Agents Who Know Their Principals: Social Connections, Institutional Investment, and Executive Compensation

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Abstract

I study how institutional investment and executive compensation are related to social connections between executives at public U.S. firms and employees of large institutional investors. I first develop and solve a principal-agent problem in which social connections reduce the marginal cost to investors of monitoring executives. Comparative statics and intuition indicate that from an optimal contracting perspective, executive-investor connections should be associated with greater investment, greater executive compensation, and lower pay-performance sensitivity. I validate each prediction in regression analysis of panel data spanning 1999 to 2015. Since similar predictions are provided by an alternate perspective that emphasizes executive influence over connected investors, I exploit an additional optimal contracting prediction about firm risk as well as the richness of my dataset to differentiate between the two perspectives. Overall, my analysis tentatively points towards optimal contracting more than executive influence as the dominant channel underlying the observed associations.

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1. Introduction

The standard framework used to model executive compensation is a principal-agent problem in which bargaining between investors and executives leads to optimal compensation contracts. Implicit in the classical approach is the assumption that principals and agents bargain at arm's-length. Of course, in practice corporate governance is embedded in a fabric of social connections. Recognizing that principals and agents can be socially connected complicates the standard framework and highlights the potential importance of executive control over pay-setting processes. In this paper, I focus on how compensation and investment are related to social connections between executives and investors.

Equipped with biographical data from 1999 to 2015 on social connections between high-level executives at public U.S. firms and employees of large institutional investors, I find that on average, a greater number of executive-investor connections is associated with higher executive compensation and with lower pay-performance sensitivity, measured by effective inside ownership. From the investor's perspective, social connections are accompanied with greater investment in the executive's firm. Since executive-investor connections, investment, and compensation are all determined endogenously throughout the career of an executive, causality is notoriously difficult to establish. Instead, I interpret my results as indications of how all of the above are sorted in the corporate landscape.

Identifying a positive association between the number of executive-investor connections and the level of executive compensation corroborates the findings of Butler and Gurun (2012), who look at an education network between CEOs and mutual fund managers. Greater investment in firms with socially connected executives supports the findings of Cohen, Frazzini, and Malloy (2008), who use a similar education network. It also supports the findings of Calluzzo (2013), who looks at executives sitting on the boards of mutual funds.

Instead of mutual funds, I consider a more diverse set of public—and some of the larger private—institutional investors. For example, my sample includes investment advisers and bank trusts, the holdings of which are aggregated across subordinate mutual funds or trust departments. I also compile a diverse set of social connections to both board directors and senior managers of institutional investors. Instead of educational connections and current board overlaps, I look more generally at overlapping periods of employment in other companies, as well as overlapping participation in charities, clubs, and government organizations.

My contribution is to use a rich dataset and the rigor of an optimal contracting model to better understand the importance of executive-investor connections. In the spirit of Baker (2002), I develop an optimal contracting model in which a risk-neutral investor (the principal) ties the pay of a risk-averse executive (the agent) to two signals of executive effort:

firm value and a secondary performance measure. Interpreting the secondary performance measure as explicit executive monitoring, I incorporate the assumption of Huddart (1993) that investors can pay to increase monitoring precision. I incorporate social connections by identifying a greater number of executive-investor connections with a lower marginal cost of monitoring. The model's main prediction is that when social connections make monitoring cheap, incentive pay is optimally tied more to monitoring channels and less to firm value. A second prediction is that social connections should come with higher compensation. I view the empirical realization of both predictions as an indication that the lessons of optimal contracting can be useful even after relaxing the standard assumption of arm's-length bargaining. Other benefits of the model include a prediction about firm risk, as well as motivation for controls.

It would be truly bizarre if a single model could sum up the importance of any social connection. Even in a corporate context, it's safe to assume that social connections are more than just tools with which people monitor each other. This is not to say that monitoring is unimportant, but rather that there are certainly other factors in play. Just as executive-investor connections should provide information about executive actions, they should also provide additional investment-relevant information. For example, social connections could provide details about firm performance, or could simply reduce the cost of gathering such information.[1] I view the positive association between social connections and investment to be at least partially a by-product of the value investors derive from both cheaper monitoring and private information.

Value to investors should also contribute to the empirical association between social connections and executive compensation. From an efficient contracting perspective, the value of social connections should be reflected by higher executive compensation. Conversely, the positive relationship could also be driven by channels analogous to the well-known managerial power hypothesis, which contends that entrenched executives use their influence—generally over board directors—to extract rent from shareholders (Bebchuk & Fried, 2003). In particular, executives may leverage connections to employees of institutional investors to guarantee continued investment in their firms, and though the substantial voting power of institutional investors, to also guarantee better compensation packages. That is, higher pay and less exposure to firm performance (lower pay-performance sensitivity). Empirically, the predictions of optional contracting and executive influence are similar. Both indicate that social connections should be associated with more investment, more compensation, and

[1] Cohen, Frazzini, and Malloy (2008), Cohen, Frazzini, and Malloy (2010), Calluzzo (2013), and Solomon and Soltes (2015) discuss and provide empirical support for the claim that executive-investor connections are channels for the flow of private information.

less pay-performance sensitivity. Although my model is informed by optimal contracting, I expect that executive influence is important as well.

I present my findings in three stages. First, I look at social connections between all employees at a single investor and all executives at a single firm, averaged over the executives. Controlling for firm characteristics and including fixed effects for years as well as the interaction between investors and industries, each additional observed social connection is associated with investment $30 to $170 million higher, depending on the type of social connection. Exploiting the richness of my data, I find that connections to senior managers of investors seem to be more important than connections to board members. Also, compared to classical employment overlaps, overlapping participation in charities, clubs, and government organizations seems to be more important for investment.

I subdivide investors into two familiar groups: potentially independent investors who are unlikely to have many business relationships with the firms in which they invest, and potentially involved investors who are more likely to have such relationships.[2] Especially after 2007, the association between social connections and investment is stronger for potentially independent investors. Since independent investors tend to be less susceptible to executive influence (Brickley, Lease, & Smith, 1988), one interpretation is that executive influence may not be the dominant channel through which executive-investor connections are related to investment. Alternatively, independent investors—who are generally less regulated—may be more adept at incorporating information from social connections into investment strategies.

I switch from institutional investment to executive compensation by considering social connections between a single executive and all employees of investors that hold shares in the executive's firm. Along with fixed effects for years, firms, and executive occupations, I also use the aforementioned model to motivate a number of executive-specific controls. Each additional observed social connection is associated with compensation $180 to $420 thousand higher, and with effective inside ownership 3 to 9 basis points lower, which for the large corporations under consideration translates to ownership differences on the order of $1 million.

As with investment, connections to potentially independent investors are most strongly associated with both compensation and pay-performance sensitivity. Also, connections through employment again seem to be less important than participation connections. Unlike investment, however, connections to managers of investors no longer consistently generate

[2] My classification corresponds loosely to the original classification of Brickley, Lease, and Smith (1988), who call the groups "pressure-resistant" and "pressure-sensitive" because investors with business relationships tend to be sensitive to pressure from firm management. Almazan, Hartzell, and Starks (2005) use the names "potentially active" and "potentially passive" because investors without business relationships are more likely to actively monitor firm executives. Chen, Harford, and Li (2007) use "independent" and "grey."

larger estimates than connections to directors. Intuitively, it makes sense that managers of institutional investors would be less involved in the design of executive compensation than board directors.

I move up to a firm level by averaging executive-investor connections over all executives at each firm. Doing so comes at the cost of replacing firm fixed effects and executive-level controls with weaker firm-level controls. Regardless, relationships between social connections and compensation characteristics remain similar. The benefit of a firm-level perspective is that it allows for interactions with important firm-specific variables. For example, I find that high mean institutional ownership amplifies the negative relationship between social connections and pay-performance sensitivity, whereas a large number of institutional investors attenuates the relationship. Intuitively, an executive-investor connection is more important when the investor has more voting power, and it's less important when there are many voices at the voting table.

I also find that return volatility is positively associated with pay-performance sensitivity, and that high return volatility amplifies the negative relationship between social connections and pay-performance sensitivity. The main effect is a common finding.[3] One well-known explanation is that in uncertain environments executives are delegated more authority, and that high-powered incentives are used to hold them accountable (Prendergast, 2002). Under this explanation, if delegation is identified with the marginal product of executive effort on firm value, my model is consistent with both empirical findings about return volatility. I view the model's consistency as additional support for the optimal contracting perspective.

Switching to governance, I interact social connections with the entrenchment index of Bebchuk, Cohen, and Ferrell (2009). If executive influence over investors plays a dominant role, one would expect that executive influence over board directors at the executive's firm would amplify the relationships between executive-investor connections and compensation characteristics. However, the entrenchment index is uncorrelated with the association between social connections and pay-performance sensitivity. Before 2008, the index actually attenuates the association between social connections and compensation. On the other hand, high board independence significantly attenuates both associations. Intuitively, independent boards may constrict the flow of information through executive-investor connections. If anything, the attenuating effect of board independence indicates a possible route through which regulation may be able to mediate the relationship between social connections and compensation design.

My findings are related to several strands of existing literature. Most similar are the

[3] See Prendergast (1999) and Prendergast (2002) for early reviews, as well as DeVaro and Kurtulus (2010) for a more recent one.

aforementioned papers, which establish that social connections between executives and investors are associated with more investment (Cohen, Frazzini, & Malloy, 2008; Calluzzo, 2013) and with higher levels of compensation (Butler & Gurun, 2012). Closely related are papers that link executive-investor connections to better investment performance (Cohen, Frazzini, & Malloy, 2010; Solomon & Soltes, 2015) and to higher executive compensation at all firms in which the investor holds shares (Ashraf, Jayaraman, & Ryan, 2012; Davis & Kim, 2007).

The association between social connections and pay-performance sensitivity is addressed by a few authors who use proxies for social interaction that are much different than the executive-investor connections in this paper. Brown, Gao, Lee, and Stathopoulos (2012) find that the pay-performance sensitivity of CEO compensation tends to be negatively associated with CEO social connectivity. Others establish the same findings when considering the social connectivity of directors in the CEO's firm (Barnea & Guedj, 2009; Renneboog & Zhao, 2011).

Each paper concerned with pay-performance sensitivity also confirms that the level of executive compensation is positively associated with executive social connectivity, which is a common finding (Meverson, 1994; Belliveau, O'Reilly, & Wade, 1996; Liu, 2010; Horton, Millo, & Serafeim, 2012; Engelberg, Gao, & Parsons, 2013). Others have established similar associations with board interlock (Hallock, 1997; Fich & White, 2003; Larcker, Richardson, Seary, & Tuna, 2005) and with CEO-board connections (Hwang & Kim, 2009; Kramarz & Thesmar, 2013; Schmidt, 2015). Finally, my paper is related to a long-standing strand of literature that examines how the composition of institutional ownership is related to characteristics of executive compensation (David, Kochhar, & Levitas, 1998; Hartzell & Starks, 2003; Almazan, Hartzell, & Starks, 2005; Khan, Dharwadkar, & Brandes, 2005; Shin, 2005; Dikolli, Kulp, & Sedatole, 2009; Janakiraman, Radhakrishnan, & Tsang, 2010).

2. Social Connections in a Principal-Agent Model

Incorporating monitoring from Huddart (1993) into the two-signal principal-agent model of Baker (2002) highlights an important function of social connections. If employees of institutional investors are in contact with a firm executive, there is no need to spend much on monitoring. More precisely, social connections between an investor (the principal) and an executive (the agent) should reduce the marginal cost of more precisely monitoring the executive.

Consider a firm with value $V \sim N(fe, \sigma_v^2)$, in which $e > 0$ is executive effort, $f > 0$ is the marginal product of effort on firm value, and σ_v^2 is variance of uncontrollable events that affect firm value, or simply firm risk. Investors cannot directly increase firm value, but instead encourage executives to do so by designing an incentive scheme contingent on signals of effort. As in Baker (1992), I model executive actions with a scalar level of effort. It would be more realistic and intuitive to follow Baker (2002) by modeling executive actions as a vector of tasks, but doing so would complicate interpretation.

From the investor's perspective, V is a measure of executive performance because its mean is a function of e. Investors also rely on a second measure of executive performance, $P \sim N(ge, \sigma_p^2)$, in which $g > 0$ is the marginal product of effort on the measure and σ_p^2 is the variance of uncontrollable events that affect the measure. I interpret P as aggregated signals of executive effort that arise from explicit monitoring. For example, P could incorporate knowledge accumulated by investors from quarterly coworker reports or from simple discussions between the executive and investor employees. Since there is no clear connection between uncontrollable events that affect monitoring channels and those that affect firm value, any correlation between P and V is likely to be small. To simplify algebra and interpretation, I assume that they are uncorrelated.

To encourage executive effort, investors must choose to what extent they rely on V and P, the two performance measures at their disposal. I assume that investors compensate the executive with a linear wage,

$$w \equiv s + b_v V + b_p P, \tag{1}$$

in which s is a base salary, b_v is the sensitivity of pay to firm value (pay-performance sensitivity), and b_p is the sensitivity of pay to the secondary performance measure. If the executive works at a publicly-traded firm, b_v can be thought of as the executive's inside ownership. Investors choose b_v and b_p in accordance with how much they rely on V and P to encourage executive effort.

The executive cares about compensation minus a positive, increasing, and convex cost of exerting effort, $C(e)$, and has exponential utility with constant absolute risk-aversion $r > 0$. The executive's problem is to choose effort that maximizes expected utility, which is equivalent to maximizing an expression for utility, u, that encodes a mean-variance trade-off:

$$\hat{e} \in \arg\max_{e} u \equiv \mathrm{E}[w] - \frac{r}{2}\mathrm{Var}(w) - C(e). \tag{2}$$

Risk-neutral investors maximize expected firm value minus compensation. As in Huddart (1993), they can pay a cost to increase the secondary performance measure's precision, $1/\sigma_p^2$, through more vigilant monitoring. Specifically, to choose σ_p^2 investors pay m/σ_p^2, a functional form that arises naturally from the problem of how to best estimate executive effort from a sequence of noisy monitoring observations.[4] The constant $m > 0$ can be interpreted as the

[4] Huddart (1993) conveys Bengt Holmström's explanation for why m/σ_p^2 is natural. If executive monitoring

marginal cost of more vigilant monitoring.

There are two standard constraints on the investor's maximization problem. The incentive compatibility constraint requires that the executive choose an optimal level of effort, $\hat{e}$, given by the executive's problem in (2). The participation constraint requires that the executive's utility is no smaller than U, a fixed reservation utility. The investor's problem is the following:

$$\max_{s,\, b_v\, b_p\, \sigma_p^2,\, \hat{e}} \mathrm{E}[V - w] - \frac{m}{\sigma_p^2} \quad \text{subject to} \quad \hat{e} \in \arg\max_e u \quad \text{and} \quad u \geq U. \tag{3}$$

The investor's problem can be solved by replacing the incentive compatibility constraint with the first-order condition from the executive's problem in (2) and by assuming that the participation constraint holds with equality. See Appendix A.1 for a full derivation. Using the same notation as Baker (2002), the optimal piece rates can be written in a familiar form:

$$\hat{b}_v = \frac{S_v}{S_v + S_p + rC''(\hat{e})} \quad \text{and} \quad \hat{b}_p = \frac{f}{g} \cdot \frac{S_p}{S_v + S_p + rC''(\hat{e})}, \tag{4}$$

in which $S_v \equiv f^2/\sigma_v^2$ and $S_p \equiv g^2/\sigma_p^2$ are the signal-to-noise ratios of V and P. Signal-to-noise ratios reflect to what extent the two performance measures are useful for detecting executive effort. For example, a greater monitoring precision, $1/\sigma_p^2$, is reflected in a higher signal-to-noise ratio of P.

The optimal piece rates are directly proportional with a proportionality constant that depends on their signal-to-noise ratios. Intuitively, if a performance measure exhibits more signal than it does noise, investors give it more weight by choosing a larger piece rate. Using piece rate proportionality, the first-order condition for the optimal variance of the performance measure can be written in terms of either piece rate:

$$m = \frac{r}{2}\left(\hat{\sigma}_p^2 \hat{b}_p\right)^2 = \frac{r}{2}\left(\frac{g}{f}\, \sigma_v^2 \hat{b}_v\right)^2. \tag{5}$$

Since $\hat{b}_v > 0$, there is a positive relationship between m, the marginal cost of more precise monitoring, and $\hat{b}_v$, the optimal pay-performance sensitivity. The intuition is straightforward: if monitoring gets cheaper, V becomes relatively less useful as a performance measure, so investors choose a smaller $\hat{b}_v$.

My focus is on the role of executive-investor social connections, denoted by SC. Assuming

generates n independent observations of executive effort, each with mean e, unit variance, and cost m, then the best estimate of e is the mean of the observations, which has variance $1/n$ and cost mn. If $\sigma_p^2 \equiv 1/n$, then a continuous approximation to the cost of monitoring is m/σ_p^2.

that social connections reduce the marginal cost of more precise monitoring, the above first-order condition predicts a negative relationship between social connections and pay-performance sensitivity.

Proposition 1. *If* $\frac{\partial m}{\partial SC} < 0$*, then* $\frac{\partial \hat{b}_v}{\partial SC} < 0$.

Proof. *Differentiating the first-order condition in* (5) *gives* $\frac{\partial \hat{b}_v}{\partial SC} = \frac{\hat{b}_v}{2m} \frac{\partial m}{\partial SC} < 0$. □

Instead of $\hat{b}_p$, I focus on $\hat{b}_v$ because measuring it is straightforward. If the executive is at a publicly-traded firm and is compensated only with stock, a simple measure for pay-performance sensitivity is inside ownership. Stock options complicate measurement, but there are established ways of incorporating them, which I discuss in Section 3.4.

