data6
ROA	Return on Assets = EBITDA/Assets	data13/data6
Intangible assets	1 – (Net Property, Plant, and Equipment /Assets)	1 – (data8/data6)
CAPEX/Assets	Capital Expenditure / Assets	data128/data6
OCF/Assets	Operating cash flow / Assets	data308/data6
R&D/Assets	Research & Development Expenditure / Assets	Max(0,data46)/data6
Leverage	Debt / Assets	(data9 + data34)/data6
Segments	Number of business segments	
Firm size	Log(sales)	Log(data12)
Sales growth	Sales / Lagged Sales	
Firm-specific risk	Logarithm of standard deviation of residual from a firm-level time-series regression (estimated for each fiscal year) of daily excess returns on the Fama-French factors	

Industry heterogeneity	Logarithm of intra-industry (within each two-digit SIC group) standard deviation of annual sales growth
Human capital intensity factor	factor formed using industry heterogeneity, R&D/Assets, and firm-specific risk

A.2. RiskMetrics adjustment

In the RiskMetrics directors' dataset, two sets of director IDs are maintained. The first is '*legacy_director_id*' and the second is '*director_detail_id*'. The latter variable is supplied by Wharton Research Data Services (WRDS) starting from 2004 onwards. Thus all directors in the RiskMetrics database as of 2004 (both directors who started in 2004 and directors who started prior to 2004 but are still on the board) have a valid *director_detail_id* from 2004 onwards. WRDS assigned the same ID to directors in earlier years where possible through matching of names, director age, etc. Directors in the database who quit before 2004 do not have a valid *director_detail_id*. Thus, prior to 2004, some directors have no *director_detail_id*.

Pre-2004, the unique director ID is *legacy_director_id*. In contrast to *director_detail_id*, this variable is not available for all directors from 2004 onwards. It is populated only for those directors who were started serving prior to 2004 and who continue to serve post-2004. The directors who joined after 2004 will not have *legacy_director_ID*. Eventually, as more years of data get added and directors who started serving prior to 2004 leave the board, this data item will not be relevant. For directors who joined after 2004, only *director_detail_id* is available; for directors who quit before 2004 only *legacy_director_id* is available. Thus, it is imperative that both IDs are used to ensure that all directors are included in the study.

We first confirm that for directors for whom both IDs are available, there is a 1-for-1 match between the two IDs. Then we take care of a discrepancy in the way WRDS assigns these IDs. There are times where WRDS should have been able to assign a *director_detail_id* to a given director based on the director's name and age but they do not do so. For example, director Joe Smith may have served on firm ABC Inc from 2003–2005. Suppose his *legacy_director_ID* is 5555 and his *director_detail_ID* is 6666. Then WRDS should have assigned this *director_detail_ID* for Joe Smith for every year from 2003–2005. But we find that this is not always true – sometimes Joe Smith has a missing *director_detail_ID* in 2004 (say). We know he is the same director because the *legacy_director_ID* is the same – therefore we assign Joe Smith the same *director_detail_ID* of 6666 in 2004. So for example,

Joe Smith, director ABC Inc from 2003–2005

year	Legacy_director_ID	Director_detail_ID	Corrected Director_detail_ID
2003	5555	6666	6666
2004	5555	-	6666
2005	5555	6666	6666

The reverse is also true – sometimes the *legacy_director_ID* is not filled in completely even though *director_detail_ID* is available for all the years. For these director-year observations, we do a similar assignment.

We then create our own unique director ID as follows: if *director_detail_id* is available, then we use this as the unique ID because this is the ID that WRDS will maintain going forward. If *director_detail_id* is not available (which implies the director served only prior to 2004), we define an ID that is *legacy_director_id*×100. The multiplication by 100 ensures that the ID we create is unique. By using both IDs, we ensure that all directors in the database are accounted for. The final tally in our sample is 179,609 director-years. If a researcher uses only *legacy_director_ID*, she would have only 171,153 director-year observations. Similarly, if a researcher uses only *director_detail_ID*, she would have only 128,759 director-year observations. Importantly, if one does not consider both IDs, then board size and co-option and all of the board measures will be incorrectly estimated as we would be ignoring a large sample of directors.

An example of what we do follows below.

Joe Smith, director ABC Inc from 2003–2005

year	Legacy_director_ID	Director_detail_ID	Our ID
2003	5555	6666	6666
2004	5555	6666	6666
2005	5555	6666	6666

John Doe, director ABC Inc from 2001–2003

Year	Legacy_director_ID	Director_detail_ID	Our ID
2001	5556	-	555600
2002	5556	-	555600
2003	5556	-	555600

Jane Adams, director ABC Inc from 2004–2006

Year	Legacy_director_ID	Director_detail_ID	Our ID
2004	-	6667	6667
2005	-	6667	6667
2006	-	6667	6667

A.3. Execucomp database adjustment

Execucomp changed its compensation data reporting in line with accounting changes imposed by the Financial Accounting Standards Board (FASB) and expanded compensation disclosure requirements (for pension, severance, change-in-control payouts and equity based compensation) imposed by the Securities and Exchanges Commission.

The FASB issued FAS 123R on December 12, 2004, which specifies a change in format for accounting for equity- based compensation. For fiscal years 1992–2005, all companies on Execucomp report using the old format (pre-FAS 123R). For fiscal years 2007 and later, all firms on Execucomp report compensation using the new format (post-FAS 123R). For 2006, 16% of firms report using the old format while the rest report under the new format.

The new rules primarily state that equity-based compensation awards must be expensed based on the fair value at the grant date. While FAS 123R does not state a preference for the type of model used to calculate fair value, most firms appear to use the Black-Scholes model for estimating fair value. Some firms, however, use lattice models or other similar models.

Pre-FAS 123R, the Execucomp definition of the total compensation, TDC1, was
TDC1 = SALARY + BONUS + OTHANN + ALLOTHTOT + RSTKGRNT + OPTION_AWARDS_BLK_VALUE + LTIP

Post-FAS 123R, Execucomp computes the total compensation, TDC1, as
TDC1 = SALARY + BONUS + NONEQ_INCENT + OTHCOMP + STOCK_AWARDS_FV + OPTION_AWARDS_FV + DEFER_RPT_AS_COMP_TOT

The variable definitions are all based on Execucomp. SALARY is annual salary, BONUS is the annual bonus, OTHANN and ALLOTHTOT are other items of annual compensation, RSTKGRNT is value of restricted stock grants, OPTION_AWARDS_BLK_VALUE is the Black-Scholes value of option compensation (*as computed by Execucomp*, and not as reported by the firm), LTIP is the long term incentive payouts, NONEQ_INCENT is the non_equity incentive compensation, OTHCOMP is other compensation, STOCK_AWARDS_FV and OPTION_AWARDS_FV are the fair values of stock and option awards *as reported by firms*, and DEFER_RPT_AS_COMP_TOT is the total portion of deferred earnings reported as compensation.

These two numbers for TDC1 are not directly comparable because in the pre-FAS 123R period, Execucomp included the Black-Scholes value of option grants in TDC1 *as calculated by them*. This involved using their own assumptions regarding risk-free rate, dividend yield, volatility, etc. Also, since option grant dates were not provided during this period, they assumed July 1st to be the grant dates for all options and they assumed further that options would be exercised early. Post FAS 123R, however, Execucomp stopped including the Black-Scholes value of option grants in TDC1 but instead used the fair value as *reported by companies*. This means that the pre- and post-FAS numbers are not strictly comparable.

We try to reconcile these numbers so that they can be compared across the years. Our understanding is based on talks with Standard & Poor officials (who supply the Execucomp database), on "A User's Guide to the SEC's New Rules for Reporting Executive Pay" issued by Moody's Investors Service (2007), and on the explanation provided by Wharton Research Database Services (WRDS) at http://wrds.wharton.upenn.edu/support/docs/exec/ExecutiveCompensation1.pdf

Pre-FAS 123R, our definition of TDC1 is:
TDC1 = SALARY + BONUS + OTHANN + ALLOTHTOT + RSTKGRNT + option_awards_calculated_value + LTIP

Post-FAS 123R, our definition of TDC1 is:
TDC1 = SALARY + BONUS + NONEQ_INCENT + OTHCOMP + stock_awards_calculated_value + option_awards_calculated_value + DEFER_RPT_AS_COMP_TOT

The key difference between our measure and the Execucomp measure is that we use the estimated Black_Scholes value of option awards both pre- and post-FAS 123R; also, post-FAS 123R we use the calculated value of stock awards rather than fair value reported by firms.

