# Competition for Managers, Corporate Governance and Incentive Compensation

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### Abstract

We propose a model in which firms compete to attract better managers by using corporate governance as part of an optimal executive compensation scheme. Higher governance decreases the cost of taking disciplinary actions against managers, but when managerial talent is scarce, competition among firms to attract better managers implies that firms under-invest in governance. The reason is that managerial rents are determined by the managerial reservation value when employed elsewhere. Hence, if a firm chooses a high level of governance, the remuneration package and pay for performance must increase to meet the managerial reservation value. We show empirically that a firm's executive compensation is not chosen in isolation but it also depends on other firms' governance. We document that firms use (weak) corporate governance as a substitute for executive compensation to attract better managers. In particular, better managers are matched to firms with weaker corporate governance.

# 1   Introduction

The public outcry against the pay of investment bankers following the crisis of 2007-09 is just the latest manifestation of the ongoing debate on executive pay that has kept academics busy for the last twenty years (at least since Jensen and Murphy, 1990). The critical questions are always the same: Why are executives (and other professional individuals) paid so much? Are they paid like bureaucrats, that is, independently of their performance? Or are they bearing the consequences of their poor performance? What can be done to make them internalize the costs of poor performance?

In the first part of the paper, we develop a theoretical model to explain how competition among firms to attract better managers plays a crucial role in answering these question. In our model, firms can incentivize managers to take the right action by (i) using pay for performance, that is, rewarding them when things go well, and (ii) using corporate governance, that is, punishing them when things go badly. When firms do not have to compete with each other to attract top quality managers, firms choose a combination of pay for performance and corporate governance that just meets the manager incentive compatibility condition.

However, when managerial talent is rare and firms have to compete to attract one of the few top quality managers, firms depart from the optimal level of corporate governance. This result follows from the inability of a firm to affect top quality managers' rents as these managers can always work for another firm. In other words, the rents for top-quality managers are exogenous for a given firm. Therefore, it becomes inefficient for a firm that wants to employ a top quality manager to invest in setting high levels of corporate governance as it would have to match the manager's reservation wage by increasing her pay for performance. In other words, shareholders end up bearing the costs of implementing corporate governance without enjoying its benefits in the form of lower executive pay.

Even if firms are identical ex ante, we show that the market equilibrium features separation between two groups of firms: some hire the better-quality managers, pay them a rent and underinvest in corporate governance; the rest of the firms hire the worse-quality managers, and choose the optimal investment in corporate governance. The former ones optimally choose to be larger than the latter ones, although they are smaller than they would be with no competition for managerial talent. The rent paid to better-quality managers is exactly equal to the difference in profitability

between better and worse managers. In short, the scarcity of managerial talent leads to managers accruing as rents all the surplus generated by their superior talent.

Our model delivers three main empirical predictions that are tested in the second part of the paper. First, the model builds on the idea that firms with poor corporate governance generate a negative spillover for other firms. Specifically, because of their poor corporate governance, these firms must offer higher wages than other firms to managers in order to incentivize them. When managerial talent is scarce, the option to work for firms with weaker governance raises the participation constraint for managers and forces all firms to pay managers more. Hence, our first empirical prediction is that executive compensation in a firm is decreasing in the quality of firm's own corporate governance and in the quality of governance of its competitors.

Second, a critical assumption in the model is that governance is chosen as part of an optimal incentive contract offered to a manager. In particular, corporate governance and executive compensation are substitutes from the firm's standpoint. Hence, our second prediction is that executive compensation and governance should mainly change when new managers are hired; and in those cases increases in corporate governance should be correlated with decreases in executive compensation and vice versa.

Third, the main result of the model is that, in equilibrium some firms attract better managers by paying them more and choosing more lax governance standards; others attract weaker managers by paying them less and choosing stricter corporate standards. If we can find a way to measure managerial talent, our main empirical prediction is that better quality managers are matched to firms that have weaker governance and receive higher pay.

We test these predictions on a dataset that combines balance-sheet data from Compustat on unregulated firms in the United States over the period 1993 to 2007, data from ExecuComp on the compensation they award their CEO's and on their turnover, and firm-level corporate governance indices constructed by Gompers et al. (2003) and Bebchuk et al. (2008). We find evidence in favor of all three our predictions.

First, we show that the choice of corporate governance in one firm has a positive spillover on other firms: the executive compensation in a given firm and year is decreasing in the lagged score of corporate governance in the firm itself *and* in the governance score of matched competitors. In particular, we identify matched competitors in two ways. One, we identify similar size firms in other industries and

employ the transition matrix of CEO mobility across industries of Cremers and Grinstein (2009) to construct each CEO's outside option and the corresponding corporate governance. Second, we verify that our results are robust to simply considering the corporate governance of relatively worse-governed firms in the same industry. Also, the result that governance of competitors affects a firm's executive compensation holds even after controlling for other determinants of executive compensation, such as market capitalization (as suggested by Gabaix and Landier, 2008).

Second, we find evidence consistent with the idea that governance is chosen as part of the incentive contract offered to newly hired managers. We find that executive compensation of the newly employed CEO differs from the previous CEO compensation only if corporate governance is changed contemporaneously. Consistent with our model's implications, we observe that in these cases there is an increase in total compensation when there is a decrease in the quality of corporate governance. This is an important result in that it helps us rule out the alternative explanation based on Hermalin and Weisbach (1998) and Bebchuk and Fried (2004) that we are picking up an association between higher compensation and weak governance that is due to CEO entrenchment. This is because by construction, CEO tenure is zero at the time of new hires.