Measuring executive compensation, $\mathrm{E}[w]$, is also straightforward. For many families of cost functions, there is a positive relationship between social connections and compensation. Faced with lower monitoring costs, investors encourage more executive effort by increasing $\hat{b}_p$, which comes at two costs. First, investors must make up for a higher marginal cost of exerting effort by increasing executive compensation. Second, a higher $\hat{b}_p$ exposes the risk-averse executive to more compensation uncertainty, which must also be offset with higher compensation. Although decreases in pay-performance sensitivity and monitoring variance have the opposite effect, compensation increases overall.

Proposition 2. *Suppose that in addition to being positive, increasing, and convex, the cost of exerting effort also satisfies* $C'''(e) \geq 0$ *for all* $e > 0$*. If* $\frac{\partial m}{\partial SC} < 0$*, then in addition to* $\frac{\partial \hat{b}_v}{\partial SC} < 0$*, it is also the case that* $\frac{\partial \hat{\sigma}_p^2}{\partial SC} < 0$*,* $\frac{\partial \hat{b}_p}{\partial SC} > 0$*,* $\frac{\partial \hat{e}}{\partial SC} > 0$*, and* $\frac{\partial E[w]}{\partial SC} > 0$.

Proof. *See Appendix A.2. Common families of cost functions that satisfy the conditions include* $C(e) = de^n$ *for* $d > 0$ *and* $n > 1$*, as well as* $C(e) = exp(de)$ *for* $d > 0$. □

Firm risk, σ_v^2, is also relatively straightforward to measure. I will mainly use stock return volatility. All else equal, the expression for $\hat{b}_v$ in (4) predicts a negative relationship between pay-performance sensitivity and firm risk. High firm risk makes V a poor signal of executive effort and it also imposes risk on the executive. However, empirical research suggests that measures for σ_v^2 and $\hat{b}_v$ are only weakly related, and if anything, have a positive relationship.[5] In the most well-known attempt to reconcile theory with this oddity, Prendergast (2002) argues convincingly that in uncertain environments executives are delegated more authority, and that high-powered incentives are used to hold them accountable. In my model, this argument loosely corresponds to a positive relationship between σ_v^2 and f, the marginal

[5] Again, see Prendergast (1999) and Prendergast (2002) for early reviews, as well as DeVaro and Kurtulus (2010) for a more recent one.

product of executive effort on firm value. When uncertainty is high, executives are delegated more authority so their actions have more of an impact.

More specifically, regardless of the cost function's third derivative, holding other constants fixed when differentiating the first-order condition in (5) gives a simple relationship between the elasticities of $\hat{b}_v$ and f with respect to σ_v^2:

$$\frac{\partial \hat{b}_v/\hat{b}_v}{\partial \sigma_v^2/\sigma_v^2} = \frac{\partial f/f}{\partial \sigma_v^2/\sigma_v^2} - 1. \tag{6}$$

Since it is unclear how to proxy for f with standard firm-level variables, testing the above relationship is difficult without more detailed data.[6] Instead, consider the expression in the proof of Proposition 1, which implies that the the negative relationship between $\hat{b}_v$ and SC depends on f only through $\hat{b}_v$. If $\hat{b}_v$ is increasing (decreasing) in σ_v^2, then a high σ_v^2 should amplify (attenuate) the negative relationship between $\hat{b}_v$ and SC. Intuitively, a social connection should affect incentives more in uncertain environments where incentives play a more important role.

Proposition 3. *If* $\frac{\partial m}{\partial SC} < 0$*, then* $sgn\left(\frac{\partial}{\partial \sigma_v^2}\frac{\partial \hat{b}_v}{\partial SC}\right) = -sgn\left(\frac{\partial \hat{b}_v}{\partial \sigma_v^2}\right)$.

Proof. *Differentiating* $\frac{\partial \hat{b}_v}{\partial SC}$ *in the proof of Proposition 1 gives* $\frac{\partial}{\partial \sigma_v^2}\frac{\partial \hat{b}_v}{\partial SC} = \frac{1}{2m}\frac{\partial m}{\partial SC}\frac{\partial \hat{b}_v}{\partial \sigma_v^2}$. □

To summarize, in addition to providing motivation for a number of controls discussed later in Section 3.4, the model yields three testable predictions. First, there should be a negative relationship between social connections and pay-performance sensitivity. Second, there should be a positive relationship between connections and compensation. Third, given a positive (negative) relationship between firm-risk and pay-performance sensitivity, high firm risk should amplify (attenuate) the negative relationship between social connections and pay-performance sensitivity. Each prediction concerns only the sign of a relationship. The choices of which scale parameter to use as a numéraire, as well as how to scale empirical measures, are irrelevant.

Importantly, the first two predictions are identical to those provided by a perspective that emphasizes executive influence over connected investors. Regardless of whether executives leverage their investor connections in board room proceedings to guarantee a better compensation package, or whether investors incorporate monitoring benefits into the design of an optimal contract, social connections should be negatively related to pay-performance

[6] Papers that provide direct empirical validation for the hypothesis of Prendergast (2002) include DeVaro and Kurtulus (2010), who use workplace survey data from Britain, as well as Ben-Ner, Kong, and Lluis (2012), who study task environments in Minnesota firms. Using a sample of executives similar to the one in this paper, Shi (2011) finds empirical support for the similar hypothesis that incentives are stronger for executives who can exert effort to collect information about their uncertain environments.

sensitivity and positively related to compensation. From the investor's point of view, both optimal contracting and executive influence also indicate that social connections should be accompanied with more investment in the executive's firm. Both cheaper information and friendly pressure should motivate higher levels of investment. Although reality probably contains elements of both explanations, the model's third prediction about firm risk along with the richness of my data helps to tentatively differentiate between optimal contracting and executive influence.

3. Data and Variables

Linking proxies for social interaction to more standard variables often requires a number of datasets. In this section, I briefly describe how I combine datasets to construct my sample. I then list the variables generated from the combined dataset. In tables and regressions, all variables are winsorized at the 1 and 99% levels. Variables in dollars are converted to 2015 dollars using annual CPI data. Appendix B contains more information about dataset matching. Additional details about sample classifications and variable definitions are in Appendix C.

3.1. Sample Construction

Firm-level data are from CRSP/Compustat and executive compensation data are from ExecuComp. The Annual CRSP/Compustat datasets provide fundamentals and stock market information for publicly traded U.S. firms. ExecuComp restricts the CRSP/Compustat sample to many of the firms in the S&P 500, S&P 400 mid-cap, and S&P 600 small-cap indices. For institutional ownership of CRSP/Compustat firms, I rely on the Thomson Reuters S34 dataset (formerly CDA/Spectrum), which provides data on quarterly 13F filings of institutional investors with more than $100 million in equities. Filings are aggregated across subordinate mutual funds, trust departments, and other fund portfolios. I use 8-digit CUSIPs to match holdings in S34 with stocks in CRSP.

For social connections, I rely on BoardEx, a private company that specializes in aggregating business information. The BoardEx dataset covers most publicly-traded U.S. firms, as well as some of the larger private firms. It provides biographical information on many high-level executives. For example, it provides detailed employment histories. BoardEx data are derived from SEC filings, as well as from other publicly available sources. At a firm level, I match BoardEx to CRSP/Compustat with CIK numbers and 6-digit CUSIPs. Within matched firms, I use a simple text matching procedure to match executive names in BoardEx with names in ExecuComp.

Since institutional investors in S34 are not tagged with standard identifiers, matching them to BoardEx is more challenging. Luckily, company names in S34 tend to be abbreviated derivatives of those in EDGAR, the SEC filings database. With another simple text matching procedure, I match institutional investors in S34 to companies in EDGAR. I then use the CIK number provided by EDGAR to match investors to BoardEx. Finally, I manually eliminate a few mismatched investors.

3.2. Coverage and Classification

My sample covers executives in ExecuComp that could be matched to BoardEx, which I further restrict to executives working at firms with shares held by at least one institutional investor that could be matched to BoardEx. In its most de-aggregated form, the sample consists of executive-firm-investor-year quadruples. In regression analysis, I work with more aggregated units of observation. Since BoardEx began collecting data in 1999, the sample covers all years from 1999 to 2015. Explicitly excluded from the sample are observations in the same year as a firm IPO, as well as investments made by an investor in its own institution.

Since the sample covers a wide range of years during which compensation practices and data availability have changed substantially, I split it into two periods: 1999-2007 and 2008-2015. Historically, the periods are divided by the recent financial crisis. The early period is characterized by a general decline in both executive compensation and inside ownership from their highest levels during the peak of the dot-com bubble. Although inside ownership has remained relatively constant during the later period, compensation has been gradually increasing. A more practical difference comes from changes in BoardEx data availability. Around 2007, BoardEx expanded its data collection team and began to actively collect information about private companies. Before then, BoardEx focused on publicly-traded companies. As a result, data on certain types of social connections that I describe in the next section are only available after 2007.

Sample counts and coverage at firm, investor, and executive levels are in Tables 1 to 3. In each period, the sample contains observations from around 2,000 firms and 200 institutional investors. Compared to other publicly-traded firms, those covered by ExecuComp tend to rely more on firm value when determining executive compensation, and also tend to have higher but less concentrated institutional ownership (Cadman, Klasa, & Matsunaga, 2010). Since the institutional investors in my sample are some of the largest in the country, they cover a substantial portion of each firm's ownership (on average around 20%). As such, the investors should have substantial voting power and influence over executive compensation design. Although each firm covers on average only two executives, the sample accounts for social connections to around 20 employees of each investor, out of which approximately half

Table 1: Sample counts and coverage at a firm level. Gives the number of unique firms in each period. Also gives mean coverage per firm-year for the number of executives, the number of institutional investors, the percentage of shares held by these investors relative to all shares, and the percentage of shares held by these investors relative to shares held by all other institutional investors.

		Mean Coverage per Firm-Year			
Period	Firms	Executives	Inst'l Investors	Ownership	Inst'l Ownership
1999-2007	2,192	2.33	45.52	16.94%	24.22%
2008-2015	2,073	1.95	40.63	21.22%	27.74%

Table 2: Sample counts and coverage at an institutional investor level. Gives the number of unique investors in each period. Also gives mean coverage per investor-year for the number of board directors and senior managers employed by the investor, as well as the number of firms in which the investor holds shares.

		Mean Coverage per Investor-Year			
Period	Inst'l Investors	All Employees	Directors	Managers	Firms Invested in
1999-2007	196	26.78	11.18	15.72	476.87
2008-2015	214	18.58	11.91	6.75	415.71

Table 3: Sample counts and coverage at an executive level. Gives the number of unique executives in each period. Also gives mean coverage per executive-year for the number of firms at which the executive is employed and the number of occupation groups under which the executive is classified.

		Mean Coverage per Executive-Year	
Period	Executives	Firms Employed by	Occupation Groups
1999-2007	7,997	1.002	2.44
2008-2015	6,077	1.004	2.52

Table 4: Firm counts broken down by industry. Gives the number of firms under different Fama-French 12 industries for each period. Firms are classified according to their Compustat SIC codes, which remain unchanged from year-to-year.

Period	NoDur	Durbl	Manuf	Enrgy	Chems	BusEq	Telcm	Utils	Shops	Hlth	Money	Other
1999-2007	115	55	245	79	61	404	55	88	244	188	409	249
2008-2015	115	52	222	85	61	374	52	84	227	172	394	235

Table 5: Institutional investor counts broken down by classification. Gives the number of investors that for at least one year are classified under a legal company type by the dataset from Brian Bushee's website. Company types are grouped into two broad categories based on whether investors are unlikely to have many business relationships with the firms in which they invest (potentially independent), or are more likely to have such relationships (potentially involved). Not all investors are classified and classifications can change from year-to-year.

	Potentially Independent Investors			Potentially Involved Investors			
Period	Independent Investment Adviser	Investment Company	Public Pension Fund	Bank Trust	Insurance Company	Private Pension Fund	University/ Foundation Endowment
1999-2007	56	11	5	57	30	12	2
2008-2013	76	10	6	47	25	12	2

Table 6: Executive counts broken down by sex and occupation. Gives the number of male and female executives in each period. Also gives the number of executive-firm pairs for which the executive is classified under a specific occupation group for at least one year. Executives can be classified under no groups, one group, or more than one group. Classifications can change from year-to-year.

Period	Male	Female	Chair/ CEO	Pres.	CFO	COO	Chief	Exec. VP	Senior VP	Group VP	VP
1999-2007	7,897	490	4,289	3,599	1,470	1,267	5,984	2,080	1,213	48	3,544
2008-2015	5,875	484	3,869	3,111	1,044	836	5,034	1,516	685	15	2,276

are board directors and half are senior managers.

In Table 4, I break down firm counts by mapping Compustat SIC codes to the 12 industries of Fama and French (1997). I include all industries in empirical tests, but because it is common in corporate governance research to exclude the highly-regulated utilities and finance industries, I verify in the robustness checks of Section 5 that excluding them does not substantially change my results. Using the legal company type dataset from Brian Bushee's website, I also break down institutional investor counts in Table 5. Legal types are subdivided into the two aforementioned groups: potentially independent investors who are unlikely to have many business relationships with the firms in which they invest (independent investment advisers, investment companies, and public pension funds), and potentially involved investors who are more likely to have such relationships (bank trusts, insurance companies, private pension funds, and endowments). Executive counts are broken down in Table 6 by sex and occupation. Occupation groups are derived from the executive's title in ExecuComp. They are similar to the ones originally defined by Bertrand and Hallock (2001).

3.3. Social Connections

I use biographical overlaps in the BoardEx dataset to define proxies for social connections. In a given year I say that two individuals are socially connected if BoardEx reports that they have simultaneously participated in the same organization during or before the year under consideration. To compare executive-investor connections with more general executive connectivity, I define two broad categories of executive social connections, which again are defined on a yearly basis:

1. Total Connections of an executive are the the number of social connections between that executive and all individuals in the BoardEx universe.

2. Connections between an executive and an institutional investor that holds shares in the executive's firm are the number of social connections between that executive and all individuals who are currently employed by the investor.

Based on the type of organization at which the two individuals overlap, I divide Total Connections and Connections into two subcategories:

1. Total Employment Connections and Employment Connections only count overlapping employment at public firms, private firms, and partnerships.

2. Total Participation Connections and Participation Connections only count overlapping participation in charities, clubs, and government organizations.

I aggregate Total Connections and Connections to a firm-investor-year level by averaging over all executives at the firm, and to an executive-firm-year level by summing over all investors that hold shares in the firm. I also aggregate Connections to a firm-year level by summing over all investors and then averaging over all executives at the firm. To further exploit the richness of the BoardEx dataset, I divide Connections into four more subcategories:

1. Director Connections are to board directors of investors.

2. Manager Connections are to senior managers of investors.

3. Independent Connections are to employees of potentially independent investors.

4. Involved Connections are to employees of potentially involved investors.

Figure 1 illustrates the above definitions with diagrams. Figures 3 to 6 give time series plots for each type of social connection. All plots are increasing over time because BoardEx has continued to accumulate data over time. The sharp increase in Participation Connections after 2007 is due to the aforementioned change in how BoardEx collected its data around that time.

3.4. Executive Variables

My measure of annual executive compensation, $\mathrm{E}[w]$ in the model, is total Direct Compensation from ExecuComp, which includes salary, bonuses, the value of stock and option grants (computed using Black-Scholes), long-term incentive payouts, and other annual compensation instruments. I measure pay-performance sensitivity, $\hat{b}_v$ in the model, with effective Inside Ownership. Originally introduced by Jensen and Murphy (1990) as Fractional Ownership, effective Inside Ownership is the effective number of shares owned by an executive divided by the total number of shares outstanding; stock options are accounted for with the delta-weighting methodology of Core and Guay (2002). More specifically, I use the same methodology as Coles, Daniel, and Naveen (2006) who describe different delta estimation procedures for the older and newer ExecuComp formats. Figure 2 plots the aforementioned trajectories of Direct Compensation and Inside Ownership.

Although Inside Ownership is the most commonly-used measure of pay-performance sensitivity, the Equity Stake measure suggested by Baker and Hall (2004) is used as well. Inside Ownership is the dollar change in executive pay for a dollar increase in firm value, whereas Equity Stake is for a percentage increase in firm value. Baker and Hall (2004) argue that Inside Ownership is appropriate when considering actions made by executives whose marginal products do not scale with firm size, whereas Equity Stake is more appropriate

Figure 1: Diagrams of the social connection variables defined in Section 3.3, which are between executives at the firms in the sample and other people in the BoardEx universe. Institutional investors in each diagram are holding shares in the firm under consideration.