To understand the mapping from pre- to post-FAS 123R, consider each individual component of TDC1 in the post-FAS 123R period.

a) SALARY: This data item continues to be reported as before, with no change. Therefore this is comparable with the SALARY figure reported pre-FAS 123R.

b) BONUS: Pre-FAS 123R, companies reported any annual cash payments as part of BONUS, regardless of what triggered the payout. Post-FAS 123R, companies separately report the discretionary and non-discretionary parts of the cash payment as the "BONUS" and "NONEQ_INCENT" respectively. The non-discretionary part (NONEQ_INCENT) is the payout resulting from formulaic, performance-based incentive plans. Payouts under both single-year plans and multi-year plans are reported together under NONEQ_INCENT. Pre-FAS 123R, the payout from single-year non-equity compensation plans was combined with the BONUS while the payout from multi-year non-equity compensation plans was combined under "LTIP". Since we cannot disentangle the payouts from single and multi-year compensation plans, and since single-year plans appear more common for bonus payments from a casual reading of proxy statements, we include the entire variable NONEQ_INCENT as part of BONUS. This is consistent with what Execucomp does.

c) OTHCOMP + DEFER_RPT_AS_COMP_TOT: These two variables now include what previously used to be reported as OTHANN and ALLOTHTOT.

d) STOCK_AWARDS_FV is the fair value (as reported by firms) of any stock awards granted in the year and is given in the table "PlanBasedAwards" in Execucomp. This table reports the number of stock, option, equity, and non-equity incentive plan awards, the grant dates, and, where applicable, the exercise price and market price of the underlying stock on the grant date. The table also reports the fair value of the awards, which is typically computed as market price on grant date times the number of shares granted. This is aggregated across all the different share grants made to each executive during the year and reported in Execucomp table 'Anncomp'. This includes both the value of restricted stock grants and the value of performance-based share awards. Thus, in a sense, it includes both RSTKGRNT and LTIP.

Pre-FAS 123R, LTIP was reported by firms in their summary compensation table, but post-FAS 123R, firms no longer report the actual payout made to the executive, but only the promised payout (which is subject to achieving certain performance targets). Thus, we multiply the target grants by the grant date share price to get the LTIP (Execucomp uses the fair values of LTIP reported by the company, which is the same as what we do – target grants multiplied either by grant date closing stock price or multiplied by average stock price on grant date). Note that LTIP computed or reported in this fashion is not necessarily received by the executive – it is only the promised payment and may not be realized if the executive does not achieve the performance targets tied to the LTIP. We came upon proxy statements which stated that executives did not actually earn this pay due to failure to meet targets (even though this was included as pay in the summary compensation table). We also noticed in some cases that companies seemed to be confused about the new reporting format. Thus they actually made performance-based option awards and reported the number of option grants and the exercise price under the plan-based awards table, but then they reported the fair value of stocks. In these cases, Execucomp would be overestimating the fair value of stock grants and underestimating the fair value of option grants made in that year.

e) OPTION_AWARDS_FV: Pre-FAS 123R, Execucomp calculated the Black-Scholes option prices based on a set of assumptions about grant date, volatility, holding period by executives, etc. Post-FAS 123R, grant dates are reported by the companies, but Execucomp stopped calculating the Black-Scholes values as companies were reporting the fair values of options granted. These may not be comparable across companies (and maybe even for the same company across years) as companies may use different methods to calculate the fair value. Even if companies use the Black-Scholes model, they may use different assumptions about future volatility, risk-free rates, holding period by executives etc. In order to make these numbers comparable, we use the same valuation procedure for all companies, and compute the Black-Scholes option values as of grant date. Consistent with the methodology Execucomp followed previously, we assume that (i) grants are made on July 1st of the grant year, (ii) executives hold the option for 70% of the maturity, (iii) risk-free rate is the 7-year Treasury note (since most options expire in 10 years and are assumed to be held for 7 years), (iv) the dividend yield is the average of the last three years, and (v) the volatility is based on the prior 60 months of stock return data. If 60 months of return data are not available, we use the actual number of months of data available, subject to having at least 12 months of data. Volatility and dividend yields are winsorized at the 5th and 95th percentiles, consistent with the Execucomp methodology. Since Execucomp provides the volatility, dividend yield and risk-free rates up to 2006, we compute the Black-Scholes value ourselves and find that the numbers have a correlation of 0.999 with the numbers reported by Execucomp. Thus, we are confident that our methodology is correctly imitates Execucomp. When we do not use the volatility numbers provided by Execucomp, but instead use our own volatility estimates calculated as described there, we achieve a correlation of 0.989 with the Black-Scholes values reported by Execucomp.

Post-FAS 123R, Execucomp no longer reports the inputs for the Black-Scholes estimates, but we continue to use the same methodology described above to calculate the Black-Scholes values for the option grants as of grant date. Note that expiration date for the option awards is not provided in the table “PlanBasedAwards” which contains the exercise price, market price, and grant date, but can be imputed from the table “OutStandingAwards.”

Overall, the TDC1 we calculate has a 0.996 correlation with the TDC1 reported in Execucomp for the period 1992–2005 (when firms were reporting only under the old format). During the period 2006-2007, the correlation, not surprisingly, drops to 0.898.

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Table 1: Summary statistics

In this table, summary statistics of the main variables used in the paper are provided. All variable definitions are given in Appendix. Reported values are based on data winsorized at the 1st and 99th percentiles.

	Observations	Mean	Median
Firm level variables			
Sales ($ Million)	14690	4949.76	1446.20
Return	14675	0.15	0.10
Abnormal Return	14610	0.05	0.00
Dollar Return ($ Million)	14661	621.45	103.02
Industry Heterogeneity	14501	-0.28	-0.65
R&D/Assets	14690	0.03	0.00
CAPEX/Assets	14082	0.05	0.04
Leverage	14680	0.23	0.22
Firm-specific Risk	14688	-8.68	-8.73
Tobin's *q*	14683	1.95	1.49
Board-related variables			
Board Size	14690	9.59	9.00
Co-option	13824	0.48	0.44
TW (Tenure-weighted) Co-option	13824	0.32	0.18
Co-opted Independent	13824	0.33	0.31
Non-Co-opted Independent	13824	0.33	0.33
Fraction Independent	14690	0.66	0.67
Average Director Tenure (Years)	14494	9.24	8.72
Involved CEO	11885	0.31	
CEO-related variables			
CEO Turnover	14690	0.11	
Forced Turnover	14585	0.03	
CEO6466	14585	0.11	
CEO Pay ($ '000s)	14592	4835.85	2613.90
CEO Pay Change ($ '000s)	14286	107.51	114.55
CEO Delta (CEO Wealth-Performance Sensitivity)	13583	905.46	275.73
CEO Tenure (Years)	14004	8.17	5.92

Table 2: Effect of co-option on CEO turnover–performance sensitivity

The table presents logit regressions of *All Turnover* (equals 1 if the identity of the CEO changes, and equals 0 otherwise) and *Forced Turnover* (equals 1 if the departing CEO was younger than 60 years of age, and equals 0 otherwise). *Co-option* is the number of directors appointed after the CEO assumed office ("new" directors) divided by the board size. *TW Co-option* is the new director-years accumulated since the CEO assumed the position of CEO divided by total years served by current directors. For a departing CEO, co-option effectively is the co-option of the board at the time of dismissal. In the year in which turnover occurs, if the turnover occurs after the date of the firm's annual meeting, then the contemporaneous co-option measure is used; if the turnover occurs before the firm's annual meeting date, then the lagged co-option measure is used. In non-turnover years, we take the average of contemporaneous and lagged values of co-option measure. For turnover years, *Prior abnormal return* is measured as the annual stock returns in the year leading up to the actual date of CEO turnover minus the value-weighted market returns over that period. For non-turnover years, prior excess return is measured as the stock returns over the previous fiscal year minus the value-weighted market returns over that period. In the year of turnover, all CEO variables correspond to that of the departing CEO; in non-turnover years, they are measured contemporaneously. All other control variables are defined in the Appendix. Intercept is included but not reported. z-statistics given in parentheses are based on standard errors corrected for heteroskedasticity and firm-level clustering. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels.