Third, we show that the allocation of CEOs and firms is consistent with the matching equilibrium predicted by the model. Our empirical strategy follows a two-stage approach. In the first stage, managerial talent is measured as the CEO fixed effect in a regression of firm's operating performance on several control variables. That is, we extract a CEO's talent relative to other CEOs hired by the firms where the CEO was hired. In the second stage, we correlate these predicted measures of managerial talent with corporate governance, executive compensation, and Tobin's q. We find that better managers are employed by firms with *weaker* governance and higher Tobin's q, and are paid more, effects that are consistent with the model's predictions. Once again, we find these associations even after controlling for CEO tenure.

The evidence from the three tests taken together provides strong support for our theoretical starting point that competition amongst firms for scarce managerial talent is an important determinant of observed executive compensation and governance practices.

The rest of the paper is structured as follows. Section 2 discusses related literature. Section 3 presents the model. Section 4 presents the empirical evidence

for our testable hypotheses. Section 5 presents robustness checks and alternative explanations. Section 6 concludes.

## 2   Related Literature

The paper is related to a large literature on executive compensation and corporate governance. The canonical view on the executive compensation problem is that it is the solution of the principal-agent problem between a set of risk-neutral investors and a risk-averse manager (Holmstrom, 1979). In this setting, pay for performance solves the trade-off between the need to incentivize the manager and the desire to insure him against idiosyncratic risk. According to this view, a firm chooses low- or high-powered compensation packages depending on the relative importance of managerial risk-aversion and incentives. Starting with Jensen and Murphy (1990), skepticism grew among academics on whether this view provides a satisfactory explanation for the recent trends in executive compensation. Three main economic views have been suggested to overcome these limitations and explain executive compensation trends: managerial rent extraction, firm heterogeneity (mainly size), and the specificity of managerial skills.

The first explanation links executive compensation to managers' ability to extract rents (see Bertrand and Mullainathan 2001, Bebchuk and Fried 2004, Kuhnen and Zwiebel 2009). According to this view, weaker corporate governance allows managers to skim profits from the firm, thereby leading to higher executive compensation. Even though this is currently the most popular explanation for the high executive pay, it begs several questions: If better corporate governance is the solution to excessive executive compensation, why don't all shareholders demand better corporate governance? Moreover, why are CEOs of well-governed firms also paid a lot? In our model, we treat corporate governance as a choice of the firm. We show that better corporate governance could indeed reduce managerial pay. However, competition for managers among firms limits the ability of firms to use corporate governance as an effective tool to reduce managerial rents. Specifically, when there is an active market for scarce managerial talent, firms are forced to choose weaker corporate governance and leave rents for managers. In this respect, our model's contribution is to clarify the link between corporate governance, pay for performance and scarcity of managerial talent.

The second explanation relates the level of pay to exogenous heterogeneity in firm

size. Gabaix and Landier (2008), Terviö (2008), and Edmans, Gabaix and Landier (2009) present matching models à la Rosen (1981) in which the differences in size across firms predict some of the well documented empirical facts on executive compensation. Gabaix and Landier (2008) and Terviö (2008) show that the empirically documented positive cross-sectional correlation between firm size and compensation may optimally arise in a setup where managerial talent has a multiplicative effect on firm performance and managers are compensated according to their increase in productivity as better managers will be matched to larger firms. Similarly, Edmans, Gabaix and Landier (2009) present a model in which both the low ownership and its negative correlation with firm size arise as part of an optimal contract. Our model improves on this part of the literature because we treat size as an endogenous variable. In particular, we explore the impact of the extent of real investment on the market for managerial talent and corporate governance. We show that investment size may be a viable way to attract better managers and thereby determine the equilibrium choice of size by firms. We find that indeed firms that invest more will attract better managers but will choose worse corporate governance. Conversely, firms that invest less will attract worse managers and will choose better corporate governance.

Third, academics have related the recent rise in compensation to changes in the types of managerial skills required by firms. For example, Murphy and Zábojník (2007) argue that CEO pay has risen because of the increasing importance of general managerial skills relative to firm-specific abilities. Supportive evidence is provided by Frydman and Saks (2008). Our model suggests that an increase in competition for managers may be the reason for the large increase in executive compensation over the last three decades.

In our model, managers can be incentivized to behave in the interest of their shareholders through a combination of incentive contracts and corporate governance, where governance acts as a substitute for compensation, as shown by Core et al. (1999) and Fahlenbrach (2009). Fahlenbrach (2009), in particular, finds that there is more pay for performance in firms with weaker corporate governance, as measured by less board independence, more CEO-Chairman duality, longer CEO tenure, and less ownership by institutions. Similarly, Chung (2008) studies the adoption of the Sarbanes-Oxley Act of 2002 and shows that firms required to have more than 50% of outside directors (interpreted as an improvement in shareholder governance) decreased significantly their CEO pay-performance sensitivity relative to the control group.