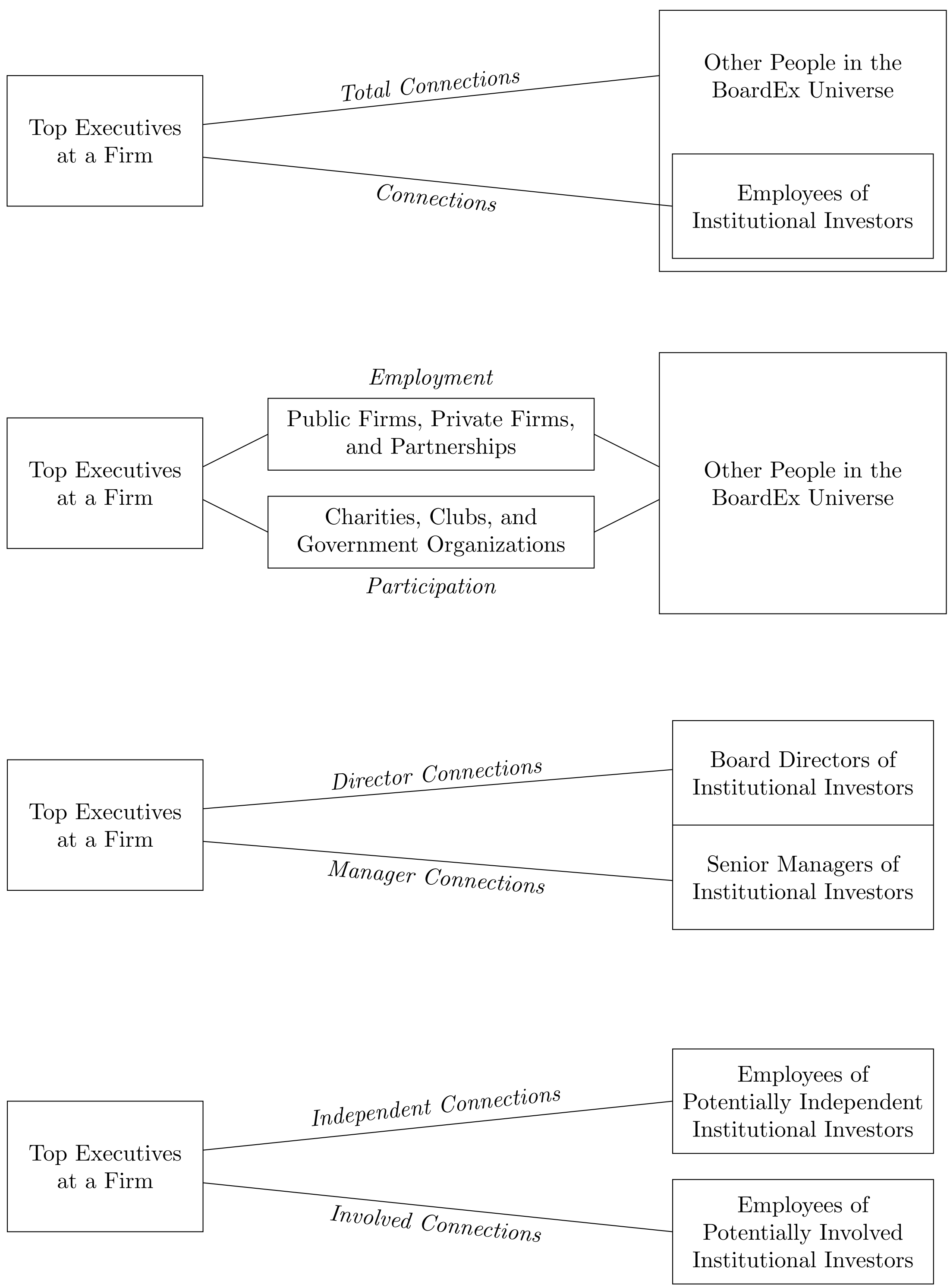


Figure 2: Direct Compensation (solid/left, in millions of 2015 dollars) and Inside Ownership (dashed/right, in percentages). Averaged over all executive-firm-year triples in each year after being winsorized over all years at the 1 and 99% levels.

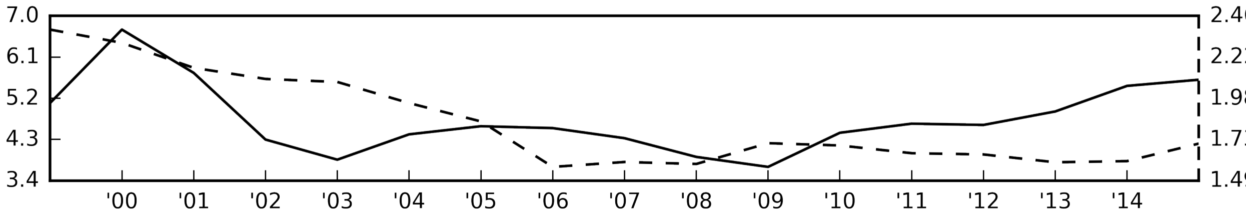


Figure 3: Connections to employees of institutional investors (solid/left) and Total Connections to all individuals in the BoardEx universe (dashed/right). Averaged over all executive-firm-year triples in each year after being winsorized over all years at the 1 and 99% levels.

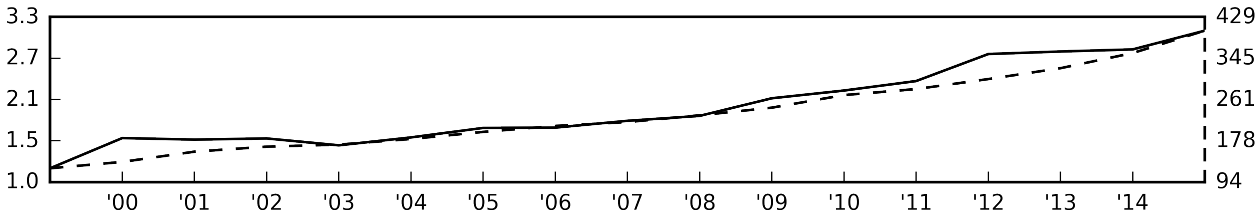


Figure 4: Employment Connections (solid/left) and Participation Connections (dashed/right). Averaged over all executive-firm-year triples in each year after being winsorized over all years at the 1 and 99% levels.

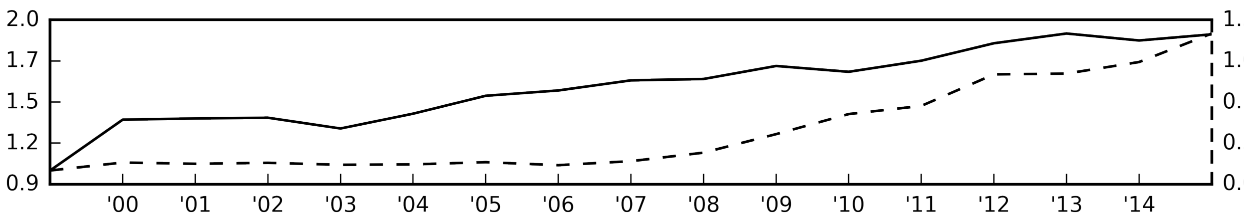


Figure 5: Director Connections (solid/left) and Manager Connections (dashed/right). Averaged over all executive-firm-year triples in each year after being winsorized over all years at the 1 and 99% levels.

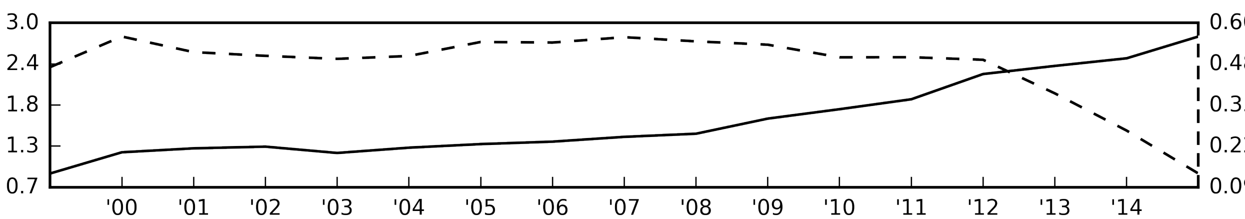
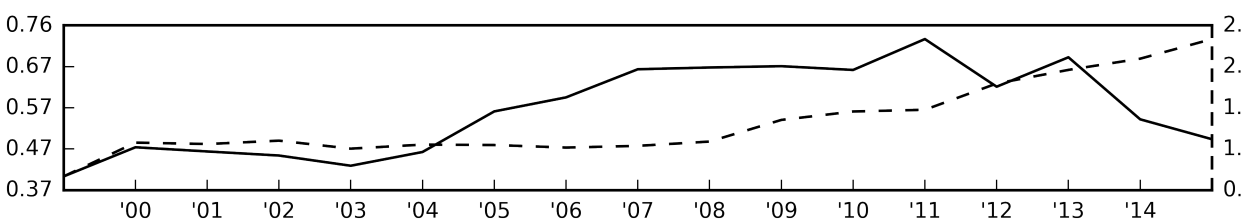


Figure 6: Independent Connections (solid/left) and Involved Connections (dashed/right). Averaged over all executive-firm-year triples in each year after being winsorized over all years at the 1 and 99% levels.



when marginal products scale proportionally with firm size. Intuitively, Inside Ownership should be more appropriate when dealing with executive-investor connections. Investors are likely to be thinking about the dollar value of information from a social connection when voting on compensation design. I also confirm in the robustness checks of Section 5 that Inside Ownership is empirically more appropriate.

In addition to providing testable predictions, the model also motivates a number of executive-level controls that are likely to be important when studying relationships between social connections and compensation characteristics. The aforementioned executive occupation groups should control for much of the heterogeneity in marginal products of executive actions, which are generally not observable. Although executive absolute risk-aversion is also not observable, it plays an important role in the model as well. A reasonable first step towards controlling for absolute risk-aversion is to estimate total executive wealth. I define Wealth as Direct Compensation plus an estimate of non-firm wealth from Ingolf Dittman's website, which is described in Dittmann and Maug (2007). If relative risk-aversion is constant among coworkers with the same occupation, controlling for Wealth should control for absolute risk-aversion. To help deal with differences in relative risk-aversion, I generate Sex and Age variables from the BoardEx dataset. Since it takes time to optimize a compensation package, I also use BoardEx to construct a Tenure variable.

3.5. Institutional Investor and Firm Variables

Since most institutional investors report to the SEC on a quarterly basis, I calculate both investment and ownership by averaging over all reports in the fiscal year of the firm under consideration. For a single report, investment is the number of shares held times their price. Ownership is the number of shares held divided by the total number of shares outstanding. For each date, investment, shares invested, and shares outstanding are summed over all stocks associated with the firm under consideration. I aggregate ownership to the firm-level variable Mean Institutional Ownership by averaging over the ownership of all covered investors that hold shares in a firm. I also record the number of such investors and call this number Institutional Investors.

My set of firm fundamentals are the same as the ones identified by Cheng, Hong, and Scheinkman (2015) as important sources of heterogeneity in executive compensation. For example, Baker and Hall (2004) document that it is important to include a measure of firm size in regressions that attempt to explain heterogeneity in executive compensation. Accordingly, I define Market Capitalization as the number of shares outstanding times price in the fiscal year-end month, summed over all classes of stock. Market/Book is Market Capitalization divided by book equity. Leverage is the total value of book assets divided by stockholders' equity. I use the CRSP Daily dataset to compute Excess Return along with two measures of firm risk, Return Volatility and Beta. Although I primarily measure firm risk with Return Volatility, I look at Beta in the robustness checks of Section 5. I use a value-weighted return for firms with more than one class of stock. When computing Beta and Excess Return, I use CRSP's methodology and take the market return to be the CRSP value-weighted index with dividends. I disregard estimates computed on abnormally small numbers of trading days.[7]

I also consider two governance variables. I measure Board Independence with the percentage of directors in a firm classified by BoardEx as independent. From the ISS dataset (formerly RiskMetrics), I extract the G Index of Gompers, Ishii, and Metrick (2003) and the E Index of Bebchuk, Cohen, and Ferrell (2009), which are well-known measures governance and entrenchment. I use the E Index as my primary measure of governance because it can be computed in both periods, whereas the G Index can only be computed before 2008. I take at look at the G Index in a robustness check.

4. Regressions and Results

I present my empirical findings in three stages. I start from the perspective of an investor, then switch to an executive-level perspective, and finally move up to a firm level.

4.1. Investment, Cheap Monitoring, and Private Information

An implicit assumption in the model is that executive-investor social connections essentially provide free monitoring of executive actions. Additionally, social connections can provide other types of valuable information about, for example, firm performance. Both types of information should make investing in a firm with connected executives more appealing. An executive influence perspective also indicates that there should be higher investment in firms with connected executives because executives should be able to leverage their investor connections to guarantee continued investment.

To test the intuition that there should be a positive relationship between investment and executive-investor connections, I work with investor-firm-year units of observation. My goal is to compare the investments of a single investor within an industry, allowing for investor-specific industry preferences. As such, each investor-level regression includes fixed effects for years as well as the product of investors and Fama-French 49 industries. Standard errors are clustered at both the year and investor level. I also include a number of firm-

[7] Specifically, I disregard estimates of Excess Return, Return Volatility, and Beta that are computed on a number of trading days that is less than the fifth percentile for the fiscal year under consideration. Generally, the fifth percentile is around 250 days.

Table 7: Summary statistics for variables in institutional investor-level regressions. Observations are investor-firm-year triples for which the investor holds shares in the firm during the given year. Social connections are averaged over all executives at a firm. Total Connections are between firm executives and all individuals in the BoardEx universe, whereas Connections are between firm executives and employees of the investor. Total Employment Connections and Employment Connections only count overlapping employment at public firms, private firms, and partnerships. Total Participation Connections and Participation Connections only count overlapping participation in charities, clubs, and government organizations. Director Connections are to board directors of the investor under consideration, whereas Manager Connections are to senior managers. The last set of variables characterizes the firms in which investors hold shares. Each variable is winsorized over one of the two periods at the 1 and 99% levels. Investment and Market Capitalization are in 2015 dollars.

	Sample restricted to 1999-2007.						
Variable	Mean	SD	Min.	Max.	Median	IQR	N
Investment (millions)	29.726	93.915	0.004	696.110	2.969	13.345	631,804
Total Employment Connections	184.218	226.450	0.000	1,113.000	98.000	223.833	631,853
Employment Connections	0.026	0.129	0.000	1.000	0.000	0.000	631,853
Director Connections	0.020	0.098	0.000	0.667	0.000	0.000	631,853
Manager Connections	0.008	0.059	0.000	0.500	0.000	0.000	631,853
Market Capitalization (billions)	16.974	38.769	0.152	248.232	3.615	11.681	631,575
Market/Book	3.292	3.124	0.485	20.224	2.331	2.348	621,540
Leverage	3.779	4.121	1.100	25.726	2.334	1.936	622,159
Excess Return	0.094	0.386	−0.936	1.415	0.065	0.410	616,559

	Sample restricted to 2008-2015.						
Variable	Mean	SD	Min.	Max.	Median	IQR	N
Investment (millions)	35.580	119.191	0.001	882.865	2.164	12.855	549,121
Total Employment Connections	288.214	301.428	0.000	1,440.000	183.000	346.000	549,157
Total Participation Connections	36.131	82.912	0.000	487.000	0.500	26.000	549,157
Employment Connections	0.037	0.162	0.000	1.000	0.000	0.000	549,157
Participation Connections	0.014	0.092	0.000	0.750	0.000	0.000	549,157
Director Connections	0.045	0.179	0.000	1.000	0.000	0.000	549,157
Manager Connections	0.007	0.056	0.000	0.500	0.000	0.000	549,157
Market Capitalization (billions)	16.641	36.410	0.094	217.088	3.641	12.266	549,041
Market/Book	2.913	3.174	0.373	21.947	1.971	2.054	535,896
Leverage	3.678	3.913	1.113	28.242	2.385	1.931	534,762
Excess Return	0.067	0.317	−0.889	1.071	0.056	0.336	539,963

Table 8: Institutional investor-level regressions of investment on social connections, averaged over all executives at a firm. Observations are investor-firm-year triples. Variables are the same as in Table 7. All regressions control for Market Capitalization, Market/Book, Leverage, and Excess Return. Each also includes fixed effects for years as well as the interaction between investors and Fama-French 49 industries of firms. Standard errors are clustered at both the year and investor level. Due to a lack of data, I omit estimates for Participation Connections in the early period.

LHS	Investment (millions). Sample restricted to 1999-2007.		
RHS	All Investors (N = 606,797)	Independent Investors (N = 231,882)	Involved Investors (N = 362,772)
Total Employment Connections	0.014***	0.014***	0.013***
	(0.003)	(0.004)	(0.004)
$\overline{R}^2$	[0.355]	[0.363]	[0.352]
Employment Connections	34.396***	32.385***	35.455***
	(5.387)	(9.243)	(6.303)
$\overline{R}^2$	[0.356]	[0.363]	[0.354]
Director Connections	43.095***	44.707***	43.198***
	(7.369)	(12.120)	(8.661)
$\overline{R}^2$	[0.356]	[0.363]	[0.354]
Manager Connections	59.790***	43.042**	68.107***
	(11.521)	(18.872)	(13.920)
$\overline{R}^2$	[0.355]	[0.362]	[0.353]
LHS	Investment (millions). Sample restricted to 2008-2015.		
RHS	All Investors (N = 526,099)	Independent Investors (N = 200,579)	Involved Investors (N = 296,491)
Total Employment Connections	0.016***	0.020***	0.013**
	(0.004)	(0.008)	(0.005)
$\overline{R}^2$	[0.363]	[0.369]	[0.349]
Total Participation Connections	0.058***	0.069**	0.050**
	(0.017)	(0.034)	(0.022)
$\overline{R}^2$	[0.362]	[0.368]	[0.349]
Employment Connections	48.179***	77.929***	38.363***
	(8.933)	(17.960)	(9.975)
$\overline{R}^2$	[0.365]	[0.372]	[0.351]
Participation Connections	92.988***	167.593***	75.496***
	(22.888)	(32.895)	(25.000)
$\overline{R}^2$	[0.368]	[0.376]	[0.355]
Director Connections	60.084***	100.342***	47.857***
	(13.317)	(21.939)	(15.417)
$\overline{R}^2$	[0.368]	[0.377]	[0.354]
Manager Connections	95.004***	105.274***	92.953***
	(18.045)	(37.603)	(19.885)
$\overline{R}^2$	[0.363]	[0.368]	[0.350]

* denotes significance at a 10% level, ** at a 5% level, and *** at a 1% level.

specific controls that are important determinants of investment: Market Capitalization, Market/Book, Leverage, and Excess Return. The outcome variable in each regression is investment and the predictors of interest are different types of social connections, which are averaged over all executives at the firm under consideration. It bears repeating that as in much of the literature, I make no attempt to establish causality. Instead, I think of my regression setup as a straightforward way to test how social connections and investment are sorted in the corporate landscape.