	Dependent variable: CEO Turnover$_t$					
	(1) All	(2) All	(3) Forced	(4) Forced	(5) Forced	(6) Forced
Co-option$_t$ × Prior abnormal return (α_1)	0.528* (1.6)	1.129*** (3.1)	2.186*** (3.8)	2.726*** (3.2)		2.731*** (2.9)
Co-option$_t$ (α_2)	1.139*** (6.2)	2.400*** (5.3)	1.613*** (4.7)	3.455*** (4.5)		3.143*** (3.9)
TW Co-option$_t$ × Prior abnormal return (α_1)					2.731*** (3.5)	
TW Co-option$_t$ (α_2)					2.931*** (3.2)	
Fraction Independent$_t$ × Prior abnormal return						-0.750 (-0.5)
Fraction Independent$_t$						-2.040 (-1.6)
Prior abnormal return (α_3)	-0.890*** (-3.7)	-1.136*** (-4.5)	-2.266*** (-5.0)	-2.703*** (-4.8)	-2.412*** (-5.4)	-2.419** (-2.1)
Firm size$_t$	0.143*** (4.3)	-0.399* (-1.7)	0.078 (1.2)	0.143 (0.3)	0.250 (0.6)	0.205 (0.4)
CEO age6466$_t$	0.670*** (6.5)	0.533*** (3.0)				
CEO tenure$_t$	0.021*** (2.7)	0.450*** (12.7)	-0.069*** (-4.4)	0.140*** (2.9)	0.219*** (4.1)	0.188*** (3.5)
CEO ownership$_t$	-0.032*** (-2.7)	-0.034 (-1.3)	0.021 (1.2)	0.041 (1.1)	0.025 (0.7)	0.025 (0.6)
CEO duality$_t$	-1.185*** (-12.4)	-1.891*** (-12.2)	-0.995*** (-5.9)	-1.556*** (-5.6)	-1.697*** (-5.8)	-1.714*** (-5.8)
Outside director ownership$_{t-1}$	-0.014** (-2.2)	-0.026* (-1.7)	0.009 (0.9)	0.042* (1.9)	0.048** (2.1)	0.041* (1.7)
GIM index$_{t-1}$	0.042*** (2.8)	-0.068 (-0.8)	0.067** (2.2)	-0.094 (-0.7)	-0.109 (-0.7)	-0.113 (-0.8)
Board size$_{t-1}$	0.021 (1.1)	0.109** (2.2)	-0.027 (-0.7)	0.036 (0.4)	0.062 (0.6)	0.043 (0.4)
Female director$_{t-1}$	0.111 (1.1)	-0.173 (-0.8)	-0.167 (-1.0)	-0.800** (-2.2)	-0.655* (-1.7)	-0.573 (-1.5)
Fixed Effects?	Industry, Year	Firm, Year	Industry, Year	Firm, Year	Firm, Year	Firm, Year
Observations	8544	4668	7834	1165	1064	1064

Table 3: Effect of co-option on CEO pay

The table presents regression results where the dependent variable is logarithm of *CEO pay*. We drop firm-years that had a turnover and require that the CEO's tenure be at least 1 year. This ensures that we do not consider pay for fractional years. *CEO pay* is the total annual pay (Execucomp variable: *TDC1*). It includes the value of stock options granted, cash compensation, the value of restricted stock grants, other annual compensation, long term incentive payouts, and all other total compensation. *Co-option* is the ratio of the number of directors appointed *after* the CEO assumed office ("new" directors) to board size. *TW Co-option* is the director years accumulated since the CEO assumed the position of CEO divided by total years served by current directors. All other control variables are defined in Appendix. Intercept is included but not reported. t-statistics given in parentheses are based on standard errors corrected for heteroskedasticity and firm-level clustering. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels.

	Dependent variable: Log(CEO pay$_t$)			
	(1)	(2)	(3)	(4)
Co-option$_t$ (β_1)	0.355***	0.230***		0.224***
	(6.1)	(3.8)		(3.7)
TW Co-option$_t$ (β_1)			0.131*	
			(1.9)	
Fraction Independent$_t$				0.098
				(1.0)
Firm size$_t$	0.434***	0.300***	0.297***	0.299***
	(30.5)	(8.3)	(8.2)	(8.3)
Return$_t$	0.173***	0.105***	0.105***	0.105***
	(8.0)	(5.1)	(5.1)	(5.1)
ROA$_t$	0.650***	1.403***	1.410***	1.403***
	(3.6)	(6.9)	(6.9)	(6.9)
CEO tenure$_t$	-0.008**	-0.006*	-0.003	-0.006*
	(-2.5)	(-1.9)	(-0.7)	(-1.8)
CEO ownership$_t$	-0.036***	-0.017***	-0.017***	-0.017***
	(-8.6)	(-3.0)	(-3.0)	(-2.9)
CEO duality$_t$	0.167***	0.039	0.048	0.037
	(5.1)	(1.3)	(1.6)	(1.2)
Outside director ownership$_t$	0.000	-0.000	-0.000	-0.000
	(0.6)	(-1.1)	(-1.0)	(-1.1)
GIM index$_t$	0.001	-0.001	-0.002	-0.001
	(0.2)	(-0.1)	(-0.1)	(-0.1)
Board size$_t$	-0.001	-0.008	-0.006	-0.008
	(-0.2)	(-1.1)	(-0.8)	(-1.1)
Female director$_t$	-0.002	0.036	0.038	0.032
	(-0.1)	(1.2)	(1.3)	(1.0)
Fixed Effects?	Industry, Year	Firm, Year	Firm, Year	Firm, Year
Observations	9421	9421	9421	9421
R^2	0.502	0.145	0.143	0.143

Table 4: Effect of co-option on CEO Delta (CEO wealth-performance sensitivity)

The table presents regressions of *CEO Delta*, defined the dollar change in CEO wealth for a 1% change in stock price, where components of delta arise from current CEO holdings of own-firm stock and options, per Core and Guay (2002). *Co-option* is the ratio of the number of directors appointed *after* the CEO assumed office ("new" directors) to board size. *TW Co-option* is the director years accumulated since the CEO assumed the position of CEO divided by total years served by current directors. Other control variables are defined in Appendix. Intercept is included but not reported. t-statistics given in parentheses are based on standard errors corrected for heteroskedasticity and firm-level clustering. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels.