The paper is also related to a growing literature on spillover and externality effects in corporate governance initiated by Hermalin and Weisbach (2006), who provide a framework for assessing corporate governance reforms from a contracting standpoint and justify the need for regulation in the presence of negative externalities arising from governance failures. Acharya and Volpin (2010) and Dicks (2009) formalize this argument in a model where the choice of corporate governance in one firm is a strategic substitute for corporate governance in another firm. As in this paper, the externality therein is due to competition for managerial talent among firms. In a somewhat different context, Nielsen (2006) and Cheng (2009) model the negative externalities caused by earnings manipulation across firms. Nielsen (2006) considers a setting where governance improves publicly disclosed information about a firm and facilitate managerial assessment in competing firms. Cheng (2009) shows that earnings management in one firm may cause earnings management in other firms in the presence of relative performance compensation.

# 3   Theoretical Analysis

The basic idea is that firms compete for managers by choosing governance as part of an optimal incentive contract. In the presence of competition for scarce managerial talent, the only symmetric equilibrium features mixed strategies, whereby firms are indifferent between hiring a better manager and paying him more and hiring a worse manager and paying him less. In this setup, we derive endogenously the optimal choice of governance and firm size.

## 3.1   Setup of the Model

Consider the problem of firms looking to hire professional managers. Let us assume that there are $n$ firms and $m$ managers. There are two types of managers, $m_H$ are high-quality, well established managers with a strong track-record ($H$-type), and $m_L$ are low-quality, possibly less-experienced managers ($L$-type): type $H$ have high productivity $e_H = 1$, while type $L$ have low productivity $e_L = e < 1$. We assume that the number of $L$-type managers is greater than the number of firms: $m_L > n$. However, the $H$-type managers may or may not be numerous enough to be hired by all firms: in what follows, we will consider the case when $m_H < n$ so that there is competition for managerial talent. In the extension, we discuss what happens when $m_H \geq n$ and thus there is no effective competition for managerial talent.

All firms are ex-ante identical and have to make the following decisions (described in Figure 1):

At $t = 0$, firms are set up: the founder chooses the level of investment $I$ at a cost $rI$, where $r \geq 1$ is the gross rate of return demanded by lenders.

At $t = 1$, firms choose professional CEOs from a pool of candidates of observable quality $\widetilde{e} \in \{e, 1\}$. Managers are risk averse and have the following utility function:

$$U = E(w) - \frac{1}{2}A \, Var(w) \tag{1}$$

where $A \geq 0$ is the coefficient of absolute risk aversion, $w$ is the (random) total pay received by the manager. Managers have an outside option which is normalized to 0. At this stage, firms make offers and managers choose. If a manager is not employed at the end of this stage, he receives the reservation utility equal to 0. Similarly, a firm that does not employ any managers receives an output equal to 0.[1]

The founder offers a contract of the following general form: a fixed payment $b$, which is paid independently of performance (the signing bonus); a performance-related bonus $p$, which is contingent on the verifiable output $X$ and paid at $t = 4$; and a severance payment $s$, which is conditional on the manager leaving the firm voluntarily at $t = 3$.[2] Moreover, as part of the incentive package, at $t = 1$ the firm also chooses the level of corporate governance $g \in [0, 1]$, which comes at a cost $kIg^2/2$. This cost reflects the costs of investing in auditing and information technology to make sure that the board of directors can detect and replace poorly performing managers. It also captures the indirect costs of hiring truly independent directors rather than directors who are better at advising the CEO on strategic decisions. The benefit of corporate governance is that it reduces the cost of firing the manager in the future, if shareholders desire to do so, and thus it reduces managerial entrenchment. For instance, governance increases coordination among shareholders and makes board of directors more effective and independent. Specifically, we assume that shareholders receive a fraction $g$ of the surplus from renegotiation (replacement decision at $t = 3$) and the manager a fraction $1 - g$.

At $t = 2$, managers choose action $A \in \{M, S\}$, where choice $M$ generates a payoff $X = 0$ for the firm and a private benefit $B$ (for sure) for the manager; while action $S$

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[1] As a tie-braking assumption, we assume that in case of indifference firms prefer to hire a $H$-type manager.

[2] In this we follow Almazan and Suarez (2003), who show that severance payments are part of an optimal incentive scheme for managers.

generates a payoff $X = Y(I)$ with probability $e$ and $X = 0$ otherwise, and no private benefits for the manager. The choice of action is not observable by shareholders.[3]

At $t = 3$, shareholders and managers observe a perfectly-informative signal $\widetilde{x}$ on the expected output $X$. After observing this signal, the manager can choose to leave voluntarily, in which case he is paid the severance pay $s$. Otherwise, he can bargain with the firm, in which case the firm and the manager receive a fraction $g$ and $1 - g$ of the surplus, respectively, as explained earlier. If there is a turnover, a replacement manager produces at $t = 4$ an output $y_T(I) = \delta I$ net of his compensation, where $\delta \in (0, 1)$.

At $t = 4$, output is realized and distributed; and $p$ is paid.

We make the following technical assumptions:

(i) Types are observable: this assumption is relaxed in an extension.

(ii) $k > \delta$: to ensure an internal solution for the choice of governance.

(iii) $e \geq 1 - \frac{1}{2AB}$: to ensure that there is a solution to the incentive problem of the manager.

(iv) $Y(I) > I$, $Y' > 0$, $Y'' < 0$, $\lim_{I \to 0} Y'(I) = \infty$, $\lim_{I \to \infty} Y'(I) = 1$: to ensure an internal solution for the choice of investment.