Table 8 documents a clear positive association between investment and social connections. To start, consider the differences between Total Employment Connections and Employment Connections, and in the later period, Total Participation Connections and Participation Connections as well. Intuitively, a social connection to an employee of the investor under consideration should be more important for investment than a connection to any random person in the BoardEx universe. Empirically, this intuition holds up well. An observed executive-investor connection is associated with investment three orders of magnitude greater than the increase associated with a connection to just any individual. Economically, the estimates are substantial. Each additional executive-investor connection is associated with investment \$30 to \$170 million higher, which is greater than the mean investment of either period (Table 7).

In the later period, an observed Participation Connection is associated with an increase in investment double that of an Employment Connection. One interpretation is that in contrast to working at the same company, overlapping participation in more social environments may better proxy for social interaction that leads to information exchange in a corporate context. However, such interpretations should be taken with a grain of salt, not only because the differences are within a couple standard errors of each other. It could be the case that Participation and Employment Connections are equally valuable, but that an observed Participation Connection is simply correlated with a larger number of unobserved social connections. If anything, the importance of Participation Connections indicates that important information may be lost by focusing only on standard business ties.

Generally, Manager Connections seem to be more important than Director Connections. This makes sense. Managers tend to make day-to-day investment decisions, not board directors. Interestingly, the difference between Director and Manager Connections is greatest when considering only potentially involved investors. Directors of involved investors may be more hesitant to act on information obtained through social connections because their institutions face more regulation. Alternatively, since involved investors are more sensitive to executive influence (Brickley, Lease, & Smith, 1988), the magnified importance of Manager Connections at potentially involved investors may indicate that senior managers of investors are more susceptible than directors to executive influence.

However, especially in the later period, the positive relationship between executive-investor connections and investment is much stronger for potentially independent investors. As such, it seems unlikely that executive influence is the dominant channel through which executive-investor connections are related to investment. It could also be the case that independent investors—who are generally less-regulated—are more adept at incorporating information from social connections into investment strategies.

4.2. Compensation of Socially Connected Executives

The model predicts that executive-investor connections should be associated with less pay-performance sensitivity and with more compensation. An executive influence perspective suggests the same. Since institutional investors have a say in compensation design, connected executives should be able to leverage their social connections to guarantee better compensation packages. That is, more compensation and less exposure to firm value. In equilibrium, a connected executive's compensation should be even higher because well-informed board members likely understand that investor connections should come with more investment in the executive's firm.

Since social connections and compensation characteristics differ among executives at the same firm, I take a within-firm approach. In particular, I work with executive-firm-year units of observation for which the executive is employed at the firm during the given year. My goal is to see whether compensation characteristics of similar coworkers differ if one has more social connections to investors than the other. As such, each executive-level regression includes fixed effects for years, firms, and executive occupations. Standard errors are clustered at both the year and firm level. I also include the aforementioned executive-specific controls that are motivated by the model: Wealth, Sex, Age, and Tenure. The outcome variables are Inside Ownership and Direct Compensation. The predictors of interest are the same kinds of social connections in investor-level regressions, with the addition of Independent and Involved Connections.

Table 10 empirically validates the main predictions of optimal contracting and executive influence. Each additional observed executive-investor connection is associated with Inside Ownership 3 to 9 basis points lower and with Direct Compensation $180 to $420 thousand higher. Both associations are economically meaningful. The mean Market Capitalization in Table 11 indicates that the observed Inside Ownership differences are on the order of $1 million. Since the mean Direct Compensation of executives in the sample is $4.4 million (Table 9), these findings indicate that executive compensation packages can differ substantially depending on whether executives are socially connected to investors.

Table 9: Summary statistics for variables in executive-level regressions. Observations are executive-firm-year triples for which the executive is employed at the firm during the given year. Total Connections are between executives and all individuals in the BoardEx universe, whereas Connections are between executives and employees of institutional investors that hold shares in the firm. Director Connections are to board directors of investors, whereas Manager Connections are to senior managers. Independent Connections are to employees of potentially independent investors; Involved Connections, of potentially involved investors. Employment Connections only count overlapping employment at public firms, private firms, and partnerships. Participation Connections only count overlapping participation in charities, clubs, and government organizations. Each variable is winsorized over one of the two periods at the 1 and 99% levels. Direct Compensation and Wealth are in 2015 dollars.

	Sample restricted to 1999-2007.						
Variable	Mean	SD	Min.	Max.	Median	IQR	N
Inside Ownership (percent)	1.991	4.347	0.000	28.415	0.530	1.464	32,391
Direct Compensation (millions)	4.434	6.082	0.225	37.540	2.338	3.701	32,078
Total Connections	172.477	287.051	0.000	1,439.000	51.000	183.000	32,391
Director Connections	1.186	2.433	0.000	14.000	0.000	1.000	32,391
Manager Connections	0.532	1.361	0.000	8.000	0.000	0.000	32,391
Independent Connections	0.495	1.102	0.000	6.000	0.000	1.000	32,391
Involved Connections	1.200	2.474	0.000	14.000	0.000	1.000	32,391
Employment Connections	1.375	2.741	0.000	15.000	0.000	2.000	32,391
Wealth (millions)	28.484	66.659	0.704	505.039	9.113	18.345	26,817
Age	53.225	7.880	37.000	76.000	53.000	10.000	32,370
Tenure	9.988	7.478	0.249	34.436	8.507	10.918	32,391
	Sample restricted to 2008-2015.						
Variable	Mean	SD	Min.	Max.	Median	IQR	N
Inside Ownership (percent)	1.636	3.880	0.000	25.943	0.391	1.136	26,326
Direct Compensation (millions)	4.392	4.631	0.173	26.275	2.849	4.132	26,027
Total Connections	296.078	390.143	0.000	1,869.000	132.000	364.000	26,329
Director Connections	2.151	4.524	0.000	28.000	0.000	2.000	26,329
Manager Connections	0.439	1.133	0.000	7.000	0.000	0.000	26,329
Independent Connections	0.650	1.408	0.000	8.000	0.000	1.000	26,329
Involved Connections	1.824	3.830	0.000	23.000	0.000	2.000	26,329
Employment Connections	1.787	3.356	0.000	19.000	0.000	2.000	26,329
Participation Connections	0.753	2.911	0.000	19.000	0.000	0.000	26,329
Wealth (millions)	37.130	80.031	0.817	601.408	13.935	26.662	21,590
Age	55.655	7.891	38.000	80.000	55.000	10.000	26,314
Tenure	12.045	9.082	0.310	38.036	10.003	13.605	26,329

Table 10: Executive-level regressions of compensation characteristics on social connections. Observations are executive-firm-year triples. Variables are the same as in Table 9. All regressions control for Wealth, Sex, Age, and Tenure. Each also includes fixed effects for years, firms, and executive occupations. Standard errors are clustered at both the year and firm level. Due to a lack of data, I omit estimates for Participation Connections in the early period.

LHS	Inside Ownership (basis points)		Direct Compensation (thousands)	
RHS	1999-2007 (N = 26,797)	2008-2015 (N = 21,580)	1999-2007 (N = 26,797)	2008-2015 (N = 21,580)
Total Connections	−0.040***	−0.021***	1.297***	1.067***
	(0.011)	(0.008)	(0.216)	(0.131)
$\overline{R}^2$	[0.565]	[0.593]	[0.522]	[0.605]
Director Connections	−6.365***	−4.503***	260.220***	184.977***
	(1.345)	(0.681)	(27.140)	(13.499)
$\overline{R}^2$	[0.566]	[0.595]	[0.527]	[0.619]
Manager Connections	−4.737***	−3.728*	181.137***	355.721***
	(1.816)	(2.018)	(36.948)	(41.726)
$\overline{R}^2$	[0.565]	[0.593]	[0.521]	[0.607]
Independent Connections	−7.262***	−9.326***	342.135***	420.462***
	(2.795)	(1.781)	(58.968)	(40.342)
$\overline{R}^2$	[0.565]	[0.594]	[0.523]	[0.612]
Involved Connections	−5.876***	−4.602***	234.417***	209.278***
	(1.136)	(0.756)	(24.774)	(16.179)
$\overline{R}^2$	[0.565]	[0.594]	[0.525]	[0.618]
Employment Connections	−4.755***	−3.157***	215.347***	188.939***
	(1.032)	(0.911)	(28.322)	(15.834)
$\overline{R}^2$	[0.565]	[0.593]	[0.526]	[0.612]
Participation Connections	-	−6.214***	-	230.726***
	-	(0.979)	-	(22.340)
$\overline{R}^2$	-	[0.595]	-	[0.614]

* denotes significance at a 10% level, ** at a 5% level, and *** at a 1% level.

Again, social connections between executives and just any random people in the BoardEx dataset are less important. Total Connections generates estimates that are two orders of magnitude smaller. Since the literature has documented that general executive social connectivity is associated with less pay-performance sensitivity and more compensation,[8] it makes sense that the estimated coefficients on Total Connections are statistically significant and have the same signs as the estimated coefficients on executive-investor connections. However, large magnitude differences suggest that executive-investor connections matter more than general connections.

As in the investor-level regressions, Participation Connections seem to be more important than Employment Connections. Also, especially in the later period, connections to potentially independent investors again generate larger estimates than connections to potentially involved investors, which suggests that executive influence is again unlikely to be the dominant underlying channel.

Unlike in the investor-level regressions, however, Manager Connections no longer dominate. Especially in regressions with Inside Ownership, Director Connections seem to be more important. It may simply be the case that directors of investors have more influence over compensation design than managers, who intuitively may be more concerned with the design of investment strategies.

4.3. Compensation and Social Connections at a Firm Level

The model's third prediction is that given a positive (negative) relationship between firm risk and pay-performance sensitivity, high firm risk should amplify (attenuate) the negative relationship between pay-performance sensitivity and social connections. Since firm risk is measured with firm-level variables, testing the model's prediction requires moving up to a firm level. Doing so comes at the cost of a weaker regression design. The benefit of a firm-level perspective is that it allows for interactions with important variables like Return Volatility. From an executive influence perspective, important firm-level governance variables should also be correlated with the relationships between social connections and compensation characteristics.

To arrive at firm-year units of observation, I average executive-investor connections, compensation characteristics, and continuous executive-level controls over all executives at a firm. In each industry, my goal is to see whether important firm-specific characteristics amplify or attenuate the relationships between social connections and executive compensation characteristics. Accordingly, each firm-level regression includes fixed effects for years

[8] Again, see Brown, Gao, Lee, and Stathopoulos (2012) for the negative association with pay-performance sensitivity and many others for the positive association with compensation (Meverson, 1994; Belliveau, O'Reilly, & Wade, 1996; Liu, 2010; Horton, Millo, & Serafeim, 2012; Engelberg, Gao, & Parsons, 2013).

Table 11: Summary statistics for variables in firm-level regressions. Observations are firm-year pairs. Connections between executives at a firm and employees of all institutional investors that hold shares in the firm are averaged over all executives at the firm. Wealth, Age, and Tenure are averaged over all executives at the firm as well. Each variable is winsorized over one of the two periods at the 1 and 99% levels. Direct Compensation, Market Capitalization, and Wealth are in 2015 dollars.

	Sample restricted to 1999-2007.						
Variable	Mean	SD	Min.	Max.	Median	IQR	N
Inside Ownership (percent)	2.278	3.634	0.020	21.682	0.971	2.084	13,881
Direct Compensation (millions)	4.319	5.254	0.311	32.610	2.580	3.584	13,804
Connections	1.482	2.404	0.000	13.000	0.500	2.000	13,881
Mean Inst'l Ownership (percent)	0.378	0.249	0.044	1.289	0.326	0.325	10,745
Inst'l Investors	284.402	219.195	35.000	1,224.000	217.000	198.000	13,881
Return Volatility	0.421	0.209	0.142	1.202	0.371	0.231	13,543
E Index	2.254	1.281	0.000	5.000	2.000	2.000	7,992
Board Independence (percent)	68.082	18.223	11.111	100.000	71.429	24.675	13,878
Market Capitalization (billions)	8.687	22.163	0.074	159.700	1.905	5.129	13,874
Market/Book	3.059	2.942	0.429	19.455	2.158	2.124	13,609
Leverage	3.515	3.715	1.091	22.388	2.228	1.777	13,622
Wealth (millions)	30.973	71.183	0.915	562.212	11.139	20.593	12,855
Age	53.368	5.884	39.667	69.750	53.333	7.500	13,877
Tenure	10.041	6.041	0.756	28.683	9.129	8.484	13,881

	Sample restricted to 2008-2015.						
Variable	Mean	SD	Min.	Max.	Median	IQR	N
Inside Ownership (percent)	1.908	3.597	0.010	22.880	0.686	1.479	13,516
Direct Compensation (millions)	4.346	3.977	0.325	23.001	3.192	3.879	13,500
Connections	2.473	4.422	0.000	26.000	1.000	3.000	13,517
Mean Inst'l Ownership (percent)	0.347	0.228	0.036	1.204	0.308	0.316	10,056
Inst'l Investors	344.240	280.656	38.000	1,583.000	248.000	256.000	13,517
Return Volatility	0.426	0.234	0.140	1.331	0.365	0.272	13,219
E Index	3.481	0.977	1.000	6.000	3.000	1.000	9,403
Board Independence (percent)	81.076	10.765	45.455	100.000	83.333	13.889	13,517
Market Capitalization (billions)	8.477	21.186	0.041	153.005	1.947	5.289	13,511
Market/Book	2.728	2.940	0.326	20.083	1.847	1.892	13,130
Leverage	3.572	3.917	1.102	28.305	2.275	1.866	13,110
Wealth (millions)	39.236	83.056	1.254	666.578	17.058	27.360	11,306
Age	55.817	6.187	41.000	74.000	55.500	7.333	13,517
Tenure	12.106	7.824	0.751	35.022	10.841	11.178	13,517

Table 12: Firm-level regressions of compensation characteristics on interactions between firm-level characteristics and Connections. Observations are firm-year pairs. Except for interactions, variables are the same as in Table 11. Interactions indicate whether a firm-level characteristic is greater than its median, which is computed over all observations in the same year and Fama-French 12 industry. All regressions control for Market Capitalization, Market/Book, Leverage, Wealth, Age, and Tenure. Each also includes fixed effects for years and Fama-French 49 industries. Standard errors are clustered at both the year and industry level.

LHS	Inside Ownership (basis points)		Direct Compensation (thousands)	
RHS	1999-2007	2008-2015	1999-2007	2008-2015
High Return Volatility	−9.289**	−4.311**	134.045*	39.538
× Connections	(3.614)	(1.975)	(72.430)	(29.246)
High Return Volatility	85.613***	75.164***	−65.680	−603.901***
	(14.714)	(16.265)	(189.587)	(121.780)
Connections	−6.705***	−3.025***	295.600***	200.707***
	(2.114)	(1.111)	(60.575)	(10.106)
$\overline{R}^2$	[0.228]	[0.190]	[0.366]	[0.391]
N	12,325	10,790	12,325	10,790
High Mean Inst'l Ownership	−11.168**	−20.501***	−174.722***	22.029
× Connections	(4.590)	(3.651)	(56.727)	(39.183)
High Mean Inst'l Ownership	160.777***	185.030***	−1783.901***	−2204.957***
	(21.526)	(23.234)	(229.412)	(178.338)
Connections	−4.921**	1.068	375.477***	190.895***
	(2.291)	(1.033)	(63.040)	(11.960)
$\overline{R}^2$	[0.261]	[0.242]	[0.396]	[0.468]
N	9,727	7,946	9,727	7,946
Many Inst'l Investors	13.479***	15.868***	164.272***	42.290*
× Connections	(4.065)	(2.532)	(51.195)	(23.412)
Many Inst'l Investors	−187.230***	−176.271***	1874.144***	2134.836***
	(18.807)	(17.244)	(173.850)	(121.625)
Connections	−14.807***	−14.637***	142.483***	129.306***
	(3.723)	(2.689)	(27.520)	(20.609)
$\overline{R}^2$	[0.271]	[0.236]	[0.391]	[0.446]
N	12,595	10,979	12,595	10,979
High E Index	4.357	−0.691	−187.605**	25.168
× Connections	(3.674)	(1.571)	(88.698)	(24.552)
High E Index	−48.518***	−6.024	594.702**	42.497
	(16.607)	(12.571)	(247.822)	(141.334)
Connections	−10.770***	−4.462***	435.434***	205.269***
	(2.637)	(1.061)	(68.068)	(14.002)
$\overline{R}^2$	[0.278]	[0.223]	[0.376]	[0.407]
N	7,438	8,078	7,438	8,078
High Board Independence	8.003**	10.813***	25.500	−89.808**
× Connections	(3.361)	(1.700)	(98.127)	(35.105)
High Board Independence	−46.639***	−96.185***	11.128	606.369***
	(13.424)	(11.623)	(174.315)	(86.414)
Connections	−15.418***	−11.538***	326.396***	274.947***
	(3.006)	(1.809)	(81.075)	(29.763)
$\overline{R}^2$	[0.220]	[0.195]	[0.360]	[0.386]
N	12,593	10,979	12,593	10,979

* denotes significance at a 10% level, ** at a 5% level, and *** at a 1% level.

and Fama-French 49 industries. Standard errors are clustered at both the year and industry level. In addition to averaged executive-level variables, I also include the aforementioned set of firm fundamentals identified by Cheng, Hong, and Scheinkman (2015) as important sources of heterogeneity in executive compensation: Market Capitalization, Market/Book, and Leverage. Outcome variables are the same as in executive-level regressions. In each regression, I interact Connections with one of five indicators: High Return Volatility, High Mean Institutional Ownership, Many Institutional Investors, High E Index, and High Board Independence. Each indicates that a firm-specific variable is greater than its median, which is computed over all observations in the same year and Fama-French 12 industry.

Although the weaker firm-level regressions naturally explain much less variance than executive-level regressions, associations between social connections and compensation characteristics remain similar. Table 12 documents that even when aggregated to a firm level, estimated coefficients on executive-investor connections remain statistically significant and similar in magnitude.