	Dependent variable: CEO Delta (CEO Wealth-Performance Sensitivity)			
	(1)	(2)	(3)	(4)
Co-option$_t$ (γ_1)	-254.101	-293.458		-259.294
	(-1.3)	(-1.5)		(-1.4)
TW Co-option$_t$ (γ_1)			-376.407*	
			(-1.7)	
Fraction Independent$_t$				-530.704**
				(-2.0)
Firm size$_t$	486.998***	199.579**	202.458**	206.423**
	(10.6)	(2.3)	(2.3)	(2.4)
Market-to-book$_t$	457.817***	391.844***	392.004***	390.714***
	(7.8)	(6.6)	(6.6)	(6.6)
(R&D/Assets)$_t$	-757.208	-2,886.324*	-2,920.841**	-2,829.613*
	(-0.8)	(-2.0)	(-2.0)	(-1.9)
(CAPEX/Assets)$_t$	-1,496.755	1,399.678	1,395.191	1,382.907
	(-1.5)	(1.4)	(1.4)	(1.4)
Leverage$_t$	-569.430*	-369.132*	-371.969*	-373.520*
	(-1.8)	(-1.7)	(-1.7)	(-1.7)
Firm-specific Risk$_t$	-6.451	-42.029***	-42.254***	-43.002***
	(-0.3)	(-2.8)	(-2.8)	(-2.9)
CEO tenure$_t$	93.868***	83.665***	85.814***	82.174***
	(6.0)	(5.2)	(5.4)	(5.2)
CEO duality$_t$	-42.831	162.498**	157.716**	169.607**
	(-0.5)	(2.1)	(2.0)	(2.2)
Outside director ownership$_t$	1.774	0.267	0.223	0.153
	(1.0)	(0.4)	(0.3)	(0.2)
GIM index$_t$	-37.969*	-4.246	-5.518	-3.991
	(-1.9)	(-0.1)	(-0.1)	(-0.1)
Board size$_t$	-15.703	-25.837	-29.174	-28.739
	(-0.7)	(-1.3)	(-1.5)	(-1.4)
Female director$_t$	-71.777	-60.063	-64.163	-39.127
	(-0.8)	(-0.9)	(-0.9)	(-0.6)
Fixed Effects?	Industry, Year	Firm, Year	Firm, Year	Firm, Year
Observations	8958	8958	8958	8958
R^2	0.319	0.177	0.177	0.178

Table 5: Effect of co-option on human capital intensity

The table presents regressions of proxies for human capital intensity on co-option. The dependent variable in Panel A is *R&D/Assets*, defined as the ratio of R&D to book assets. The dependent variable in Panel B is *firm-specific risk*, measured as the logarithm of the residual from a regression of firm's daily excess returns on Fama-French factors. This regression is estimated for each fiscal year. *Co-option* is the ratio of the number of directors appointed *after* the CEO assumed office ("new" directors) to the board size. *TW Co-option* is the director years accumulated since the CEO assumed the position of CEO divided by total years served by current directors. Other control variables are defined in Appendix. Intercept is included but not reported. t-statistics given in parentheses are based on standard errors corrected for heteroskedasticity and firm-level clustering. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels.

Panel A: Measure of human capital intensity: R&D/Assets

	Dependent variable: R&D/Assets$_t$			
	(1)	(2)	(3)	(4)
Co-option$_{t-1}$ (Φ_1)	0.014***	-0.003		-0.003
	(4.3)	(-1.4)		(-1.5)
TW Co-option$_{t-1}$ (Φ_1)			-0.004	
			(-1.6)	
Fraction Independent$_{t-1}$				0.002
				(0.8)
CEO tenure$_{t-1}$	-0.001***	-0.000	0.000	-0.000
	(-4.0)	(-0.1)	(0.4)	(-0.0)
CEO cash compensation$_{t-1}$ × 10^6	0.463	0.197	0.202	0.194
	(1.0)	(0.8)	(0.8)	(0.8)
Firm size$_{t-1}$	-0.005***	0.000	0.000	0.000
	(-7.0)	(0.2)	(0.2)	(0.2)
Market-to-book$_{t-1}$	0.009***	0.000	0.000	0.000
	(9.2)	(0.3)	(0.3)	(0.3)
Leverage$_{t-1}$	-0.032***	-0.013***	-0.012***	-0.013***
	(-5.6)	(-3.6)	(-3.6)	(-3.6)
CEO vega$_{t-1}$ × 10^6	17.000***	-1.070	-1.040	-1.11
	(4.7)	(-0.6)	(-0.6)	(-0.6)
CEO delta$_{t-1}$ × 10^6	-0.38	0.018	0.021	0.027
	(-1.1)	(0.1)	(0.1)	(0.2)
OCF/Assets$_{t-1}$	-0.088***	-0.008	-0.009	-0.008
	(-6.0)	(-1.4)	(-1.4)	(-1.4)
Sales growth$_{t-1}$	-0.003	-0.004***	-0.004***	-0.004***
	(-1.1)	(-3.0)	(-3.0)	(-3.0)
Return$_{t-1}$	-0.009***	-0.002***	-0.002***	-0.002***
	(-8.0)	(-4.5)	(-4.5)	(-4.6)
Fixed Effects?	Industry, Year	Firm, Year	Firm, Year	Firm, Year
Observations	9359	9359	9359	9359
R^2	0.49	0.03	0.03	0.03

Panel B: Measure of human capital intensity: firm-specific risk

	Dependent variable: Firm-specific risk$_t$			
	(1)	(2)	(3)	(4)
Co-option$_{t-1}$ (Φ_1)	0.178***	0.137*		0.141*
	(3.1)	(1.7)		(1.8)
TW Co-option$_{t-1}$ (Φ_1)			0.120	
			(1.2)	
Fraction Independent$_{t-1}$				-0.060
				(-0.6)
CEO tenure $_{t-1}$	-0.004	-0.005	-0.004	-0.005
	(-1.4)	(-1.2)	(-0.9)	(-1.2)
CEO cash compensation $_{t-1}$ × 10^6	-13.400	-19.700	-19.300	-19.600
	(-1.1)	(-1.3)	(-1.3)	(-1.3)
Firm size$_{t-1}$	-0.193***	-0.072*	-0.073*	-0.072*
	(-14.6)	(-1.7)	(-1.8)	(-1.7)
Leverage$_{t-1}$	0.296***	0.314**	0.312**	0.313**
	(3.1)	(2.2)	(2.2)	(2.2)
CEO vega $_{t-1}$ × 10^6	-130.4**	-248.800***	-248.400***	-247.500***
	(-2.0)	(-2.9)	(-2.8)	(-2.8)
CEO delta$_{t-1}$ × 10^6	4.780	15.300*	15.100*	15.100*
	(0.8)	(1.8)	(1.7)	(1.7)
R&D/Assets$_{t-1}$	2.767***	1.175*	1.170*	1.174*
	(8.2)	(1.7)	(1.7)	(1.7)
Capex/Assets$_{t-1}$	0.309	0.303	0.312	0.303
	(1.0)	(0.8)	(0.8)	(0.8)
Fixed Effects?	Industry, Year	Firm, Year	Firm, Year	Firm, Year
Observations	9334	9334	9334	9334
R^2	0.40	0.31	0.31	0.31

Table 6: Effect of co-option on firm value

The table presents regressions of *Tobin's q*, defined as the ratio of the market value of assets to the book value of assets. *Human capital intensity factor* is a factor formed using *industry heterogeneity*, *R&D/Assets*, and *firm-specific risk*. *Co-option* is the ratio of the number of directors appointed *after* the CEO assumed office ("new" directors) to board size. *TW Co-option* is the director years accumulated since the CEO assumed the position of CEO divided by total years served by current directors. Other control variables are defined in Appendix. Intercept is included but not reported. t-statistics given in parentheses are based on standard errors corrected for heteroskedasticity and firm-level clustering. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels.

	Dependent variable: Tobin's *q*			
	(1)	(2)	(3)	(4)
Co-option$_t$ × Human capital intensity$_{t-1}$ (λ_1)	0.379***	0.234**		0.223**
	(2.8)	(2.3)		(2.2)
Co-option$_t$ (λ_2)	0.046	0.052		0.053
	(1.0)	(1.1)		(1.1)
TW Co-option$_t$ × Human capital intensity$_{t-1}$ (λ_1)			0.251**	
			(2.4)	
TW Co-option$_t$ (λ_2)			0.072	
			(1.3)	
Fraction Independent$_t$ × Human capital intensity$_{t-1}$ (ς_1)				-0.494***
				(-2.6)
Fraction Independent$_t$ (ς_2)				-0.050
				(-0.5)
Human capital intensity$_{t-1}$	0.564***	-0.001	0.029	0.329**
	(5.9)	(-0.0)	(0.5)	(2.2)
Segments$_t$	-0.046***	0.013	0.013	0.014
	(-3.8)	(0.8)	(0.8)	(0.9)
Leverage$_t$	-0.735***	-0.885***	-0.882***	-0.871***
	(-4.1)	(-5.0)	(-5.0)	(-4.9)
Firm size$_t$	0.011	-0.466***	-0.469***	-0.462***
	(0.5)	(-7.4)	(-7.4)	(-7.4)
Board size$_t$	-0.011	-0.032***	-0.031***	-0.031***
	(-1.3)	(-3.5)	(-3.4)	(-3.4)
ROA$_t$	5.704***	5.568***	5.573***	5.560***
	(17.6)	(15.4)	(15.4)	(15.4)
ROA$_{t-1}$	1.582***	1.403***	1.403***	1.403***
	(5.5)	(5.0)	(5.0)	(5.0)
ROA$_{t-2}$	0.573*	0.548*	0.519*	0.535*
	(1.7)	(1.8)	(1.7)	(1.8)
Intangible assets$_t$	1.260***	0.468*	0.474**	0.485**
	(7.8)	(1.9)	(2.0)	(2.0)
CEO ownership$_t$	0.003	0.001	0.000	0.001
	(0.7)	(0.2)	(0.1)	(0.1)
Fixed Effects?	Industry, Year	Firm, Year	Firm, Year	Firm, Year
Observations	10858	10858	10858	10858
R^2	0.407	0.223	0.223	0.225