(v) The signal $\widetilde{x}$ at $t = 3$ is perfectly informative: this assumption can be relaxed without changing the substance of the paper.

## 3.2 Competition for Managers

To find the equilibrium, we proceed by backwards induction, starting from the replacement of incumbent manager at $t = 3$.

### 3.2.1 Severance Payment and Turnover

Firing the manager generates an output $\delta I < Y(I)$ (from the replacement manager). Hence, the manager will not be fired if $\widetilde{x} = Y(I)$. Now, consider the case in which $\widetilde{x} = 0$. In this case, since $\delta I > 0$ there is a case for managerial turnover (as without

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[3] An alternative interpretation of the $L$-type managers is that they are managers with uncertain productivity. With probability $e$, they are as good as $H$-type managers. Otherwise, they produce 0.

it both the firm and the manager receive a payoff of 0).

If $s \geq (1 - g)\delta I$, there is a voluntary turnover and the manager leaves with the severance pay $s$. If $s < (1 - g)\delta I$, there is a forced turnover but the manager extracts a compensation equal to $(1-g)\delta I$. We focus on renegotiation-proof contracts. Hence, we restrict the choice of contracts such that $s = (1 - g)\delta I$ must hold in equilibrium. The firm's payoff if $\tilde{x} = 0$ is therefore $g\delta I$.

In the timing of the compensation presented above, severance payments are agreed upon employment of the manager and are not an outcome of the negotiation happening when the manager is fired. This is consistent with empirical evidence from Rusticus (2006) that shows that severance agreements are agreed upon when the CEO is appointed.

### 3.2.2  Compensation Contract and Corporate Governance

Now consider the firm's choice of incentive contract and corporate governance at $t = 1$. Given that types are observable, firms offer a menu of contracts $(b_i, g_i, p_i)$ for each type $i = \{H, L\}$. Each firm advertises two jobs, one for $L$-type managers and one for $H$-type managers. Managers apply for the jobs. After the manager's choices, firms look at the managers who have accepted their offers. If they have two managers to choose from, they choose whom to employ between the $L$- and the $H$-type who have accepted their offer. If they have only one manager to choose from, they hire him. Managers who are rejected and firms without a manager will stay on the market and match in the next round. We assume market clearing happens instantaneously and therefore we ignore discounting.

To solve for the choice of contracts, first we need to derive the manager's incentive compatibility and participation constraint. Starting with the incentive compatibility condition, if the manager chooses action $A = M$, output will always equal 0 and his utility equals

$$U(M) = b_i + (1 - g_i)\delta I + B$$

If he chooses action $S$, then his utility equals

$$U(S) = b_i + (1 - g)\delta I + e_i\left[p_i - (1 - g_i)\delta I\right] - \frac{1}{2}Ae_i(1 - e_i)\left[p_i - (1 - g_i)\delta I\right]^2$$

Hence, we can derive the incentive compatibility (IC) condition $U(S) \geq U(M)$ as follows

$$\left[p_i - (1 - g_i)\delta I\right] - \frac{1}{2}A(1 - e_i)\left[p_i - (1 - g_i)\delta I\right]^2 \geq \frac{B}{e_i} \tag{2}$$

The corresponding participation constraint (PC) is

$$b_i + (1 - g_i)\delta I + e_i[p_i - (1 - g_i)\delta I] - \frac{1}{2}Ae_i(1 - e_i)\left[p_i - (1 - g_i)\delta I\right]^2 \geq \overline{u}_i \quad (3)$$

where $\overline{u}_i$ is manager's $i$ reservation utility. It is useful to rewrite the (IC) and (PC) conditions in terms of the *net* incentive contract $\xi_i \equiv [p_i - (1 - g_i)\delta I]$: the IC condition becomes

$$\xi_i - \frac{1}{2}A(1 - e_i)\xi_i^2 \geq \frac{B}{e_i} \quad (4)$$

while the PC condition takes the form

$$b_i + (1 - g_i)\delta I + e_i\xi_i - \frac{1}{2}Ae_i(1 - e_i)\xi_i^2 \geq \overline{u}_i \quad (5)$$

Then, we can solve the second order equation in $\xi_i$ to find the IC-compatible incentive contract

$$\xi_i = \begin{cases} \frac{1 - \sqrt{1 - 2AB\frac{1-e}{e}}}{A(1-e)} \equiv \xi(e) & \text{if } i = L \\ B & \text{if } i = H \end{cases}$$

Because of the definition of $\xi_i$, the corresponding pay for performance is:

$$p_i = (1 - g_i)\delta I + \xi_i. \quad (6)$$

Given that there are lots of $L$-type managers, there is no competition for them. Therefore, the participation constraint is redundant and the incentive compatibility condition is strictly binding for the $L$-type managers. Hence,

$$p_L = (1 - g)\delta I + \xi(e)$$

and $b_L = 0$.