The first row of firm-level regressions provides support for the model's prediction about firm risk. In line with most of the literature, High Return Volatility is positively associated with Inside Ownership. In the model, a positive relationship between firm risk and pay-performance sensitivity indicates that there may be a strong positive relationship between firm risk and the marginal product of executive effort on firm value. Accordingly, the model predicts that High Return Volatility should amplify the observed negative association between Connections and Inside Ownership. This prediction holds up in both periods. I view the model's consistency as additional support for the optimal contracting perspective.

I also interact Connections with High Mean Institutional Ownership and Many Institutional Investors. High Mean Institutional Ownership substantially amplifies the relationship between Connections and Inside Ownership, whereas Many Institutional Investors has a large attenuating effect. Intuitively, an executive-investor connection should be more important when investors have more voting power, and it should be less important when there are many voices at the voting table. Conversely, although a robustness check in the next section suggests otherwise, regressions with Direct Compensation are at odds with this intuition.

If executive influence over investors is the dominant channel underlying associations between social connections and compensation characteristics, one might expect that executive influence over board directors in the executive's firm would amplify the associations. Entrenched executives should be able to better leverage their investor connections in board room proceedings. However, High E Index—a measure of executive entrenchment—neither amplifies nor attenuates the negative association between Connections and Inside Ownership. Before 2008, it actually attenuates the positive association between Connections and

Direct Compensation.

On the other hand, High Board Independence significantly attenuates both relationships. Having a board with mostly independent directors almost cancels out the negative relationship between Connections and Inside Ownership. In the later period, High Board Independence also significantly attenuates the positive relationship between Connections and Direct Compensation. Intuitively, it makes sense that an independent board would be able to block executive influence over the voting patterns of institutional investors. Alternatively, an independent board may inhibit acting on potentially useful information derived from executive-investor connections. Regardless, the attenuating influence of board independence indicates a possible route through which regulation may be able to mediate the relationship between social connections and compensation design.

5. Robustness Checks

In Appendix D, I provide tables for a number of robustness checks on the above findings. To start, I replicate all regressions after excluding utilities and finance firms classified by the Fama-French 12 industry definitions. Excluding both industries is common in the corporate governance literature because among other reasons, both industries are subject to substantial regulation. Results are mostly unchanged regardless of whether they are included. If anything, estimates are larger without the two industries.

Since the model indicates that the variables of interest are related multiplicatively instead of additively, I also replicate all regressions after logarithmically transforming continuous variables. Results are very similar in investor- and executive-level regressions, except that when interpreting coefficients in terms of percentages, Total Connections generates estimates that are only two orders of magnitude smaller than Connections estimates in investor-level regressions, and just under one-half their size in executive-level regressions. Firm-level regressions are also similar, although with logarithmically-transformed variables, regressions with Direct Compensation are no longer at odds with the intuition that executive-investor connections should be more important when mean institutional investment is higher or when there are only a few institutional investors.

Another concern is that my executive-level variables do not effectively control for absolute risk-aversion. Although controlling for risk-aversion is notoriously difficult, I do perform one robustness check. I follow Baker and Hall (2004) who look at a similar optimal contracting model by seeing how my results change when I drop my control for executive wealth, which is an important determinant of absolute risk-aversion. Similar to what Baker and Hall (2004) find, executive- and firm-level regressions look very similar regardless of whether Wealth is included. Dropping Wealth does lead to some loss of significance, but similarity between point estimates provides at least some evidence that absolute risk-aversion may not be an incredibly important control.

I also compare my measure of pay-performance sensitivity, Inside Ownership, with the Equity Stake measure suggested by Baker and Hall (2004). As I discuss in Section 3.4, intuition indicates that Inside Ownership should be the more appropriate measure when dealing with executive-investor connections. To empirically check this intuition, I first replicate executive- and firm-level regressions with Equity Stake instead of Inside Ownership. As expected, firm level regressions with Equity Stake exhibit minimal significance, and in the early period, executive-level regressions exhibit no significance. In the later period, the relationship between Equity Stake and executive-level social connections is unexpectedly statistically significant and positive. However, when Equity Stake is computed without taking stock options into account, its relationships with all types of social connections are similar to Inside Ownership: negative and even statistically significant in the early period. Conversely, when Inside Ownership is computed without stock options (simply shares held divided by shares outstanding), results are practically unchanged. Accordingly, I chalk up Equity Stake oddities to problems inherent in the somewhat crude measures that exist for pay-performance sensitivity.[9]

Since there are a number of ways to measure firm risk, in addition to return volatility I also compute beta. In firm-level regressions, I empirically confirm the prediction of Baker and Jorgensen (2003) that when controlling for return volatility, executives at high beta firms have significantly lower pay-performance sensitivity, which is the opposite of the common finding for return volatility. Intuitively, executives should be given more authority—and higher pay-performance sensitivity to hold them accountable—when an environment exhibits risk that is controllable by executive authority. Firm-specific return volatility is at least somewhat controllable by executives, but when holding firm-specific risk constant, high beta indicates exposure to market-level risks, which are less controllable. Accordingly, when controlling for return volatility, beta does not amplify the negative relationship between social connections and pay-performance sensitivity. If anything, it weakly attenuates the relationship, which is in line with the model's prediction.

Finally, I run one other type of firm-level regression in which I replace the E Index of Bebchuk, Cohen, and Ferrell (2009) with the G Index of Gompers, Ishii, and Metrick (2003),

[9] In Appendix C.4, I describe the assumptions needed to incorporate stock options into delta-weighted estimates of Equity Stake and Inside Ownership. Measurement error is an inherent problem in the estimation procedure. The fact that stock options are more complicated instruments that are often used for purposes other than simply tying executive pay to firm value is also a concern. Recent regulatory changes to option-based compensation such as FAS 123R in 2005 may account for the surprising significance of Equity Stake in the later period when it is computed using stock options.

which is a similar measure of governance that can only be computed in the early period. When significant, the G Index also attenuates the relationships between social connections, pay-performance sensitivity, and compensation.

6. Concluding Remarks

By framing my discussion with a principal-agent model, I highlight an important function of executive-investor social connections: they should reduce the marginal cost to investors of monitoring executives. Comparative statics generates three testable predictions. First, social connections should be associated with greater executive compensation. Second, they should be be associated with less pay-performance sensitivity. Third, given a positive (negative) relationship between firm risk and pay-performance sensitivity, high firm risk should amplify (attenuate) the negative relationship between social connections and pay-performance sensitivity. Additional intuition indicates that from an optimal contracting perspective, investment should be increasing in executive-investor connections as well.

I find statistically significant and economically meaningful support for each prediction in a dataset of social connections between high-level employees of public firms and large institutional investors. Since similar predictions are provided by an alternate perspective that emphasizes executive influence over both investment and pay-setting, I exploit an additional optimal contracting prediction about firm risk as well as the richness of my dataset to differentiate between the two perspectives. My analysis tentatively points towards optimal contracting more than executive influence as the dominant channel through which executive-investor connections are related to institutional investment and executive compensation. This is not to say that executive influence is unimportant. Indeed, the attenuating effect of board independence may reflect the importance of managerial power. Overall, I view my results as a confirmation that the lessons of optimal contracting can be useful even after relaxing the standard assumption of arm's-length bargaining between principals and agents.

My dataset also indicates that the most important proxy for meaningful executive-investor social interaction may not be standard business ties, but rather overlapping participation in more social environments such as charities, clubs, and government organizations. Intuitively, corporate governance cannot be fully understood without taking into account an underlying fabric of social connections. Since datasets of biographical information and social interactions are becoming larger and increasingly available, I have high hopes for future research that explicitly ties corporate governance to its social underpinnings.

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A. Derivations for the Principal-Agent Model

In this appendix, I provide derivations for Section 2.

A.1. Solving the Model

Assuming that the participation constraint holds with equality, the investor's problem in (3) can be rewritten by replacing $\mathrm{E}[w]$ in the objective with the participation constraint and by replacing the incentive compatibility constraint with the first-order condition from the executive's problem in (2). The Lagrangian for the rewritten maximization problem is

$$L \equiv f\hat{e} - \frac{r}{2}\Big(b_v^2\sigma_v^2 + b_p^2\sigma_p^2\Big) - C(\hat{e}) - \frac{m}{\sigma_p^2} + \lambda\Big[b_v f + b_p g - C'(\hat{e})\Big], \tag{A.1}$$

in which λ is the Lagrange multiplier for the incentive compatibility constraint. Differentiating the incentive compatibility constraint gives the following expressions:

$$\frac{\partial \hat{e}}{\partial b_v} = \frac{f}{C''(\hat{e})}, \tag{A.2a}$$

$$\frac{\partial \hat{e}}{\partial b_p} = \frac{g}{C''(\hat{e})}, \tag{A.2b}$$

$$\frac{\partial \hat{e}}{\partial \sigma_p^2} = 0. \tag{A.2c}$$

When using all three expressions, λ drops out of the following first-order conditions:

$$\frac{\partial L}{\partial b_v} = \frac{f^2}{C''(\hat{e})} - r b_v \sigma_v^2 - f\frac{C'(\hat{e})}{C''(\hat{e})} = 0, \tag{A.3a}$$

$$\frac{\partial L}{\partial b_p} = \frac{fg}{C''(\hat{e})} - r b_p \sigma_p^2 - g\frac{C'(\hat{e})}{C''(\hat{e})} = 0, \tag{A.3b}$$

$$\frac{\partial L}{\partial \sigma_p^2} = -\frac{r}{2} b_p^2 + \frac{m}{\sigma_p^4} = 0. \tag{A.3c}$$

Substituting $C'(\hat{e})$ from the incentive compatibility constraint into both (A.3a) and (A.3b) and then solving the two equations for b_v and b_p gives expressions for the optimal piece rates in (4):

$$\hat{b}_v = \frac{S_v}{S_v + S_p + rC''(\hat{e})}, \tag{A.4a}$$

$$\hat{b}_p = \frac{f}{g} \cdot \frac{S_p}{S_v + S_p + rC''(\hat{e})}. \tag{A.4b}$$

Since $fS_p\hat{b}_v = gS_v\hat{b}_p$, or equivalently, $g\sigma_v^2\hat{b}_v = f\hat{\sigma}_p^2\hat{b}_p$, (A.3c) can be rewritten in terms of either piece rate to get both equations in (5):

$$m = \frac{r}{2}\left(\hat{\sigma}_p^2\hat{b}_p\right)^2, \tag{A.5a}$$

$$m = \frac{r}{2}\left(\frac{g}{f}\,\sigma_v^2\hat{b}_v\right)^2. \tag{A.5b}$$

A.2. Proof of Proposition 2

Suppose that in addition to being positive, increasing, and convex, the cost of exerting effort also satisfies $C'''(e) \geq 0$ for all $e > 0$. Differentiating the incentive compatibility constraint with respect to SC gives

$$\frac{\partial \hat{e}}{\partial SC} = \frac{1}{C''(\hat{e})}\left(f\frac{\partial \hat{b}_v}{\partial SC} + g\frac{\partial \hat{b}_p}{\partial SC}\right), \tag{A.6}$$

and implicitly differentiating $fS_p\hat{b}_v = gS_v\hat{b}_p$ with respect to SC yields

$$\frac{\partial \hat{b}_p}{\partial SC} = \frac{f}{g}\left(\frac{\hat{b}_v}{S_v}\frac{\partial S_p}{\partial SC} + \frac{S_p}{S_v}\frac{\partial \hat{b}_v}{\partial SC}\right). \tag{A.7}$$

Next, differentiating $\hat{b}_v$ in (A.4a), solving for the derivative of S_p, and substituting in both (A.6) and (A.7) gives

$$\frac{\partial S_p}{\partial SC} = -\frac{S_v}{\hat{b}_v^2}\frac{\partial \hat{b}_v}{\partial SC} - rf\frac{C'''(\hat{e})}{C''(\hat{e})}\left[\left(1 + \frac{S_p}{S_v}\right)\frac{\partial \hat{b}_v}{\partial SC} + \frac{\hat{b}_v}{S_v}\frac{\partial S_p}{\partial SC}\right]. \tag{A.8}$$

Solving for the derivative of S_p and simplifying the resulting expression by substituting in (A.4a) gives

$$\frac{\partial S_p}{\partial SC} = -\frac{S_p}{\hat{b}_v}\left[1 + \frac{S_v + \Lambda rC''(\hat{e})}{S_p}\right]\frac{\partial \hat{b}_v}{\partial SC} > 0, \tag{A.9}$$

in which

$$\Lambda \equiv \frac{S_v + S_p + rC''(\hat{e})}{S_v + S_p + rC''(\hat{e}) + rfC'''(\hat{e})/C''(\hat{e})} > 0. \tag{A.10}$$

That is, $S_p \equiv g^2/\sigma_p^2$ is increasing in SC. Accordingly, $\hat{\sigma}_p^2$ is decreasing in SC:

$$\frac{\partial \hat{\sigma}_p^2}{\partial SC} = -\frac{\hat{\sigma}_p^2}{S_p}\frac{\partial S_p}{\partial SC} < 0. \tag{A.11}$$

Substituting (A.9) into (A.7) and using piece rate proportionality to simplify the resulting expression shows that $\hat{b}_p$ is increasing in SC:

$$\frac{\partial \hat{b}_p}{\partial SC} = -\frac{\hat{b}_p}{\hat{b}_v}\left[\frac{S_v + \Lambda r C''(\hat{e})}{S_p}\right]\frac{\partial \hat{b}_v}{\partial SC} > 0. \tag{A.12}$$

Substituting (A.12) into (A.6) and again using piece rate proportionality shows that effort is increasing in SC as well:

$$\frac{\partial \hat{e}}{\partial SC} = -\left[\frac{\Lambda r f}{S_v}\right]\frac{\partial \hat{b}_v}{\partial SC} > 0. \tag{A.13}$$

Finally, substituting the incentive compatibility constraint into the definition of $\mathrm{E}[w]$ and differentiating with respect to SC gives the main result of Proposition 2:

$$\frac{\partial\, \mathrm{E}[w]}{\partial SC} = \left[C'(\hat{e}) + \hat{e}C''(\hat{e})\right]\frac{\partial \hat{e}}{\partial SC} > 0. \tag{A.14}$$

B. Dataset Matching

In this appendix, I supplement Section 3.1 with more information about how I match datasets.

B.1. Matching Compustat to ExecuComp and CRSP

Filtering the annual Compustat dataset by the following guarantees that `FYEAR-GVKEY` is a unique identifier:

- `DATAFMT` = "STD"
- `INDFMT` = "INDL"
- `CONSOL` = "C"
- `LOC` = "USA"

I match Compustat to ExecuComp's Annual Compensation dataset on `GVKEY`s and `FYEAR`s, which I further match to other ExecuComp datasets with `GVKEY`s, `YEAR`s, and `EXECID`s. I match Compustat to both the daily and monthly CRSP datasets using the CCM linking file. To guarantee that links are well-researched, I restrict `LINKTYPE` to be one of the following:

- "LC"
- "LU"
- "LS"

I then match each `FYEAR-GVKEY` pair to daily and monthly CRSP rows that satisfy all of the following:

- CCM indicates a match between `GVKEY` from Compustat and `PERMNO` from CRSP.
- Both `DATADATE` from Compustat and `DATE` from CRSP are between `LINKDT` and `LINKENDDT` from CCM.
- `DATE` from CRSP is during the year leading up to and including `DATADATE` from Compustat.

B.2. Matching CRSP/Compustat to ISS

I match `FYEAR-GVKEY` pairs from Compustat to ISS (formerly RiskMetrics) Historical Governance rows (for data before 2008) and Governance rows (starting in 2008) that satisfy all of the following:

- `TIC` from Compustat equals `TICKER` from ISS.
- The first six digits of `NCUSIP` from at least one monthly CRSP row equals `CN6` from the Historical Governance dataset, or equals the first six digits of `CUSIP` (after filling it from the left with zeros such that it has nine digits) from the Governance dataset.
- `FYEAR` from Compustat equals `YEAR` from ISS.

Requiring a match on both tickers and 6-digit CUSIPs guarantees that each `FYEAR-GVKEY` pair is matched to no more than one ISS row.

B.3. Matching CRSP/Compustat to S34

I match `FYEAR-GVKEY` pairs from Compustat to S34 rows that satisfy all of the following:

- The first eight digits of `NCUSIP` from at least one monthly CRSP row equals `CUSIP` from S34.
- `FDATE` from S34 is between `LINKDT` and `LINKENDDT` from the CCM linking file.

- RDATE from S34 is during the year leading up to and including DATADATE from Compustat.

The file date, FDATE, is the appropriate date to use when matching CUSIPs because this is when Thomson Reuters identifies holdings with CUSIPs. The report date, RDATE, is when holdings are current.

B.4. Matching CRSP/Compustat to BoardEx

I match GVKEYs from Compustat to Board IDs from BoardEx that satisfy at least one of the following:

- CIK from Compustat equals the CIK Code associated with a Board ID (or equivalently, a Company ID) from BoardEx.

- The first six digits of NCUSIP from at least one monthly CRSP row equals the 6-digit CUSIP code embedded in the ISIN Code associated with the Board ID, provided that "US" or "CA" are the first two characters in the ISIN Code.

By themselves, CIK codes are relatively strong identifiers. Incorporating CUSIPs generates approximately an additional one percent of matches. It is possible for a single GVKEY to be matched to more than one Board ID. For example, this can occur if BoardEx generated a new Board ID after a company went through major restructuring. By manually checking random samples in which single GVKEYs match with multiple Board IDs, I verify that this is not a problem.