F test: 25th percentile value HCI × $\lambda_1 + \lambda_2$	-0.04	0.00		0.00
	(-0.7)	(-0.1)		(0.0)
F test: 75th percentile value HCI × $\lambda_1 + \lambda_2$	0.28***	0.19**		0.19**
	(3.1)	(2.3)		(2.3)
F test: 25th percentile value HCI × $\lambda_1 + \lambda_2$			0.01	
			(0.2)	
F test: 75th percentile value HCI × $\lambda_1 + \lambda_2$			0.23***	
			(2.6)	
F test: 25th percentile value HCI × $\varsigma_1 + \varsigma_2$				0.07
				(0.6)
F test: 75th percentile value HCI × $\varsigma_1 + \varsigma_2$				-0.35**
				(-2.1)

Table 7: Determinants of board co-option

The table presents regressions of board co-option. *Co-option* is defined as the ratio of the number of directors appointed *after* the CEO assumed office ("new" directors) to board size. *TW Co-option* is the director years accumulated since the CEO assumed the position of CEO divided by total years served by current directors. We drop firm-years that had a turnover in the current or previous year and require that the CEO's tenure be at least 2 years. This regression is estimated for each fiscal year. *Human capital intensity factor* is a factor formed using *industry heterogeneity*, *R&D/Assets* and *firm-specific risk*. *Outside CEO* = 1 if the CEO was not employed at the firm before he became the CEO; = 0 otherwise. Other control variables are defined in Appendix. Intercept is included but not reported. t-statistics given in parentheses are based on standard errors corrected for heteroskedasticity and firm-level clustering. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels.

	Dependent Variable					
	(1) Co-option$_t$	(2) Co-option$_t$	(3) TW Co-option$_t$	(4) TW Co-option$_t$	(5) Co-option$_t$	(6) Co-option$_t$
Outside CEO$_t$	0.070***	0.085***	0.115***	0.133***	0.068***	0.083***
	(5.1)	(3.4)	(7.3)	(6.1)	(4.9)	(3.3)
Human Capital Intensity$_{t-1}$	0.045***	0.001	0.042***	-0.007	0.045***	0.001
	(3.9)	(0.1)	(3.3)	(-1.2)	(3.9)	(0.2)
Fraction Independent$_t$					0.136***	0.114***
					(4.0)	(4.1)
Return$_t$	0.007	0.002	0.011*	0.002	0.007	0.001
	(1.1)	(0.4)	(1.9)	(0.5)	(1.1)	(0.3)
Return$_{t-1}$	0.001	0.004	0.004	0.001	0.003	0.005
	(0.2)	(1.0)	(0.6)	(0.2)	(0.4)	(1.2)
ROA$_t$	-0.008	-0.013	-0.071	0.013	0.003	-0.009
	(-0.1)	(-0.2)	(-1.1)	(0.3)	(0.0)	(-0.2)
ROA$_{t-1}$	-0.085	-0.081	-0.001	-0.001	-0.090	-0.087*
	(-1.3)	(-1.6)	(-0.0)	(-0.0)	(-1.4)	(-1.8)
CEO duality$_{t-1}$	0.043***	0.052***	0.033***	0.033***	0.035***	0.051***
	(4.0)	(4.9)	(2.9)	(3.5)	(3.2)	(4.9)
Firm size$_{t-1}$	-0.001	-0.031***	-0.007	-0.027**	-0.002	-0.032***
	(-0.2)	(-2.7)	(-1.5)	(-2.6)	(-0.5)	(-2.8)
CEO tenure$_{t-1}$	0.029***	0.035***	0.030***	0.033***	0.029***	0.035***
	(30.2)	(24.9)	(29.4)	(26.8)	(30.3)	(25.0)
CEO ownership$_{t-1}$	-0.002**	0.000	-0.001	0.001	-0.002	0.000
	(-2.1)	(0.0)	(-0.6)	(0.8)	(-1.4)	(0.2)
Fixed Effects?	Industry, Year	Firm, Year	Industry, Year	Firm, Year	Industry, Year	Firm, Year
Observations	6567	6567	6567	6567	6567	6567
R^2	0.538	0.558	0.584	0.619	0.542	0.562

Table 8: Addressing endogeneity of co-option

The table reports some key results using various approaches to address endogeneity concerns. 'Base-case' (Column 1) results are presented for comparison purposes and are based on results reported in tables 2 – 6. *Co-option* is the ratio of the number of directors appointed *after* the CEO assumed office ("new" directors) to the board size. The two-step procedure involves (i) predicting *Co-option* using the specification in Column 1 of Table 7, and (ii) using the predicted values in the regressions of turnover, pay etc. In the second step, the standard errors are corrected for bias induced by using predicted, rather than actual, values of *Co-option*. The 2SLS IV estimation procedure is two-stage least squares instrument variable estimation where the instrument used for *Co-option* is *Outside CEO*. *Outside CEO* is an indicator variable that equals 1 if the CEO was not an employee of the firm prior to his appointment. Interactions involving *Co-option* with other variables are instrumented using interactions of *Outside CEO* with the corresponding variables. For brevity, the economic significance based on estimated coefficients is reported. *TPS* refers to Turnover-Performance Sensitivity. t-statistics given in parentheses are based on standard errors corrected for heteroskedasticity and firm-level clustering. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels.

Row	Hypothesis	Effect of an increase in *Co-option* on:	Specification based on	Base Case (1)	Two-step procedure (2)	2SLS IV estimation (3)
1	H1	CEO Forced TPS (*Co-option* up from 25th %-ile to 75th %-ile)	Table 2, Model 3	1.202*** (3.8)	NA	0.450*** (3.0)
2	H2	CEO Pay Level (*Co-option* up from 25th %-ile to 75th %-ile)	Table 3, Model 1	0.195*** (6.1)	0.593*** (5.2)	0.447*** (3.3)
3	H3	CEO Delta (*Co-option* up from 25th %-ile to 75th %-ile)	Table 4, Model 1	-139.756 (-1.3)	-955.955** (-2.3)	46.966 (0.1)
4	H4	R&D/Assets (*Co-option* up from 25th %-ile to 75th %-ile)	Table 5, Panel A, Model 1	0.008*** (4.3)	NA	0.031*** (3.0)
5	H4	Firm-specific risk (*Co-option* up from 25th %-ile to 75th %-ile)	Table 5, Panel B, Model 1	0.098*** (3.1)	NA	0.661*** (3.3)
6	H5	*q* for firms with low human capital intensity needs (25th %-ile *HCI*) (*Co-option* up from 25th %-ile to 75th %-ile)	Table 6, Model 1	-0.045 (-0.7)	-0.091 (-0.7)	-0.044 (-0.1)
7	H5	*q* for firms with high human capital intensity needs (75th %-ile *HCI*) (*Co-option* up from 25th %-ile to 75th %-ile)	Table 6, Model 1	0.277*** (3.1)	0.379* (1.9)	0.560 (1.5)