Without loss of generality, we can also assume that the IC condition for the $H$-type manager is binding. The intuition for this result is that for any effort $e < 1$, the pay for performance $p$ is chosen at the lowest possible level since paying a higher $p$ is more expensive for the firm than paying a higher $b$. Specifically, a firm which wants to increase the manager's utility by \$1 in certainty equivalence, is better off by increasing $b$ than $p$ (as \$1 increase in certainty equivalence terms costs exactly \$1 in expectation when done through $b$ and more than \$1/$e$ > \$1 if done through $p$). We assume that this argument also applies for $e = 1$. However, in this case, managers are indifferent between $b$ and $p$ as there is no uncertainty on their productivity. Therefore, $p_H$ is set to satisfy the incentive compatibility condition with equality:

$$p_H = (1 - g)\delta I + B.$$

Importantly, when analyzing the $H$-type managers, we should take account of the fact that they are rare. Hence, a firm that wants to hire them faces a non-trivial participation constraint, as the managers' outside option is to work for another firm. Let us denote with $\overline{u}_H$ the firm's expectation of the lowest utility that a $H$-type manager receives: in other words, $\overline{u}_H$ is the outside option of the worst off $H$-type manager whom the firm could target. We focus on symmetric equilibria. Hence, all $H$-type managers share the same $\overline{u}_H$.

Given these considerations, we can prove the following result:

**Lemma 1:** *(i) If $\overline{u}_H < (1-e)Y(I) + e[\delta I + \xi(e)] - \frac{\delta^2 I}{2k}$, then firms prefer to hire a $H$-type manager, by offering an incentive contract*

$$(b, g, p) = (\overline{u}_H - B - \delta I, 0, \delta I + B)$$

*with associated profit*

$$\Pi(I, \overline{u}_H) = Y(I) - \overline{u}_H.$$

*(ii) If $\overline{u}_H > (1-e)Y(I) + e[\delta I + \xi(e)] - \frac{\delta^2 I}{2k}$, then firms prefer to hire a $L$-type manager, by offering an incentive contract*

$$(b, g, p) = \left(0, \frac{\delta}{k}, (1 - \frac{\delta}{k})\delta I + \xi(e)\right)$$

*with associated profit*

$$\Pi(I) = e[Y(I) - \delta I - \xi(e)] + \frac{\delta^2}{2k}I.$$

*(iii) Finally, if $\overline{u}_H = (1-e)Y(I) + e[\delta I + \xi(e)] - \frac{\delta^2 I}{2k}$, then firms are indifferent between the two types.*

**Proof:** See Appendix.

In Figure 2, we show the choice of manager in the space $(I, \overline{u}_H)$: the case of indifference between hiring an $H$- or a $L$-type manager is represented by the increasing and concave line $\overline{u}_H = (1-e)Y(I) + e[\delta I + \xi(e)] - \frac{\delta^2 I}{2k}$. Consider two alternative values of $\overline{u}_H$. If $\overline{u}_H$ is low ($\overline{u}_H = \overline{u}_H^1$ in the figure), then hiring a $H$-type manager is quite cheap and thus all firms, independently of their investment, will do so. If instead $\overline{u}_H$ is high ($\overline{u}_H = \overline{u}_H^2$ in the figure), then hiring a $H$-type manager is quite expensive. Therefore, all firms with $I < \widehat{I}$ will be above the indifference curve and

would prefer to hire a low quality manager as their reservation value for a $H$-type manager is below the other firms. In contrast, a firm with high investment (at a level $I > \widehat{I}$ in the figure) would prefer to hire the $H$-type manager. We have therefore shown that high-investment firms will beat the competition of low-investment firms for $H$-type managers. This is akin to the point made by Gabaix and Landier (2008): as in Figure 2, in their model too larger firms attract better managers and pay them more. Crucially, we also show that larger firms choose *lower* corporate governance.

### 3.2.3 Choice of Investment

We now analyze the choice of firm's investment, or in other words, firm size:

$$\max_I \ \Pi\left(I, \overline{u}_H\right) - rI$$

We will show that there is no symmetric equilibrium in pure strategies. The intuition is as follows: in a pure strategy equilibrium all firms would choose the same investment $I$, they would hire the $H$-type with probability $\mu$ and would be indifferent between hiring a $H$-type or a $L$-type in equilibrium. However, because the optimal choice of investment for each type of manager is different, firms have an incentive to deviate from the symmetric equilibrium to target a specific type ($H$ or $L$) by choosing the optimal level of investment for that type.

However, there is an asymmetric equilibrium (in pure strategies) in which a fraction $\mu$ of firms target the $H$-types by choosing $I = I_H^*$ and $(b, g, p) = (\overline{u}_H - B - \delta I, 0, \delta I + B)$; while the remaining ones target $L$-types and choose $I = I_L^*$ and $(b, g, p) = \left(0, \frac{\delta}{k}, (1 - \frac{\delta}{k})\delta I + \xi(e)\right)$. $H$-types would be paid a rent $\overline{u}_H$ that makes firms indifferent between these two strategies and deviations are not profitable.