B.5. Matching ExecuComp to BoardEx

I generate a list of candidate matches between ExecuComp Annual Compensation rows and rows in the BoardEx Employment datasets that satisfy all of the following:

- The employment period provided by BoardEx overlaps with the year leading up to and including DATADATE from the Compustat row that is matched to the ExecuComp row. I assume that employment Start Dates are in January if no month is given, and are on the first of the month if no day is given. I assume that End Dates are in December if no month is given, and are on the last day of the month if no day is given. I ignore periods with missing Start Dates or End Dates.

- The employee name provided by BoardEx matches EXEC_FNAME from ExecuComp followed by any number of characters, a space, and finally EXEC_LNAME. Before checking whether strings match, however, I first replace EXEC_FNAME with a blank string if it contains a period since this indicates that the first name is only an initial. If there is an opening parenthesis in the string, I only use the characters before it. Finally, if `EXEC_LNAME` contains a comma, I only use the characters before it, and if these characters contain a closing parenthesis, I use the remaining characters after it. These transformations cut out titles and nicknames.

The above procedure often generates at most one match. However, it infrequently generates more than one match. This happens most often when two high-level executives at a company are related and share the same last name. I choose the candidate who minimizes the Levenshtein distance between the BoardEx name and the combined `EXEC_FNAME`, `EXEC_MNAME`, and `EXEC_LNAME` provided by ExecuComp. I verify that this procedure almost always chooses the right candidate by looking at a random sample of cases for which there are multiple candidates.

B.6. Matching S34 to BoardEx

Unlike in the other datasets, institutional investors in S34 are not tagged with well-known identifiers. Instead, S34 uses the `MGRNO` key to identify an investor. However, the data in S34 are extracted from the same 13F forms that are filed on EDGAR, the SEC filings database, which is the original source of the CIK codes used by BoardEx to identify companies. To bridge the gap between S34 and BoardEx, I read through the EDGAR master indices to compile a mapping from company names to CIK codes for all companies that have filed a 13F form.

A key observation that vastly improves the accuracy of name matching between S34 and EDGAR is that S34 company names are generally abbreviated derivatives of EDGAR names. This means that while compiling the S34 dataset, Thomson Reuters likely shorted EDGAR company names with some set of standard abbreviations. To generate a list of candidate matches between `MGRNO`s from S34 and CIKs from EDGAR, I first normalize the company names in both datasets. To normalize a company name, I use the following procedure:

1. I make the name lowercase and strip any surrounding spaces.

2. I replace with the word "and" any instances of ampersands and plus signs.

3. There is sometimes extra locational information at the end of EDGAR names. For example, "/ny/" often appears at the end of names. I remove characters that match such locational identifiers.

4. I replace all non-alphanumeric characters with spaces. When acronyms are separated by periods, this sometimes generates a set of spaced characters (for example, "u s a").

Table B.1: Abbreviations expanded in the process of matching S34 company names with EDGAR names.

Abbreviation	Expanded	Abbreviation	Expanded	Abbreviation	Expanded
advr	advisors	finl	financial	mutl	mutual
amer	america	found	foundation	natl	national
assoc	associates	gr	growth	prtnrs	partners
assocs	associates	grp	group	ptnr	partners
assur	assurance	inc	incorporated	res	resolution
bk	bank	ins	insurance	ret	retirement
cap	capital	insur	insurance	secs	securities
cas	casualty	intl	international	serv	services
co	company	inv	investment	soc	society
commun	community	invmt	investment	str	street
corp	corporation	invt	investment	strat	strategic
emp	employees	invts	investments	tech	technology
eq	equities	managemen	management	tr	trust
fd	fund	mgmt	management	underwritrs	underwriters

To alleviate this problem, I condense 2-letter and 3-letter acronyms (for example, "u s a" would become "usa").

5. I expand the list of common abbreviations in Table B.1.

6. The abbreviations "llc" and "lp" are often tacked-on to company names. The word "incorporated" also provides little matching information. I remove all of these words when they are surrounded by spaces. Excluding them helps make the company names more specific.

7. I condense more than one sequential spaces into a single space.

I match each `MGRNO` from S34 to the normalized EDGAR company name that is closest to the `MGRNO`'s normalized name in terms of Levenshtein distance. I break ties based on the Levenshtein distance between non-normalized names. Finally, I associate each `MGRNO` that is successfully matched to one or more EDGAR company names, to one or more CIK numbers provided by EDGAR, and finally to `Board ID`s associated with these CIK numbers. To be conservative, I manually look through all matched investors and eliminate a few incorrect matches. As is true for the matching between Compustat and BoardEx, it is possible and not problematic for a `MGRNO` to be matched to more than one `Board ID`.

C. Sample Classification and Variable Definitions

In this appendix, I supplement Section 3 with additional information about sample classification and variable definitions.

C.1. Institutional Investor Classification

In each year, I classify `MGRNO`s using the S34 legal type classification data from Brian Bushee's website, which carries forward the S34 type codes through 2013. Since legal company types tend to remain unchanged from year-to-year, I naively carry them forward through 2015. The dataset also manually classifies new institutions under the same type codes originally provided by Thomson Reuters. In addition, it splits the "other" type code into three more specific groups: private pensions, public pensions, and endowments. This is helpful because I follow Chen, Harford, and Li (2007) by classifying private pensions as potentially involved and public pensions as potentially independent.

C.2. Occupation Classification

My categories for executive occupations are very similar to the ones originally defined by Bertrand and Hallock (2001). To define them, I use `TITLEANN` from ExecuComp. When missing, I use `TITLE` instead. Before searching an executive's title for keywords, I first normalize it in the following manner:

1. I make the title lowercase.
2. If there is a semicolon in the title, I remove it along with all subsequent characters.

I check to see whether each normalized title contains any of the texts in Table C.1 when surrounded by non-alphanumeric characters. If it does, I assign the executive to the associated occupation group. Containing any of the blacklisted italicized texts negates an assignment. Executives can be assigned to multiple groups.

C.3. Social Connections

In a given year, I say that an executive is socially connected to another individual if all of the following are satisfied:

– There exists a row in the BoardEx Network dataset connecting both of the individuals through their `Person ID`s. This large dataset lists all overlapping periods of organizational participation for each pair of people in the BoardEx universe.

– The `Start Date` of the connection is before both `DATADATE` from Compustat and the `End Date` of the the executive's employment at the `Board ID` associated with the firm under consideration. I assume that `Start Date`s are in January if no month is given, and are on the first of the month if no day is given. I assume that `End Date`s are in December if no month is given, and are on the last day of the month if no day is given. I ignore periods with missing `Start Date`s or `End Date`s.

Table C.1: Texts used to match ExecuComp titles with occupation groups. Blacklisted texts are italicized.

Chair/CEO	President	CFO	COO	Chief
chair	pres	cfo	coo	ceo
chairman	president	chf finance officer	chf operating officer	cfo
chmn	*assistant*	chf financial officer	chf operation officer	coo
ceo	*office of*	chief finance officer	chf operations officer	chf
chief executive officer	*vice pres*	chief financial officer	chief operating officer	chief
assistant	*vice president*		chief operation officer	
office of			chief operations officer	
Executive VP	Senior VP	Group VP	VP	
exec v.p	sr v.p	group v.p	v.p	
exec v-p	sr v-p	group v-p	v-p	
exec vice pres	sr vice pres	group vice pres	vice pres	
exec vice president	sr vice president	group vice president	vice president	
exec. v.p	sr. v.p			
exec. v-p	sr. v-p			
exec. vice pres	sr. vice pres			
exec. vice president	sr. vice president			
executive v.p	senior v.p			
executive v-p	senior v-p			
executive vice pres	senior vice pres			
executive vice president	senior vice president			

I also require that the `Company Type` of the connecting organization is one of the following:

- "Private"
- "Quoted"
- "Partnership"
- "Charities"
- "Clubs"
- "Government"

Total Connections are between an executive and all individuals in the BoardEx universe. For a social connection to contribute to the Connections of an executive, it must be to a person who satisfies both of the following:

- The person must have been employed at some point by a `Board ID` matched to an institutional investor currently holding shares in the firm of the executive.
- The person must have been employed by the institutional investor during the fiscal year under consideration. That is, the `Start Date` and `End Date` of the person's

employment must overlap with the year leading up to and including `DATADATE` from Compustat. I assume that `Start Date`s are in January if no month is given, and are on the first of the month if no day is given. I assume that `End Date`s are in December if no month is given, and are on the last day of the month if no day is given. I ignore periods with missing `Start Date`s or `End Date`s.

If the `Company Type` of the connecting organization is one of the following, I define the connection as an Employment Connection:

- "Private"
- "Quoted"
- "Partnership"

Otherwise, I define it as a Participation Connection. There are a number of `Company Type`s that I exclude. Overlapping participation at "Universities" or in the "Armed Forces" tends to only indicate that two individuals were in the same large institution for a number of years, so the development of a social connection is unlikely. Unfortunately, when I apply the methodology originally developed by Cohen, Frazzini, and Malloy (2008) for the S12 dataset to identify overlaps in universities that are more likely to generate social connections, I only get a small number of educational connections. There are also very few overlaps at "Medical" and "Sporting" organizations, so for clarity I exclude them as well.

BoardEx defines the following employment roles: "ED" (executive director), "NED" (non-executive director), and "SM" (senior manager). Director Connections only count Connections to executive and non-executive directors at an investor, whereas Manager Connections only count Connections to senior managers. Independent and Involved Connections only count Connections to investors that are classified as potentially independent and potentially involved.

C.4. Inside Ownership and Equity Stake

Although Inside Ownership is my primary measure of pay-performance sensitivity, I also compute Equity Stake to carry out robustness checks. To compute both measures, I follow the methodology of Coles, Daniel, and Naveen (2006) that is explained in more detail in Coles, Daniel, and Naveen (2013), which is based on the original work of Core and Guay (2002). Much of the material in this section is the same as in Coles, Daniel, and Naveen (2013).

Depending on the value of `OLD_DATAFMT_FLAG` in ExecuComp's Annual Compensation dataset, I use one of two different procedures. Each gives estimates of important variables for each option portfolio held by the executive under consideration. Thinking of each portfolio as a single option, the variables derived from either procedure are the following:

- T_i: Time to maturity of portfolio i in years.
- n_i : Number of options in portfolio i.
- X_i: Exercise price of portfolio i.

Under the new format, which began to be available in 2006, detailed data are available for each outstanding option tranche in ExecuComp's Outstanding Equity Awards dataset. In each tranche, T_i is the number of years between `EXDATE` and `DATADATE` from Compustat, n_i is `OPTS_UNEX_EXER` plus `OPTS_UNEX_UNEXER`, and X_i is `EXPRIC`.

Under the old format, less-detailed data on options are available in the Annual Compensation and Stock Option Grants datasets. Coles, Daniel, and Naveen (2013), following Core and Guay (2002), consider the following three types of option portfolios:

1. Current year's option grants. In each of these portfolios, n_i is `NUMSECUR`, T_i is the number of years between `EXDATE` and `DATADATE` from Compustat, and X_i is `EXPRIC`.
2. Unvested options. In this portfolio, T_i is the average maturity of the current year's option grants minus one, the number of options is

$$n_i = \texttt{OPT\_UNEX\_UNEXER\_NUM} - \texttt{OPTION\_AWARDS\_NUM}, \tag{C.1}$$

and the exercise price is

$$X_i = S - \frac{\texttt{OPT\_UNEX\_UNEXER\_EST\_VAL} - \sum(S - \texttt{EXPRIC}) \times \texttt{NUMSECUR}}{n_i}. \tag{C.2}$$

3. Vested options. In this portfolio, T_i is the maturity of unvested options minus three, n_i is `OPT_UNEX_EXER_NUM`, and the exercise price is

$$X_i = S - \frac{\texttt{OPT\_UNEX\_EXER\_EST\_VAL}}{n_i}. \tag{C.3}$$

When dealing with edge cases, I again follow the methodology of Coles, Daniel, and Naveen (2013). Whenever there is not enough data to compute T_i, I assume it is 10 years. If T_i ever becomes negative, I set it to zero. Whenever n_i for the unvested portfolio is negative, I set it to zero and reduce n_i for the vested portfolio by the magnitude of the negative value.

I further follow Coles, Daniel, and Naveen (2013) when gathering four additional variables from sources other than ExecuComp:

- r_i: Continuously compounded risk-free rate over the life of portfolio i. I use a return on the treasury bill with maturity equal to T_i after being rounded to the nearest integer. The Federal Reserve Board website provides treasury bill returns for most maturities up to 10 years. For missing maturities, I interpolate the two closest rates. If T_i is larger than 10, I use the 10 year rate.

- S: Price of the underlying stock. I use `PRCC_F` from Compustat.

- σ: Expected stock-return volatility of the underlying stock over the life of the portfolio. Under the old data format, calculation of X_i relies on the estimates provided by CRSP of the portfolio's value, which also relies on an estimate of σ. Accordingly, I follow CRSP's methodology as closely as possible. To do so, I first compute the annualized standard deviation of the firm's monthly stock returns—which are $\log(1 + \texttt{RET})$ from CRSP—over the 60 months prior to `DATADATE` from Compustat. If a firm has more than one stock, I use a value-weighted index. Next, if there are less than 12 months of returns data, I replace this value with the mean volatility across all firms in my sample for the same fiscal year. Finally, I winsorize the fiscal year's worth of volatility estimates at the 5 and 95% levels.

- d: Expected continuously compounded dividend yield over the life of the portfolio. Again, I follow CRSP's methodology. To do so, I use the average dividend yield—which is `DVPSX_F/PRCC_F` from Compustat—over the three years prior to and including `FYEAR` from Compustat. I then winsorize the fiscal year's worth of dividend yield estimates at the 5 and 95% levels.

I use all of the above variables in the following equation for the delta of an executive's compensation (sensitivity to firm value). Delta is a simple summation of the equation from Core and Guay (2002) that is based on the formula from Black and Scholes (1973) and modified by Merton (1973) to account for dividends:

$$\text{delta} \equiv \frac{\partial(\text{pay})}{\partial S} = \text{shares owned} + \sum_i n_i \exp(-dT_i)\Phi(Z_i), \tag{C.4}$$

in which Φ is the standard normal cumulative density function and

$$Z_i \equiv \frac{\log(S/X_i) + T_i(r - d + \sigma^2/2)}{\sigma\sqrt{T_i}}. \tag{C.5}$$

I take the number of shares owned by the executive to be `SHROWN_EXCL_OPTS`. The number of shares enters (C.4) because the value of equity moves one-to-one with S. In a robustness check in Section 5, I ignore options when computing measures of pay-performance sensitivity. To do so, I simply equate delta with shares owned in (C.4).

When one or more variables for a portfolio is unavailable, I assume that the delta of the portfolio is zero. After double-checking that my values for delta match those provided by Lalitha Naveen's website, I define the two measures of pay-performance sensitivity as

$$\text{Inside Ownership} \equiv 100\% \times \text{delta} \div \text{shares outstanding}, \tag{C.6a}$$

$$\text{Equity Stake} \equiv 0.01 \times \text{CPI inflator} \times \text{delta} \times S, \tag{C.6b}$$

in which shares outstanding is the sum over all stocks of `SHROUT` from CRSP as of the fiscal year-end month, and the CPI inflator (constructed using data from the Bureau of Labor Statistics website) is computed to express Equity Stake in 2015 dollars.

C.5. Direct Compensation and Wealth

I define Direct Compensation as `TDC1` from the ExecuComp Annual Compensation dataset and express it in 2015 dollars using CPI data from the Bureau of Labor Statistics website. In the few instances in which Direct Compensation is negative, I truncate it at zero.

I define Wealth as Direct Compensation plus an estimate of non-firm wealth from Ingolf Dittman's website, which is described in Dittmann and Maug (2007). For a detailed discussion of how the estimate is constructed, refer to Appendix B in Dittmann and Maug (2007). Generally, executives are assumed to have zero non-firm wealth when they enter the ExecuComp dataset, and their non-firm wealth in any given year is estimated with cumulative earnings recorded by ExecuComp, not taking into account the compensation from the current year. Taxes and the cost of stock purchases are subtracted for each year.

C.6. Sex, Age, and Tenure

I extract the `Gender` and `DOB` of an executive from the BoardEx Characteristics datasets. I define an executive's Age to be the number of years between `DOB` and `DATADATE` from Compustat. Tenure is the number of years between `DATADATE` and the first `Start Date` recorded by BoardEx for which the executive began working at the `Board ID` associated with the company under consideration. I ignore missing `Start Date`s, assume that they are in January if no month is given, and assume that they are on the first of the month if no day is given.

C.7. Mean Institutional Ownership and Investment

MGRNOs from S34 usually have multiple reports of ownership during the fiscal year under consideration. If there are multiple reports on a single RDATE, I follow the literature and consider only the report associated with the earliest FDATE. I compute the ownership for each report as 10^6 times SHARES divided by SHROUT2. If my sample started before 1999, I would have used SHROUT1 instead. Investment is SHARES times PRC. I ignore the few observations in which SHARES is negative. If the MGRNO reports simultaneous ownership in multiple stocks associated with the firm under consideration, I instead divide the sum of SHARES by the sum of shares outstanding to get ownership, and I sum all values of investment. Using the number of shares outstanding reported by S34 instead of CRSP is standard in the literature because there is no guarantee that Thomson Reuters and CRSP deal with stock splits in an identical manner.

To compute the ownership and investment of each MGRNO in a firm over the entire fiscal year, I take a simple average over all reports. I define Investment as this average. For a single firm, I define Mean Institutional Ownership as the average ownership across all covered institutional investors holding at least one share in the firm. There are a few instances in which the reported number of shares outstanding seems incorrect. To deal with this, I disregard ownership observations that are larger than one.