Table 9: Estimation of "true" effects of Co-option using exogenous shock provided by SOX
This table reports estimates of various specifications from Tables 2–6 for post-SOX years (2002–2007) for firms that were noncompliant in 2001 with the subsequent (2002) NYSE/Nasdaq listing requirement that at least half the board be comprised on independent directors. The implication is that on firms in this subsample was imposed an exogenous increase in *Co-option*. *Co-option* is the ratio of the number of directors appointed after the CEO assumed office to board size. This table also reports comparisons of the effects across the three other subsamples based on the 2x2 partition of the data by pre-SOX listing requirements: compliance versus non compliance and by the pre-SOX (1996–2001) versus post-SOX (2002–2007) periods. SOX represents how associated changes in the environment affect the sensitivity of the dependent variable to co-option through avenues other than the change in listing requirements for board independence. "Bias" arises from the standard endogeneity problem. We allow that bias on the estimate of the effect of co-option on the dependent variable differs by whether the firm was (superscript C) or was not (superscript NC) compliant pre-SOX, though we restrict Bias^{C} to be the same both pre- and post-SOX. For each sub-sample in Panel A, we report what the coefficient for that particular sub-sample represents as well as the number and percentage of observations in each. For example, the estimated regression coefficient in the non-compliant post-SOX sub-sample captures the "Clean" effect + "SOX" effect. The 5242 observations here represent 43%of the full sample. In Panel B, we report the same coefficients for a representative regression estimated with total pay as the dependent variable (as in Table 3). In Panel C, the results of hypotheses relating to "Clean", "Bias", and "SOX" are reported for all our base-case specifications in Tables 2–6. t-statistics given in parentheses are based on standard errors corrected for heteroskedasticity and firm-level clustering. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels.

Panel A: Comparison framework

	Estimated coefficient represents:	
	Pre-SOX period (1996–2001)	Post-SOX period (2002–2007)
Compliant	Clean + Bias^{C} 966 [8%]	Clean + Bias^{C} + SOX 4887 [40%]
Non-Compliant	Clean + Bias^{NC} 1097 [9%]	Clean + SOX 5242 [43%]

Panel B: Representative example for regression of CEO pay on co-option

$$Pay = \beta_0 + \beta_1\, Co\text{-}option + \beta_2\, PreSOX \times Co\text{-}option + \beta_3\, Compliant \times Co\text{-}option$$
$$+ \beta_4\, PreSOX \times Compliant \times Co\text{-}option + controls + error$$

	Estimated coefficient (= ∂Pay/∂Co-option):	
	Pre-SOX period (1996–2001)	Post-SOX period (2002–2007)
Compliant	$\beta_1 + \beta_2 + \beta_3 + \beta_4$ (Clean + Bias^{C})	$\beta_1 + \beta_3$ (Clean + Bias^{C} + SOX)
Non-Compliant	$\beta_1 + \beta_2$ (Clean + Bias^{NC})	β_1 (Clean + SOX)

SOX = $-(\beta_2 + \beta_4)$; $\text{Bias}^{C} = \beta_3$; $\text{Bias}^{C} - \text{Bias}^{NC} = \beta_3 + \beta_4$; $\text{Bias}^{NC} = -\beta_4$; Clean = $\beta_1 + \beta_2 + \beta_4$.

Panel C: Estimates of the true effects of Co-option

	Expected per hypotheses	Results from base-case	Clean Estimate	$Bias^{C} = 0$?	$Bias^{NC} = 0$?	$Bias^{C}$ - $Bias^{NC} = 0$?	SOX = 0?
Table 2: Model 1 (turnover, α_1)	+	0.53* (1.6)	3.20** (2.1)	-2.77* (-1.9)	-3.01* (-1.8)	0.24 (0.3)	-0.16 (-0.2)
Table 3: Model 1 (pay level, β_1)	+	0.36*** (6.1)	0.86*** (3.8)	-0.50** (-2.3)	-0.49 (-1.6)	-0.01 (-0.1)	-0.10 (-0.9)
Table 4: Model 1 (CEO delta, γ_1)	-	-254 (-1.3)	-1300* (1.9)	1210* (1.7)	1717** (2.2)	-507 (-0.6)	155 (0.6)
Table 5, panel A: Model 1 (R&D, Φ_1)	+	0.01*** (4.3)	0.01 (0.8)	0.00 (0.2)	0.01 (1.0)	-0.01 (-0.9)	0.01 (1.0)
Table 5, panel B: Model 1 (unsys risk, Φ_1)	+	0.18*** (3.1)	0.43* (1.7)	-0.28 (-1.1)	-0.15 (-0.5)	-0.13 (-0.6)	-0.09 (-0.8)
Table 6: Model 1 (q for <u>low</u> human capital intensity, $25^{th}\ HCI \times \lambda_1 + \lambda_2$)	-/0	-0.04 (-0.7)	0.19 (0.8)	-0.16 (-0.8)	-0.05 (-0.2)	-0.11 (-0.4)	0.04 (0.3)
Table 6: Model 1 (q for <u>high</u> human capital intensity, $75^{th}\ HCI \times \lambda_1 + \lambda_2$)	+	0.28*** (3.1)	0.52* (1.9)	-0.12 (-0.5)	-0.05 (-0.2)	-0.06 (-0.2)	-0.27* (-1.8)

Table 10: Co-opted versus non-co-opted independent directors

The table reports results for experiments in Tables 2 – 6 re-estimated using representation on the board of co-opted (Panel A) and non-co-opted (Panel B) independent directors rather than overall board co-option as the key explanatory variables. *Co-opted Independent* is the number of independent directors appointed *after* the CEO assumed office relative to board size. *Non-co-opted Independent* is the number of independent directors appointed *prior* to the CEO assuming office relative to board size. Column 1 reports results on turnover-performance sensitivity. Column 2 reports results on CEO compensation level. Column 3 addresses CEO wealth-performance sensitivity. Columns 4 and 5 estimate specifications for investment policy. Column 6 reports results for *Tobin's q*. t-statistics given in parentheses are based on standard errors corrected for heteroskedasticity and firm-level clustering. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels.

Panel A: Co-opted independents

	Dependent variable:					
	(1) Forced Turnover	(2) log(CEO Pay)	(3) CEO Delta	(4) R&D/Assets	(5) Firm-specific Risk	(6) Tobin's q
Co-opted Independent × Prior abnormal Return	2.905** (2.4)					
Co-opted Independent	2.694*** (3.3)	0.212*** (3.4)	-499.03** (-2.3)	-0.002 (-0.9)	0.038 (0.5)	0.038 (0.7)
Co-opted Independent × Human Capital Intensity						0.143 (1.2)
Other controls and time subscripts as in:	Table 2, Model 3	Table 3, Model 1	Table 4, Model 1	Table 5, Panel A, Model 1	Table 5, Panel B, Model 1	Table 6, Model 1
Fixed Effects?	Firm, Year	Firm, Year	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Observations	1064	9421	8958	9359	9334	10858

Panel B: Non-Co-opted independents

	Dependent variable:					
	(1) Forced Turnover	(2) log(CEO Pay)	(3) CEO Delta	(4) R&D/Assets	(5) Firm-specific Risk	(6) Tobin's q
Non-Co-opted Independent × Prior abnormal Return	-3.927*** (-3.2)					
Non-Co-opted Independent	-4.096*** (-4.5)	-0.174** (2.4)	244.996 (1.2)	0.003 (1.5)	-0.072 (-0.8)	-0.047 (-0.8)
Non-Co-opted Independent × Human Capital Intensity						-0.354*** (-3.0)
Other controls and time subscripts as in:	Table 2, Model 3	Table 3, Model 1	Table 4, Model 1	Table 5, Panel A, Model 1	Table 5, Panel B, Model 1	Table 6, Model 1
Fixed Effects?	Firm, Year	Firm, Year	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Observations	1064	9421	8958	9359	9334	10858