Therefore,

**Proposition 1 (Competition for scarce managerial talent)** *The equilibrium choice of governance and investment is: (i) $m_H$ firms choose corporate governance and investment respectively equal to*

$$g_H^* = 0, \quad I_H^* = Y'^{-1}\left(r\right)$$

*and they hire the $H$-type managers with the following incentive contract:*

$$b_H^* = \overline{u}_H - B - \delta I_H^*, p_H^* = \delta I_H^* + B \ ;$$

*(ii) the remaining $(n - m_H)$ firms choose corporate governance and investment equal to*

$$g_L^* = \frac{\delta}{k}, \quad I_L^* = Y'^{-1}\left(\delta + \frac{r}{e} - \frac{\delta^2}{2ke}\right)$$

*and they hire the L-type managers with the following incentive contract:*

$$b_L^* = 0 \ , \ p_L^* = (1 - \frac{\delta}{k})\delta I_L^* + \xi(e) \ ;$$

*where $\overline{u}_H = Y(I_H^*) - e\left[Y(I_L^*) - \delta I_L^* - \xi(e)\right] - \frac{\delta^2}{2k}I_L^* - r\left(I_H^* - I_L^*\right).$*

**Proof:** See Appendix.

The intuition for this most important result of our paper on the labor-market equilibrium when managerial talent is scarce is as follows. When the quality of the manager is observable, the competition among firms to employ better managers implies that they will be given all the additional rents they produce. On the one hand, given that corporate governance is used by firms to reduce managerial rents, it is reasonable to expect that a firm intending to hire a high quality manager will be better off by saving the cost of investing in corporate governance in the first place. On the other hand, a firm that is willing to hire a low quality manager faces no competition and can, therefore, keep the manager down to the incentive compatibility constraint. Hence, these firms will choose the optimal level of corporate governance. Because the firms hiring the $L$-type managers choose the optimal level of governance, they also choose the optimal level of investment (conditional on hiring $L$-type managers). Conversely, the firms hiring the $H$-type managers choose a lower investment than optimal because they choose a lower than optimal level of corporate governance.

## 3.3 Extensions

In this section, we consider two extensions: first, the case in which there is no effective competition for managers as the number of $H$-type managers is greater than the number of firms; and second, the case in which there is no information on managerial quality. In both cases, unlike before, there is no distortion in the choice of corporate governance and investment.

### 3.3.1   No competition

In this section we consider the special case in which $m_H \geq n$ and thus there is no effective competition for managerial talent. Given that there are enough managers of both types, for both types the participation constraint is redundant and the incentive compatibility condition is strictly binding. Hence, the firm's profit can be written as:

$$P_i = \begin{cases} e\left[Y(I) - \delta I\right] - e\xi(e) + g_L \delta I - rI - \frac{kIg_L^2}{2} & \text{if } i = L \\ Y(I) - \delta I - B + g_H \delta I - rI - \frac{kIg_H^2}{2} & \text{if } i = H \end{cases} \qquad (7)$$

Notice that the optimal choice of governance is independent of the manager's type: from the first order condition,

$$g_L = g_H = \frac{\delta}{k}.$$

Also notice that the profits are strictly greater with $i = H$. Hence, all firms hire $H$-types and we obtain the following result:

**Lemma 2:** *The optimal incentive contract is:*

$$b^* = 0, \, g^* = \frac{\delta}{k}, \, p_i^* = \begin{cases} (1 - \frac{\delta}{k})\delta I + \xi(e) & \text{if } i = L \\ (1 - \frac{\delta}{k})\delta I + B & \text{if } i = H \end{cases}$$

*All firms hire H-types for a profit*

$$P(I) = Y(I) - \delta I - B + \frac{\delta^2}{2k}I - rI \qquad (8)$$

At $t = 0$, the founder chooses $I$ to maximize the expected profits:

$$\max_I \ Y(I) - \delta I - B + \frac{\delta^2}{2k}I - rI \qquad (9)$$

so we can solve for the optimal level of investment using the first order condition

$$I^* : Y'(I^*) = \delta\left(1 - \frac{\delta}{2k}\right) + r \ .$$

To summarize our analysis:

**Proposition 2 (No effective competition for managerial talent)** *The   equilibrium choice of investment is:*

$$I^* = Y'^{-1}\left(\delta - \frac{\delta^2}{2k} + r\right).$$

*The corresponding incentive contracts are:*

$$b^* = 0, \; g^* = \frac{\delta}{k}, \; p_i^* = \begin{cases} (1 - \frac{\delta}{k})\delta I^* + \xi(e) & \textit{if } i = L \\ (1 - \frac{\delta}{k})\delta I^* + B & \textit{if } i = H \end{cases}$$

This solution can be considered the benchmark (the first-best case) for the analysis that precedes. In particular, when comparing this benchmark to Proposition 1, we obtain that when there is competition for scarce managerial talent, the $H$-type managers are in firms with lower governance, receive higher bonus, and engage in lower investment, whereas the $L$-type managers are in firms with efficient levels of governance, compensation and investment. These outcomes will form the core of our empirical analysis to follow.

### 3.3.2 Unobservable managerial quality

We have assumed so far that managerial quality is perfectly observable. This is an important assumption but it can be relaxed. The results can be extended to the cases in which there are only imperfect signals about the quality of managers. As long as these signal contain some information, so that the expected productivity of $H$-type managers is strictly greater than the productivity of $L$-type managers, the analysis would be unchanged.