C.8. Market Capitalization, Market/Book, and Leverage

Market Capitalization is 10^3 times SHROUT times PRC in the fiscal year-end month, summed over all classes of stock in the monthly CRSP dataset. A negative PRC indicates that the price is a bid/ask average. In these cases, I use |PRC|. When used alone as a variable, Market Capitalization is multiplied by a CPI inflator that expresses it in 2015 dollars. I compute Market/Book using Market Capitalization and Compustat variables:

$$\text{Market/Book} \equiv \frac{\text{Market Capitalization} \div 10^6}{\texttt{SEQ} + \texttt{TXDITC} - \texttt{PSTK}}. \tag{C.7}$$

When SEQ is unknown, I assume it is zero. Leverage is simply AT divided by SEQ.

C.9. Excess Return, Return Volatility, and Beta

I use the CRSP Daily dataset to compute Excess Return, Return Volatility, and Beta. Indexing classes of stock with i and days during the fiscal year with t, define the weighted return of a firm's stocks on day t as

$$w_t \equiv \frac{\sum_i \texttt{PRC}_{it} \times \texttt{SHROUT}_{it} \times \texttt{RET}_{it}}{\sum_i \texttt{PRC}_{it} \times \texttt{SHROUT}_{it}}. \tag{C.8}$$

Also needed is the CRSP value-weighted return on day t, `VWRETD`, which I denote with M_t. On days $t = 1, 2, \ldots, T$ during the fiscal year, Excess Return and Return Volatility are calculated as follows:

$$\text{Excess Return} \equiv \frac{252}{T} \sum_{t=1}^{T} (w_t - M_t), \tag{C.9a}$$

$$\text{Return Volatility} \equiv \left(\frac{252}{T-1} \left[\sum_{t=1}^{T} w_t^2 - \frac{1}{T} \left(\sum_{t=1}^{T} w_t \right)^2 \right] \right)^{\frac{1}{2}}. \tag{C.9b}$$

Next, let $lw_t \equiv \log(1+w_t)$ and $lM_t \equiv \log(1+M_t)$. Also, following the methodology of CRSP, define the three-day moving window of above market return as $M3_t \equiv lM_{t-1} + lM_t + lM_{t+1}$. Beta is calculated as follows:

$$\text{Beta} \equiv \frac{\sum_t \left(lw_t M3_t \right) - \frac{1}{T} \left(\sum_t lw_t \right) \left(\sum_t M3_t \right)}{\sum_t \left(lM_t M3_t \right) - \frac{1}{T} \left(\sum_t lM_t \right) \left(\sum_t M3_t \right)}. \tag{C.10}$$

I disregard estimates of Excess Return, Return Volatility, and Beta that are computed on a number of days less than the fifth percentile for the fiscal year under consideration. For most fiscal years, the cutoff is 249, 250, 251, or 252 days. Exceptions are 2001, for which the cutoff is 246 days, and 2002, which has a cutoff of 247 days. Both exceptions correspond to fiscal years that overlap with September 11-17 of 2001 during which time U.S. stock exchanges were closed.

C.10. Board Independence

I count the number of board directors at a firm as the number of people in BoardEx satisfying the following:

- The `Start Date` and `End Date` of the person's employment at a `Board ID` matched to the firm must overlap with the year leading up to and including `DATADATE` from Compustat. I assume that `Start Date`s are in January if no month is given, and are on the first of the month if no day is given. I assume that `End Date`s are in December if no month is given, and are on the last day of the month if no day is given. I ignore employment periods with missing `Start Date`s or `End Date`s.

– At least one role held by the person at a `Board ID` matched to the firm must indicate director status. That is, the person must hold an "EX" or "NX" role.

I define Board Independence as the percentage of directors with the word "independent" in the `Role` title associated with their role that indicates director status. I verify that this is a good way to identify independent directors by checking a random sample of directors.

C.11. G Index and E Index

ISS (formerly RiskMetrics) has two governance datasets: Governance Legacy for data prior to 2008 and Governance for data starting in 2008. The G Index of Gompers, Ishii, and Metrick (2003) is `GINDEX` in the Governance Legacy dataset. It cannot be computed on the newer dataset. In the older Governance Legacy dataset, the E Index of Bebchuk, Cohen, and Ferrell (2009) is

$$\text{E Index} \equiv \texttt{CBOARD} + \texttt{LABYLW} + \texttt{LACHTR} + \texttt{PPILL} + \texttt{GOLDENPARACHUTE} + \texttt{SUPERMAJOR}, \quad \text{(C.11)}$$

and in the newer Governance dataset, it is

$$\text{E Index} \equiv \texttt{CBOARD} + \texttt{LABYLW} + \texttt{LACHTR} + \texttt{PPILL} + \texttt{GPARACHUTE} + \text{super majority}, \quad \text{(C.12)}$$

in which super majority is an indicator for when `SUPERMAJOR_PCNT` is larger than zero.

D. Results from the Robustness Checks

In this appendix, I provide tables of results for the robustness checks discussed in Section 5.

Table D.1: Institutional investor-level regressions excluding investments in firms classified under Utilities or Money by the Fama-French 12 industry classifications.

LHS	Investment (millions). Sample restricted to 1999-2007.		
RHS	All Investors (N = 479,729)	Independent Investors (N = 184,316)	Involved Investors (N = 285,792)
Total Employment Connections	0.014*** (0.003)	0.014*** (0.004)	0.013*** (0.004)
$\overline{R}^2$	[0.362]	[0.364]	[0.361]
Employment Connections	31.672*** (4.668)	31.485*** (7.963)	32.248*** (5.179)
$\overline{R}^2$	[0.363]	[0.365]	[0.362]
Director Connections	43.239*** (6.833)	46.760*** (10.904)	42.935*** (7.907)
$\overline{R}^2$	[0.363]	[0.365]	[0.362]
Manager Connections	47.870*** (9.818)	39.540** (17.446)	52.104*** (11.799)
$\overline{R}^2$	[0.362]	[0.364]	[0.361]
LHS	Investment (millions). Sample restricted to 2008-2015.		
RHS	All Investors (N = 397,400)	Independent Investors (N = 152,304)	Involved Investors (N = 223,282)
Total Employment Connections	0.018*** (0.005)	0.021** (0.008)	0.014*** (0.005)
$\overline{R}^2$	[0.359]	[0.359]	[0.351]
Total Participation Connections	0.064*** (0.020)	0.069* (0.036)	0.063** (0.029)
$\overline{R}^2$	[0.359]	[0.358]	[0.351]
Employment Connections	48.692*** (9.889)	78.826*** (21.686)	38.375*** (10.569)
$\overline{R}^2$	[0.361]	[0.362]	[0.353]
Participation Connections	176.743*** (43.115)	302.072*** (62.408)	144.441*** (48.627)
$\overline{R}^2$	[0.366]	[0.367]	[0.358]
Director Connections	61.156*** (13.677)	106.184*** (21.813)	46.781*** (15.766)
$\overline{R}^2$	[0.364]	[0.367]	[0.356]
Manager Connections	115.171*** (23.111)	120.164** (58.082)	116.240*** (23.048)
$\overline{R}^2$	[0.359]	[0.358]	[0.352]

* denotes significance at a 10% level, ** at a 5% level, and *** at a 1% level.

Table D.2: Executive-level regressions excluding firms classified under Utilities or Money by the Fama-French 12 industry classifications.

LHS	Inside Ownership (basis points)		Direct Compensation (thousands)	
RHS	1999-2007 (N = 21,355)	2008-2015 (N = 16,606)	1999-2007 (N = 21,355)	2008-2015 (N = 16,606)
Total Connections	−0.044***	−0.035***	1.270***	1.168***
	(0.012)	(0.010)	(0.210)	(0.166)
$\overline{R}^2$	[0.561]	[0.596]	[0.483]	[0.599]
Director Connections	−6.495***	−5.823***	282.188***	202.174***
	(1.594)	(0.935)	(31.371)	(19.065)
$\overline{R}^2$	[0.562]	[0.598]	[0.489]	[0.613]
Manager Connections	−5.884***	−7.175**	204.608***	432.362***
	(2.283)	(3.102)	(45.535)	(68.944)
$\overline{R}^2$	[0.561]	[0.595]	[0.482]	[0.600]
Independent Connections	−8.764***	−13.069***	382.404***	473.148***
	(3.089)	(2.400)	(66.210)	(51.270)
$\overline{R}^2$	[0.561]	[0.597]	[0.484]	[0.607]
Involved Connections	−5.760***	−6.266***	249.906***	231.794***
	(1.351)	(1.037)	(28.591)	(23.469)
$\overline{R}^2$	[0.561]	[0.597]	[0.487]	[0.611]
Employment Connections	−5.299***	−4.706***	227.208***	202.159***
	(1.148)	(1.151)	(29.570)	(21.154)
$\overline{R}^2$	[0.561]	[0.596]	[0.487]	[0.606]
Participation Connections	-	−8.116***	-	269.954***
	-	(1.410)	-	(31.907)
$\overline{R}^2$	-	[0.597]	-	[0.608]

* denotes significance at a 10% level, ** at a 5% level, and *** at a 1% level.

Table D.3: Firm-level regressions excluding firms classified under Utilities or Money by the Fama-French 12 industry classifications.

LHS	Inside Ownership (basis points)		Direct Compensation (thousands)	
RHS	1999-2007	2008-2015	1999-2007	2008-2015
High Return Volatility	−13.592***	−10.080***	25.294	35.096
× Connections	(4.008)	(2.214)	(70.417)	(38.417)
High Return Volatility	97.798***	96.407***	−205.278	−836.638***
	(16.160)	(16.959)	(182.961)	(104.217)
Connections	−7.783***	−4.591***	316.245***	225.105***
	(2.426)	(1.583)	(68.277)	(15.229)
$\overline{R}^2$	[0.223]	[0.173]	[0.335]	[0.379]
N	9,941	8,381	9,941	8,381
High Mean Inst'l Ownership	−12.785**	−28.531***	−181.378***	66.649
× Connections	(5.956)	(4.184)	(67.742)	(57.065)
High Mean Inst'l Ownership	179.634***	229.511***	−1970.343***	−2489.877***
	(24.702)	(23.237)	(225.292)	(135.099)
Connections	−6.669**	−0.014	349.956***	207.862***
	(2.816)	(1.555)	(80.206)	(23.520)
$\overline{R}^2$	[0.254]	[0.233]	[0.376]	[0.457]
N	7,477	5,851	7,477	5,851
Many Inst'l Investors	16.688***	19.280***	158.487***	60.732*
× Connections	(4.602)	(3.271)	(58.099)	(35.509)
Many Inst'l Investors	−209.857***	−208.032***	1949.281***	2252.049***
	(17.886)	(15.532)	(175.888)	(118.082)
Connections	−18.647***	−19.170***	118.758***	129.114***
	(3.746)	(3.184)	(23.552)	(26.612)
$\overline{R}^2$	[0.270]	[0.224]	[0.367]	[0.431]
N	10,086	8,447	10,086	8,447
High E Index	4.470	1.053	−223.732**	−13.559
× Connections	(4.405)	(2.544)	(97.676)	(36.297)
High E Index	−53.215***	−21.042	567.040**	122.181
	(19.919)	(15.702)	(269.383)	(173.430)
Connections	−11.635***	−7.133***	433.677***	225.849***
	(3.170)	(1.347)	(79.493)	(19.314)
$\overline{R}^2$	[0.267]	[0.204]	[0.355]	[0.378]
N	6,084	6,433	6,084	6,433
High Board Independence	10.166***	12.642***	33.903	−110.855*
× Connections	(3.525)	(2.270)	(117.168)	(59.636)
High Board Independence	−47.505***	−110.320***	33.618	604.535***
	(15.514)	(12.783)	(159.989)	(98.888)
Connections	−19.343***	−15.535***	302.833***	314.441***
	(2.895)	(2.120)	(94.888)	(51.648)
$\overline{R}^2$	[0.213]	[0.176]	[0.331]	[0.368]
N	10,084	8,447	10,084	8,447

* denotes significance at a 10% level, ** at a 5% level, and *** at a 1% level.

Table D.4: Institutional investor-level regressions with logarithmically-transformed variables.

LHS	log(1 + Investment). Sample restricted to 1999-2007.		
RHS	All Investors (N = 606,797)	Independent Investors (N = 231,882)	Involved Investors (N = 362,772)
log(1 + Total Employment Connections)	−0.006*	0.007	−0.014***
	(0.003)	(0.004)	(0.005)
$\overline{R}^2$	[0.619]	[0.545]	[0.659]
log(1 + Employment Connections)	0.333***	0.356***	0.323***
	(0.050)	(0.117)	(0.056)
$\overline{R}^2$	[0.619]	[0.546]	[0.659]
log(1 + Director Connections)	0.395***	0.417***	0.382***
	(0.062)	(0.127)	(0.076)
$\overline{R}^2$	[0.619]	[0.545]	[0.659]
log(1 + Manager Connections)	0.426***	0.516***	0.386***
	(0.076)	(0.159)	(0.093)
$\overline{R}^2$	[0.619]	[0.545]	[0.659]
LHS	log(1 + Investment). Sample restricted to 2008-2015.		
RHS	All Investors (N = 526,099)	Independent Investors (N = 200,579)	Involved Investors (N = 296,491)
log(1 + Total Employment Connections)	−0.010***	−0.003	−0.016***
	(0.003)	(0.005)	(0.005)
$\overline{R}^2$	[0.714]	[0.710]	[0.716]
log(1 + Total Participation Connections)	0.003	0.001	0.006*
	(0.003)	(0.005)	(0.003)
$\overline{R}^2$	[0.714]	[0.710]	[0.716]
log(1 + Employment Connections)	0.318***	0.337***	0.282***
	(0.074)	(0.087)	(0.089)
$\overline{R}^2$	[0.714]	[0.710]	[0.716]
log(1 + Participation Connections)	0.350***	0.700***	0.134
	(0.120)	(0.176)	(0.144)
$\overline{R}^2$	[0.714]	[0.710]	[0.716]
log(1 + Director Connections)	0.297***	0.353***	0.211**
	(0.076)	(0.093)	(0.091)
$\overline{R}^2$	[0.714]	[0.710]	[0.716]
log(1 + Manager Connections)	0.669***	0.850***	0.571***
	(0.111)	(0.257)	(0.123)
$\overline{R}^2$	[0.714]	[0.710]	[0.716]

* denotes significance at a 10% level, ** at a 5% level, and *** at a 1% level.

Table D.5: Executive-level regressions with logarithmically-transformed variables.

LHS	log(1 + Inside Ownership)		log(1 + Direct Compensation)	
RHS	1999-2007 (N = 26,797)	2008-2015 (N = 21,580)	1999-2007 (N = 26,797)	2008-2015 (N = 21,580)
log(1 + Total Connections)	−0.013***	−0.013***	0.026***	0.022***
	(0.004)	(0.005)	(0.004)	(0.005)
$\overline{R}^2$	[0.678]	[0.690]	[0.691]	[0.717]
log(1 + Director Connections)	−0.030***	−0.031***	0.068***	0.042***
	(0.008)	(0.007)	(0.013)	(0.007)
$\overline{R}^2$	[0.678]	[0.690]	[0.690]	[0.717]
log(1 + Manager Connections)	−0.025**	−0.016	0.052***	0.061***
	(0.010)	(0.012)	(0.010)	(0.012)
$\overline{R}^2$	[0.677]	[0.689]	[0.690]	[0.717]
log(1 + Independent Connections)	−0.030**	−0.032***	0.078***	0.056***
	(0.012)	(0.009)	(0.014)	(0.009)
$\overline{R}^2$	[0.677]	[0.690]	[0.690]	[0.717]
log(1 + Involved Connections)	−0.032***	−0.030***	0.062***	0.041***
	(0.007)	(0.007)	(0.010)	(0.008)
$\overline{R}^2$	[0.678]	[0.690]	[0.690]	[0.717]
log(1 + Employment Connections)	−0.034***	−0.021***	0.068***	0.042***
	(0.008)	(0.008)	(0.011)	(0.009)
$\overline{R}^2$	[0.678]	[0.690]	[0.691]	[0.717]
log(1 + Participation Connections)	-	−0.047***	-	0.048***
	-	(0.009)	-	(0.017)
$\overline{R}^2$	-	[0.691]	-	[0.717]

* denotes significance at a 10% level, ** at a 5% level, and *** at a 1% level.

Table D.6: Firm-level regressions with logarithmically-transformed variables.

LHS	log(1 + Inside Ownership)		log(1 + Direct Compensation)	
RHS	1999-2007	2008-2015	1999-2007	2008-2015
High Return Volatility × log(1 + Connections)	−0.048** (0.024)	−0.035* (0.020)	−0.031 (0.030)	−0.019 (0.020)
High Return Volatility	0.053** (0.022)	0.067** (0.029)	0.094*** (0.031)	0.098*** (0.023)
log(1 + Connections)	−0.019 (0.017)	−0.005 (0.017)	0.098*** (0.027)	0.064*** (0.012)
$\overline{R}^2$	[0.441]	[0.411]	[0.536]	[0.591]
N	12,325	10,790	12,325	10,790
High Mean Inst'l Ownership × log(1 + Connections)	−0.052* (0.027)	−0.141*** (0.026)	−0.001 (0.030)	0.059** (0.024)
High Mean Inst'l Ownership	0.090*** (0.025)	0.196*** (0.047)	0.031 (0.038)	−0.044 (0.037)
log(1 + Connections)	−0.021 (0.018)	0.030* (0.017)	0.103*** (0.026)	0.066*** (0.013)
$\overline{R}^2$	[0.472]	[0.457]	[0.569]	[0.629]
N	9,727	7,946	9,727	7,946
Many Inst'l Investors × log(1 + Connections)	0.072*** (0.023)	0.136*** (0.018)	−0.012 (0.031)	−0.056*** (0.019)
Many Inst'l Investors	−0.209*** (0.038)	−0.253*** (0.046)	0.117** (0.045)	0.164*** (0.035)
log(1 + Connections)	−0.080*** (0.021)	−0.105*** (0.020)	0.088*** (0.015)	0.094*** (0.017)
$\overline{R}^2$	[0.447]	[0.421]	[0.534]	[0.589]
N	12,595	10,979	12,595	10,979
High E Index × log(1 + Connections)	0.007 (0.024)	0.012 (0.021)	−0.057* (0.032)	−0.020 (0.021)
High E Index	−0.073** (0.033)	−0.029 (0.026)	0.145*** (0.041)	0.110*** (0.031)
log(1 + Connections)	−0.032 (0.021)	−0.017 (0.018)	0.113*** (0.021)	0.068*** (0.014)
$\overline{R}^2$	[0.498]	[0.460]	[0.542]	[0.589]
N	7,438	8,078	7,438	8,078
High Board Independence × log(1 + Connections)	0.037* (0.021)	0.077*** (0.018)	−0.038 (0.035)	−0.076*** (0.020)
High Board Independence	−0.093*** (0.028)	−0.179*** (0.025)	0.108*** (0.031)	0.178*** (0.020)
log(1 + Connections)	−0.054*** (0.018)	−0.056*** (0.019)	0.098*** (0.029)	0.095*** (0.017)
$\overline{R}^2$	[0.442]	[0.417]	[0.535]	[0.592]
N	12,593	10,979	12,593	10,979

* denotes significance at a 10% level, ** at a 5% level, and *** at a 1% level.