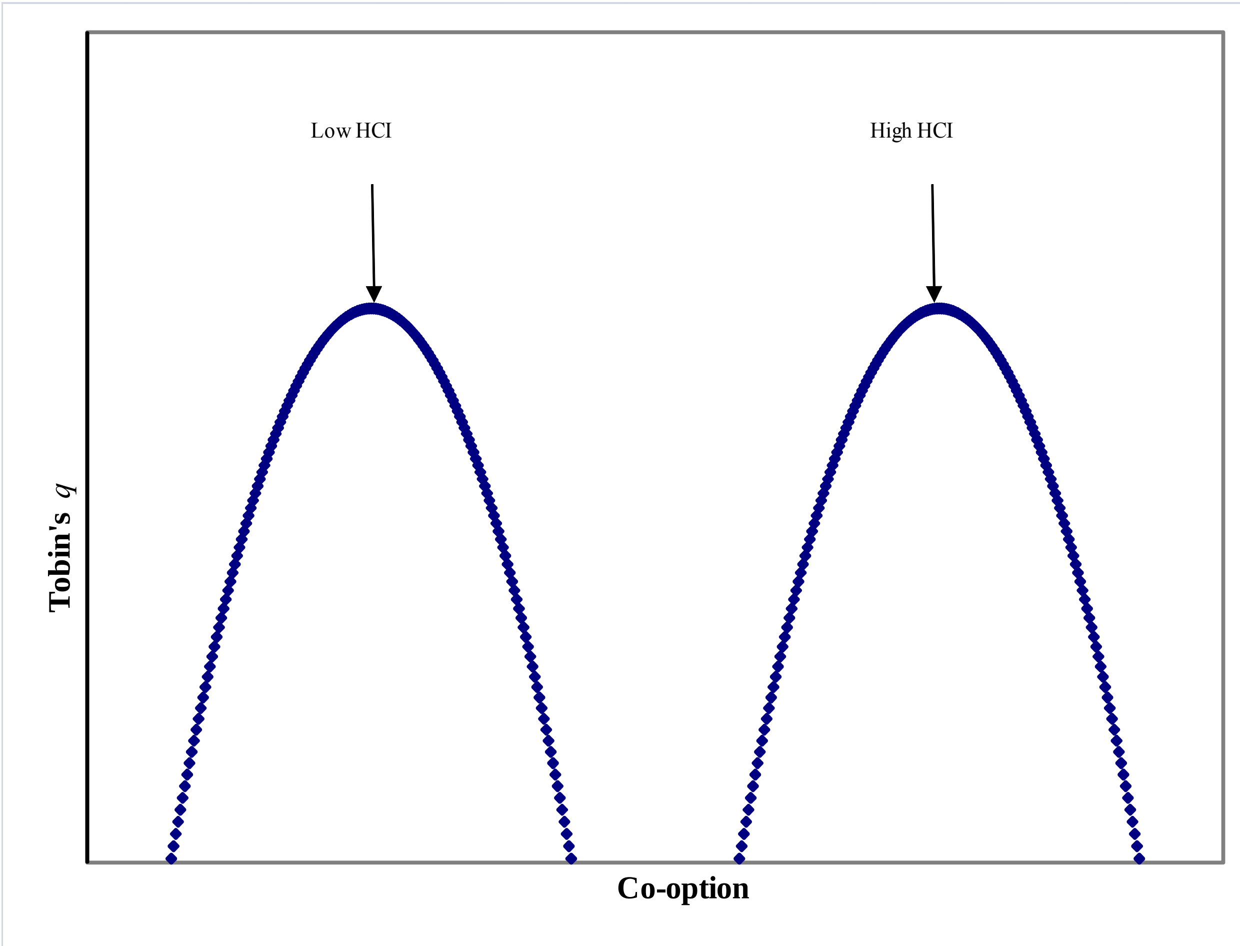

Figure 1. Relation between *q* and board co-option in the presence of transaction costs
The figure presents hypothetical data based on a transaction-costs based model. In this world, there are two types of firms, "low-HCI" and "high-HCI," each having distinct optimal board co-option. *HCI* is the *Human capital intensity factor* formed using *industry heterogeneity*, *R&D/Assets,* and *firm-specific risk*. Transaction costs are significant and hence deviations from optimal board co-option are likely to be permanent. Assume also that the deviations are random, in that, some could be above-optimal and some could be below-optimal. The locus of points represents the objective function that firms maximize in the absence of transaction costs.

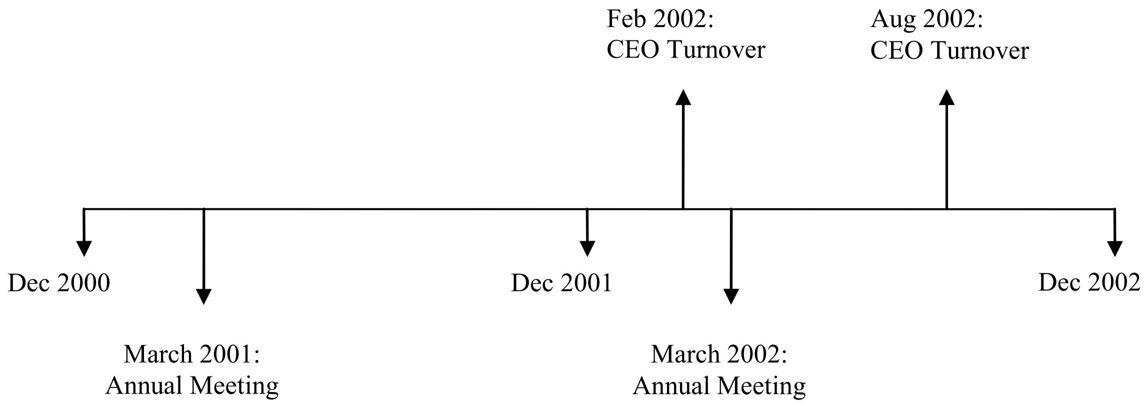

Figure 2. Timeline

The example above illustrates how we estimate the relevant board co-option for any given outcome. Consider a firm that has a December fiscal year end and has its annual meeting in March. Co-option for year 2001 is based on the slate of directors presented at the March 2001 annual meeting, because this is the board in place for the majority of the year. Thus, by definition, co-option is based on the board prevailing at the end of the year rather than at the beginning of the year. Similarly, co-option for the year 2002 is based on the slate of directors presented at the March 2002 meeting. Assume a CEO turnover event occurs in August 2002 (i.e., after the annual meeting date). Then the board that determined the CEO turnover is the board in place since March 2002, and hence turnover and co-option are measured contemporaneously. If the turnover occurs before the annual meeting (say, February 2002) then the board that determined the turnover is the board elected as of March 2001, and the lagged co-option measure is used in regressions. For non-turnover years, because both the lagged and contemporaneous boards decide on the CEO's 'non-replacement,' we use the average of the lagged and contemporaneous values of co-option. For regressions of CEO compensation, we use the contemporaneous co-option measure because this is based on the board that is in place for the majority of the year and also because performance-based pay will be decided by the board at the end of the fiscal year.