If instead, there are no informative signals about the quality of managers, the results are quite different. In that case, since all managers are ex-ante identical and they are more than the number of firms $(m_H + m_L > n)$, there is no effective competition for managers. Notice that this happens independently of the size of $m_H$ compared to $n$. Hence, the manager's outside option is equal across types and equal to the reservation utility from being unemployed $(\overline{u} = 0)$. The manager's expected profitability is then

$$\frac{m_H}{n} + \frac{m_L}{n} e \equiv \overline{e}$$

Adapting the same analysis done before, we can show the following result:

**Proposition 3 (No information about managerial talent)** *The optimal incentive contract is:*

$$b^* = 0, \; g^* = \frac{\delta}{k}, \; p^* = (1 - \frac{\delta}{k})\delta I + \xi(\overline{e})$$

*and the chosen level of investment is*

$$I^* = Y'^{-1}\left(\delta + \frac{r}{\overline{e}} - \frac{\delta^2}{2k\overline{e}}\right)$$

**Proof:** See Appendix.

Notice that the choice of corporate governance is (on average) higher than in the case with known type and competition among firms for scarce managerial talent. The reason is that with no information there is no effective competition. However, the level of investment is higher than optimal if ex post the firm finds out that the manager is a $L$-type and lower than optimal if the type is $H$.

# 4 Empirical Analysis

In this section, we test some of the empirical predictions of our main model in which managerial talent was assumed to be scarce so that there was effective competition amongst firms for high quality managers. First we develop the three main empirical predictions from the model.

## 4.1 Empirical Predictions

The model is based on the idea that competing firms with poor corporate governance generate a negative spillover for other firms. Specifically, because of their poor corporate governance, these firms must offer higher wages than other firms to managers in order to incentivize them. The option to work for firms with weaker governance raises the level of the participation constraint for managers and forces all firms to pay managers more. Hence, our first test is:

**Prediction 1 (Externality in corporate governance)**: *Executive compensation in a firm is decreasing in the quality of the governance of the firm itself and of its competitors.*

Second, a critical assumption in the model is that governance is chosen as part of an optimal incentive contract offered to a manager of known quality. In particular, corporate governance and executive compensation are substitutes from the firm's standpoint.[4] Hence, our second test is:

**Prediction 2 (Governance as incentive contract)**: *Executive compensation and*

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[4]Formally, from the IC constraint, $p_i = (1 - g_i)\delta I + \xi(e_i)$, so that corporate governance $g_i$ and executive compensation $p_i$ are substitutes.

*governance should mainly change when new managers are hired and contracts written. In such cases, increases in corporate governance should be correlated with decreases in executive compensation and vice versa.*

The main result of the model is that, in equilibrium some firms will attract better managers by paying them more and choosing more lax governance standards; others will attract worse managers by paying them less and choosing stricter corporate standards. Proposition 2 predicts a negative correlation between corporate governance and managerial talent when different firms compete to attract managerial talent; it also predicts a positive correlation between managerial talent and firms' investment opportunities (say, measured by Tobin's $q$) and managerial compensation. The model also predicts the positive correlation between size and managerial compensation already documented by Gabaix and Landier (2008). Assuming that we can find a way to measure managerial talent, our main empirical prediction is:

**Prediction 3 (Matching equilibrium):** *Better quality managers are matched to firms that have weaker governance and receive higher pay.*

In the remaining part of the section, we discuss the econometric methodology, describe the data and then present the results.

## 4.2   Econometric methodology

To test for the presence of spillovers in the choice of corporate governance, we regress total executive compensation of the manager (empirically, the CEO) of firm $i$ at the end of year $t$ not only on a measure of the firm's own corporate governance but also on the corporate governance of the firms that constitute its managers' outside option. We calculate this outside option as follows: we assume that a manager of the firm can find a job in another firm of similar size operating in the same or a different industry according to the CEO transition probabilities across industries produced by Cremers and Grinstein (2009).[5] Further details on how we construct the outside option of each firm's managers are provided along with the data description in Section 4.3.

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[5] Cremers and Grinstein (2009) study CEOs movements for the period between 1993 and 2005 and find that the characteristics of the market for CEOs differs across industries. Specifically, the proportion of CEOs coming from firms in other sectors significantly varies accross industries, indicating that there is not a unique pool of managers that all firms compete for, but instead many pools specific to individual industries.

Hence, to test the first prediction, we estimate the following equation:

$$\text{Compensation}_{it} = \begin{aligned} &\alpha_G \times \text{Governance}_{it-1} + \alpha_E \times \text{Outside Governance}_{it-1} + \\ &+ \beta X_{it-1} + \varphi_{ind/i} + \lambda_t + \varepsilon_{it} \end{aligned} \quad (10)$$

where $X_{it-1}$ are time variant firm-specific controls that could affect compensation and $\lambda_t$ and $\varphi_{ind/i}$ are time and either industry or firm dummies, respectively. Our model would predict that both $\alpha_G$ and $\alpha_E$ should be negative. The first prediction ($\alpha_G < 0$) captures the idea that corporate governance is a substitute for executive compensation. The second prediction ($\alpha_E < 0$) reflects the idea that there is a positive externality in the choice of corporate governance across firms: the firm can pay the CEO less if the outside option is worse. To make sure that the governance channel is independent of the effect of size uncovered by Gabaix and Landier (2008), our time variant firm-specific controls ($X_{it-1}$) include the market capitalization of firm $i$ and the market capitalization of the firm that is the manager's outside option. The inclusion of year dummies is to capture any economy-wide time pattern in managerial compensation.