Table D.7: Executive-level regressions that do not control for Wealth.

LHS	Inside Ownership (basis points)		Direct Compensation (thousands)	
RHS	1999-2007 (N = 32,370)	2008-2015 (N = 26,311)	1999-2007 (N = 32,057)	2008-2015 (N = 26,013)
Total Connections	-0.033^{***}	-0.014	1.285^{***}	1.278^{***}
	(0.012)	(0.010)	(0.203)	(0.134)
$\overline{R}^2$	[0.486]	[0.553]	[0.484]	[0.592]
Director Connections	-5.549^{***}	-3.213^{***}	288.399^{***}	203.574^{***}
	(1.358)	(0.815)	(25.955)	(13.042)
$\overline{R}^2$	[0.486]	[0.554]	[0.490]	[0.608]
Manager Connections	-4.756^{*}	-1.023	209.771^{***}	349.045^{***}
	(2.642)	(2.617)	(39.581)	(51.750)
$\overline{R}^2$	[0.486]	[0.553]	[0.484]	[0.590]
Independent Connections	-7.978^{**}	-5.485^{**}	392.057^{***}	463.420^{***}
	(3.257)	(2.665)	(59.410)	(49.942)
$\overline{R}^2$	[0.486]	[0.553]	[0.486]	[0.598]
Involved Connections	-4.987^{***}	-3.386^{***}	253.010^{***}	228.964^{***}
	(1.254)	(0.850)	(24.328)	(16.726)
$\overline{R}^2$	[0.486]	[0.554]	[0.489]	[0.606]
Employment Connections	-4.288^{***}	-2.126^{*}	227.042^{***}	204.624^{***}
	(1.356)	(1.150)	(25.657)	(17.760)
$\overline{R}^2$	[0.486]	[0.553]	[0.489]	[0.598]
Participation Connections	-	-5.161^{***}	-	257.227^{***}
	-	(0.902)	-	(21.289)
$\overline{R}^2$	-	[0.554]	-	[0.602]

* denotes significance at a 10% level, ** at a 5% level, and *** at a 1% level.

Table D.8: Firm-level regressions that do not control for Wealth.

LHS	Inside Ownership (basis points)		Direct Compensation (thousands)	
RHS	1999-2007	2008-2015	1999-2007	2008-2015
High Return Volatility × Connections	−9.490**	−3.362	168.898**	42.278
	(3.715)	(2.293)	(75.277)	(26.385)
High Return Volatility	88.466***	76.917***	−44.391	−709.025***
	(14.696)	(17.973)	(188.824)	(143.262)
Connections	−4.755**	−2.857**	298.152***	212.147***
	(2.101)	(1.309)	(56.344)	(11.553)
$\overline{R}^2$	[0.191]	[0.165]	[0.340]	[0.373]
N	13,292	12,839	13,220	12,823
High Mean Inst'l Ownership × Connections	−8.445	−16.344***	−162.495***	7.612
	(5.432)	(5.035)	(58.357)	(30.365)
High Mean Inst'l Ownership	148.007***	183.270***	−1951.031***	−2327.623***
	(22.359)	(28.473)	(229.899)	(203.759)
Connections	−3.764	0.630	379.905***	197.115***
	(2.408)	(1.302)	(62.916)	(11.168)
$\overline{R}^2$	[0.222]	[0.208]	[0.377]	[0.456]
N	10,520	9,752	10,461	9,739
Many Inst'l Investors × Connections	11.944**	16.135***	150.531***	38.963
	(4.640)	(3.492)	(49.563)	(27.721)
Many Inst'l Investors	−174.362***	−194.574***	2041.475***	2329.411***
	(18.781)	(23.936)	(181.516)	(154.921)
Connections	−12.257***	−14.319***	160.877***	141.839***
	(4.282)	(3.793)	(23.979)	(27.150)
$\overline{R}^2$	[0.222]	[0.205]	[0.369]	[0.434]
N	13,595	13,094	13,518	13,078
High E Index × Connections	3.366	−0.764	−173.862*	33.064
	(4.545)	(1.233)	(93.889)	(26.180)
High E Index	−60.152***	−15.640	456.464*	−23.821
	(19.929)	(12.935)	(242.926)	(129.977)
Connections	−8.764***	−3.810***	444.316***	215.075***
	(2.531)	(1.205)	(68.788)	(14.860)
$\overline{R}^2$	[0.232]	[0.201]	[0.345]	[0.397]
N	7,866	9,259	7,838	9,247
High Board Independence × Connections	9.072***	10.397***	23.823	−91.666***
	(2.880)	(2.390)	(88.907)	(34.887)
High Board Independence	−50.368***	−110.569***	−50.045	579.076***
	(15.771)	(13.851)	(176.445)	(84.990)
Connections	−14.260***	−10.651***	343.417***	290.998***
	(2.957)	(2.546)	(73.728)	(31.216)
$\overline{R}^2$	[0.183]	[0.171]	[0.333]	[0.365]
N	13,592	13,094	13,515	13,078

* denotes significance at a 10% level, ** at a 5% level, and *** at a 1% level.

Table D.9: Executive-level regressions in which Equity Stake is computed normally (left) and computed without taking options into consideration (right).

LHS	Equity Stake (thousands)		Stock Equity Stake (thousands)	
RHS	1999-2007 (N = 26,797)	2008-2015 (N = 21,580)	1999-2007 (N = 26,797)	2008-2015 (N = 21,580)
Total Connections	−0.044	0.063*	−0.115***	−0.022
	(0.048)	(0.037)	(0.037)	(0.030)
$\overline{R}^2$	[0.608]	[0.613]	[0.573]	[0.577]
Director Connections	6.735	14.756***	−11.482**	−2.276
	(7.352)	(3.650)	(5.289)	(2.657)
$\overline{R}^2$	[0.608]	[0.616]	[0.573]	[0.577]
Manager Connections	−10.368	15.369	−19.268**	−6.670
	(12.148)	(11.086)	(8.403)	(8.786)
$\overline{R}^2$	[0.608]	[0.613]	[0.573]	[0.577]
Independent Connections	−0.683	23.761**	−23.072**	−11.032
	(13.735)	(11.771)	(9.871)	(7.716)
$\overline{R}^2$	[0.608]	[0.613]	[0.573]	[0.577]
Involved Connections	2.875	16.616***	−12.163**	−2.154
	(6.982)	(4.027)	(4.878)	(2.974)
$\overline{R}^2$	[0.608]	[0.616]	[0.573]	[0.577]
Employment Connections	−1.009	14.187***	−13.404***	−2.483
	(5.671)	(4.959)	(4.064)	(3.398)
$\overline{R}^2$	[0.608]	[0.614]	[0.573]	[0.577]
Participation Connections	-	16.967***	-	−2.706
	-	(5.007)	-	(2.974)
$\overline{R}^2$	-	[0.614]	-	[0.577]

* denotes significance at a 10% level, ** at a 5% level, and *** at a 1% level.

Table D.10: Firm-level regressions in which Equity Stake is computed normally (left) and computed without taking options into consideration (right).

LHS	Equity Stake (thousands)		Stock Equity Stake (thousands)	
RHS	1999-2007	2008-2015	1999-2007	2008-2015
High Return Volatility × Connections	26.146	−3.221	25.851*	−1.904
	(16.096)	(7.372)	(15.381)	(7.444)
High Return Volatility	−50.963	−34.468	−27.299	−9.718
	(46.901)	(22.670)	(40.834)	(23.355)
Connections	−26.263*	10.047	−34.134***	−1.970
	(15.581)	(9.626)	(13.187)	(10.030)
$\overline{R}^2$	[0.425]	[0.348]	[0.348]	[0.289]
N	12,325	10,790	12,325	10,790
High Mean Inst'l Ownership × Connections	63.062***	−13.139	61.688***	−8.194
	(23.345)	(11.349)	(20.056)	(11.037)
High Mean Inst'l Ownership	−318.143***	−139.138***	−202.931***	−55.624
	(85.267)	(36.055)	(73.399)	(35.715)
Connections	−45.468*	11.386	−52.024***	−0.626
	(23.421)	(10.760)	(19.614)	(11.043)
$\overline{R}^2$	[0.426]	[0.359]	[0.357]	[0.311]
N	9,727	7,946	9,727	7,946
Many Inst'l Investors × Connections	−33.786**	11.372	−30.947**	6.045
	(16.638)	(8.574)	(13.245)	(7.777)
Many Inst'l Investors	212.775***	103.990***	93.460*	29.901
	(67.773)	(33.113)	(52.712)	(29.207)
Connections	3.223	−3.565	−3.803	−8.789*
	(7.570)	(4.257)	(6.134)	(4.542)
$\overline{R}^2$	[0.422]	[0.350]	[0.345]	[0.287]
N	12,595	10,979	12,595	10,979
High E Index × Connections	13.919	18.937	23.272*	17.455
	(16.367)	(12.871)	(13.794)	(13.823)
High E Index	−73.374	−27.970	−105.190**	−33.348
	(47.743)	(33.502)	(49.344)	(35.386)
Connections	−12.839	7.016	−34.560***	−5.227
	(13.583)	(7.980)	(9.863)	(8.405)
$\overline{R}^2$	[0.436]	[0.364]	[0.349]	[0.312]
N	7,438	8,078	7,438	8,078
High Board Independence × Connections	−43.269*	−5.540	−35.082*	−5.831
	(22.471)	(7.363)	(18.111)	(6.200)
High Board Independence	−20.609	−88.734***	−61.227	−108.351***
	(44.931)	(29.327)	(45.104)	(29.992)
Connections	11.822	14.212*	−1.835	2.984
	(23.994)	(8.192)	(19.723)	(7.491)
$\overline{R}^2$	[0.421]	[0.350]	[0.346]	[0.293]
N	12,593	10,979	12,593	10,979

* denotes significance at a 10% level, ** at a 5% level, and *** at a 1% level.

Table D.11: Executive-level regressions in which Inside Ownership is computed normally (left) and computed without taking options into consideration (right).

LHS	Inside Ownership (basis points)		Stock Inside Ownership (thousands)	
RHS	1999-2007 (N = 26,797)	2008-2015 (N = 21,580)	1999-2007 (N = 26,797)	2008-2015 (N = 21,580)
Total Connections	-0.040^{***}	-0.021^{***}	-0.038^{***}	-0.022^{***}
	(0.011)	(0.008)	(0.011)	(0.008)
$\overline{R}^2$	[0.565]	[0.593]	[0.539]	[0.568]
Director Connections	-6.365^{***}	-4.503^{***}	-6.284^{***}	-4.504^{***}
	(1.345)	(0.681)	(1.302)	(0.682)
$\overline{R}^2$	[0.566]	[0.595]	[0.539]	[0.570]
Manager Connections	-4.737^{***}	-3.728^{*}	-4.935^{***}	-4.465^{**}
	(1.816)	(2.018)	(1.694)	(2.012)
$\overline{R}^2$	[0.565]	[0.593]	[0.538]	[0.568]
Independent Connections	-7.262^{***}	-9.326^{***}	-8.067^{***}	-9.788^{***}
	(2.795)	(1.781)	(2.712)	(1.747)
$\overline{R}^2$	[0.565]	[0.594]	[0.538]	[0.569]
Involved Connections	-5.876^{***}	-4.602^{***}	-5.586^{***}	-4.612^{***}
	(1.136)	(0.756)	(1.107)	(0.750)
$\overline{R}^2$	[0.565]	[0.594]	[0.539]	[0.570]
Employment Connections	-4.755^{***}	-3.157^{***}	-4.802^{***}	-3.405^{***}
	(1.032)	(0.911)	(0.995)	(0.896)
$\overline{R}^2$	[0.565]	[0.593]	[0.539]	[0.568]
Participation Connections	-	-6.214^{***}	-	-5.986^{***}
	-	(0.979)	-	(0.968)
$\overline{R}^2$	-	[0.595]	-	[0.570]

* denotes significance at a 10% level, ** at a 5% level, and *** at a 1% level.

Table D.12: Firm-level regressions in which Inside Ownership is computed normally (left) and computed without taking options into consideration (right).

LHS	Inside Ownership (basis points)		Stock Inside Ownership (thousands)	
RHS	1999-2007	2008-2015	1999-2007	2008-2015
High Return Volatility × Connections	-9.289^{**}	-4.311^{**}	-6.881^{**}	-3.543^{**}
	(3.614)	(1.975)	(3.393)	(1.780)
High Return Volatility	85.613^{***}	75.164^{***}	63.985^{***}	57.264^{***}
	(14.714)	(16.265)	(13.497)	(13.888)
Connections	-6.705^{***}	-3.025^{***}	-5.997^{***}	-3.381^{***}
	(2.114)	(1.111)	(1.880)	(1.029)
$\overline{R}^2$	[0.228]	[0.190]	[0.208]	[0.175]
N	12,325	10,790	12,325	10,790
High Mean Inst'l Ownership × Connections	-11.168^{**}	-20.501^{***}	-11.288^{***}	-18.720^{***}
	(4.590)	(3.651)	(4.321)	(3.681)
High Mean Inst'l Ownership	160.777^{***}	185.030^{***}	115.235^{***}	155.279^{***}
	(21.526)	(23.234)	(22.185)	(21.735)
Connections	-4.921^{**}	1.068	-4.467^{**}	0.394
	(2.291)	(1.033)	(2.145)	(0.958)
$\overline{R}^2$	[0.261]	[0.242]	[0.235]	[0.223]
N	9,727	7,946	9,727	7,946
Many Inst'l Investors × Connections	13.479^{***}	15.868^{***}	14.320^{***}	15.457^{***}
	(4.065)	(2.532)	(3.696)	(2.495)
Many Inst'l Investors	-187.230^{***}	-176.271^{***}	-147.184^{***}	-149.917^{***}
	(18.807)	(17.244)	(16.982)	(16.482)
Connections	-14.807^{***}	-14.637^{***}	-15.103^{***}	-14.872^{***}
	(3.723)	(2.689)	(3.254)	(2.576)
$\overline{R}^2$	[0.271]	[0.236]	[0.239]	[0.213]
N	12,595	10,979	12,595	10,979
High E Index × Connections	4.357	-0.691	6.355^{*}	0.375
	(3.674)	(1.571)	(3.783)	(1.377)
High E Index	-48.518^{***}	-6.024	-52.780^{***}	-18.073
	(16.607)	(12.571)	(16.540)	(11.197)
Connections	-10.770^{***}	-4.462^{***}	-9.677^{***}	-4.663^{***}
	(2.637)	(1.061)	(2.490)	(1.026)
$\overline{R}^2$	[0.278]	[0.223]	[0.260]	[0.212]
N	7,438	8,078	7,438	8,078
High Board Independence × Connections	8.003^{**}	10.813^{***}	9.167^{***}	10.173^{***}
	(3.361)	(1.700)	(3.072)	(1.647)
High Board Independence	-46.639^{***}	-96.185^{***}	-59.983^{***}	-96.074^{***}
	(13.424)	(11.623)	(11.751)	(11.613)
Connections	-15.418^{***}	-11.538^{***}	-14.027^{***}	-11.015^{***}
	(3.006)	(1.809)	(2.406)	(1.562)
$\overline{R}^2$	[0.220]	[0.195]	[0.207]	[0.187]
N	12,593	10,979	12,593	10,979

* denotes significance at a 10% level, ** at a 5% level, and *** at a 1% level.

Table D.13: Firm-level regressions with alternate variable specifications. The first row interacts Beta with Connections but retains Return Volatility as a control. The second row considers the G Index instead of the E Index. Data needed to compute the G Index are only available through 2007.

LHS	Inside Ownership (basis points)		Direct Compensation (thousands)	
RHS	1999-2007	2008-2015	1999-2007	2008-2015
High Beta	2.280	2.774*	135.413*	19.596
× Connections	(2.970)	(1.436)	(69.880)	(29.570)
High Beta	−25.741**	−44.046***	434.195**	583.991***
	(13.079)	(6.425)	(175.551)	(92.167)
Connections	−10.829***	−5.764***	293.556***	201.439***
	(2.157)	(1.128)	(64.044)	(11.339)
$\overline{R}^2$	[0.231]	[0.191]	[0.370]	[0.398]
N	12,325	10,790	12,325	10,790
High G Index	7.857**	-	−196.024**	-
× Connections	(3.388)	-	(96.387)	-
High G Index	−89.528***	-	310.617	-
	(16.413)	-	(196.981)	-
Connections	−12.424***	-	459.542***	-
	(2.706)	-	(75.237)	-
$\overline{R}^2$	[0.289]	-	[0.375]	-
N	7,438	0	7,438	0

* denotes significance at a 10% level, ** at a 5% level, and *** at a 1% level.