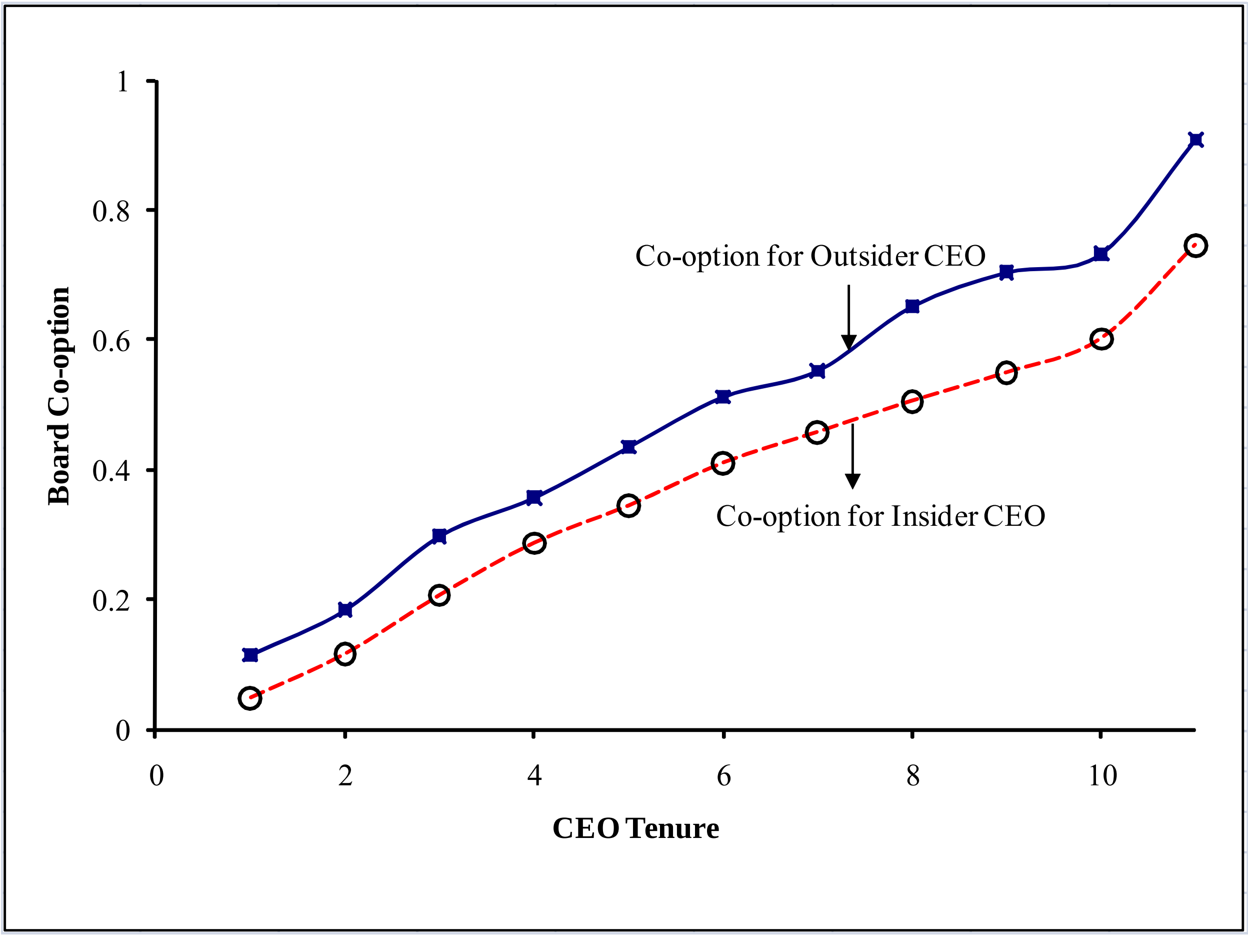

Figure 3. Co-option for CEOs appointed from inside versus outside as a function of CEO tenure

The figure shows how co-option varies with CEO tenure by whether the CEO was appointed to that position from outside the firm or inside the firm. *Co-option* is the ratio of the number of directors appointed *after* the CEO assumed office ("new" directors) to the board size. CEOs are put in 11 groups based on their tenure, where CEO tenure is measured as fiscal year end date minus the date the executive became the CEO. All CEOs with ≤ 1 year are put in the 1st group, CEOs with tenure greater than 9 years but ≤ 10 years are put in the 10th group, and CEOs with greater than 10 years are put in the 11th group.

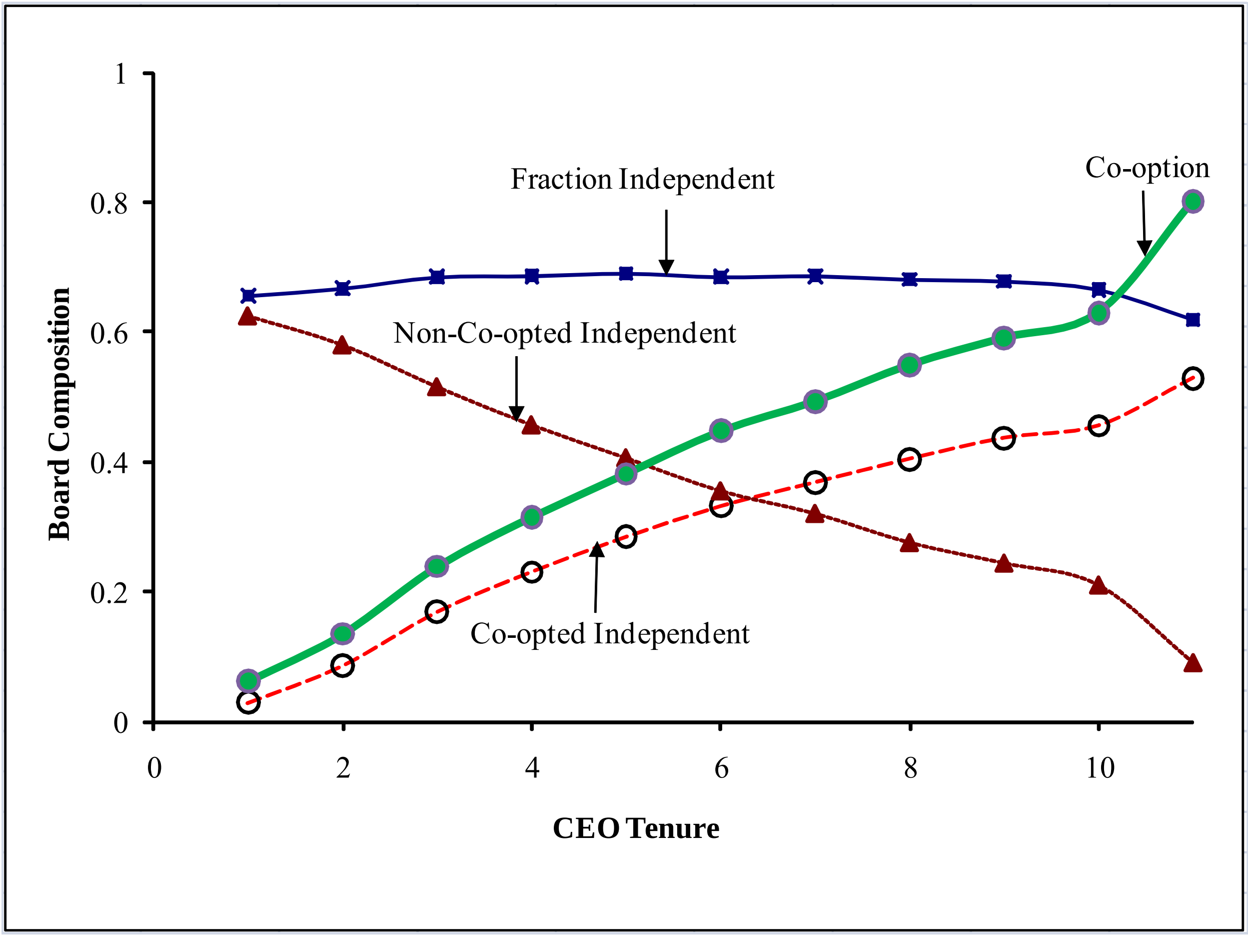

Figure 4. Board independence, co-option, and CEO tenure
The figure plots various measures of board composition and co-option against CEO tenure. *Co-option* is the ratio of the number of directors appointed *after* the CEO assumed office ("new" directors) to the board size. *Fraction Independent* is the ratio of the number of independent directors to board size. *Co-opted Independent* is the ratio of the number of independent directors appointed *after* the CEO assumed office to the board size. *Non-Co-opted Independent* is the ratio of the number of independent directors appointed *before* the CEO assumed office to the board size. CEOs are put in 11 groups based on their tenure, where CEO tenure is measured as fiscal year end date minus the date the executive became the CEO. All CEOs with ≤ 1 year are put in the 1st group, CEOs with tenure greater than 9 years but ≤ 10 years are put in the 10th group, and CEOs with greater than 10 years are put in the 11th group.