Our second test is to check whether governance is chosen as part of an optimal incentive contract, in particular, as a substitute for executive compensation. For this purpose, we study the changes in compensation when firms change managers and/or corporate governance. We estimate the following specification:

$$\text{Compensation}_{it} = \begin{aligned} &\alpha_C \times \Delta\text{Governance}_{it} + \alpha_T \times \text{Turnover}_{it} + \\ &+ \alpha_S \times \text{Turnover}_{it} \times \Delta\text{Governance}_{it} + z_i + d_t + \varepsilon_{it} \end{aligned} \quad (11)$$

where $\Delta\text{Governance}_{it}$ is the change in corporate governance during year $t$, $\text{Turnover}_{it}$ is a dummy variable that takes value 1 if there is a change of CEO during year $t$ and 0 otherwise, $z_i$ is a firm fixed effect, and $d_t$ is a year dummy. Our model would predict that $\alpha_C$ and $\alpha_T$ should not be statistically different from zero, while $\alpha_S < 0$. The first prediction ($\alpha_C = 0$) follows from the fact that, without a turnover, governance should already be at the optimal level for the incumbent CEO. Hence, on average changes in governance should not have any effects on total compensation. Similarly, the second prediction ($\alpha_T = 0$) follows from the fact that, if there is no change in governance, the replacement CEO should be of similar quality as the incumbent CEO. Hence, there should be no need to change compensation. The critical prediction is the third one ($\alpha_S < 0$): this is a clear test of the assumption that governance and compensation are substitutes. In fact, according to the model, we expect to see an increase in compensation only when there is a turnover and a contemporaneous decrease in corporate governance.

Finally, to be able to test our main empirical prediction, we need to develop a measure of managerial ability ($\gamma_j$). Then, we could study the equilibrium relationship between corporate governance and managerial ability measures:

$$\text{Governance}_{it}^{j} = \beta_G \times \gamma_j + \chi_t + \xi_{it} \tag{12}$$

where $\chi_t$ is a year dummy, with our model predicting $\beta_G < 0$. However, obtaining this measure $\gamma_j$ requires that we take into account both the presence of endogenous manager-firm matching and the low managerial mobility across firms. If we had a large set of managers randomly moving across a limited set of firms, we could obtain a measure of managerial ability to test our model via the regression

$$\text{Firm Performance}_{it} = \beta X_{it} + \delta_t + \gamma_j + \varepsilon_{it} \tag{13}$$

where $\delta_t$ is a year dummy; Firm Performance$_{it}$ would be any adequate firm performance measure; $X_{it}$ would be a set of time variant and time invariant controls that affect the performance of firm $i$; and $\gamma_j$ would be manager fixed effects, our measure of managerial ability. In this case, the identification of $\gamma_j$ would arise from the difference in performance of firms employing manager $j$ when they employ $j$ compared to when they don't. The random assignment and mobility across firms would ensure that managers are employed in a wide selection of firms and so all managers would face the same average firm quality over their life.

The main identification problem with this approach arises from the fact that firms differ along dimensions other than the CEO they employ. Suppose that a subset of firms has better performance than the rest of firms, for instance, because different industries have different returns on assets. Then, if our governance measure also changes for each of these subset of firms, we could find a spuriously negative coefficient in regression (12). To correct for this problem, we need to control for industry or firm dummies in regression (13). However, we should bear in mind the implications these dummies will have for regression (12). If the average managerial quality differs across subsets of firms, the estimated $\widehat{\gamma}_j$ would not be comparable across subsets as they would be contaminated by the different mean of managerial ability for each subset.

The following example may clarify this point. Suppose firm $i = 1$, in industry $h = 1$, employs managers $j = 1$ and $j = 2$; and, firm $i = 2$, in industry $h = 2$, employs managers $j = 3$ and $j = 4$. Suppose that managers 1 to 4 are ordered from better to worse, i.e. better managers work in industry 1. If we run regression (13) including

industry dummies, we could find that $\widehat{\alpha}_1 > \widehat{\alpha}_2$; $\widehat{\gamma}_1 > 0 > \widehat{\gamma}_2$ and $\widehat{\gamma}_3 > 0 > \widehat{\gamma}_4$; leading us to the wrong conclusion that manager 2 is worse than manager 3. Only high managerial mobility across industries would ensure that all managers face the same $\alpha_h$ over their life and so their $\gamma$'s are comparable. In short, when using regression (13), a given $\gamma_j$ can only be compared with managerial talent estimates of other managers that worked in a firm that could have hired manager $j$. Obviously, some firms attract better managers than others.

Thus, the crucial identification strategy for our model is that the firm could have attracted any other manager in their sample "subset" if it wanted. Cremers and Grinstein (2009) document that most of the managerial mobility takes place within an industry so industry dummies constitute a natural starting point. When deciding between industry or firm dummies, we face a trade off. On the one hand, introducing industry dummies may imply that different unobserved firm characteristics that allow firms to recruit better managers within an industry may distort our results if these unobserved characteristics are related to corporate governance. On the other hand, employing the most encompassing identification of unobserved firm characteristics, i.e., firm fixed effects, implies that managerial talent cannot be estimated when there is no managerial mobility for a given firm. Given these trade-offs, we show results under both specifications.

To estimate regression (13), we follow Bertrand and Schoar (2003) and Graham, Li and Qiu (2008) and compute the (unobserved) CEO fixed effect on performance, as measured by return on assets. Precisely, we estimate

$$ROA_{it}^j = \beta X_{it}^j + \delta_t + z_{ind/i} + \widetilde{\gamma}_j + \varepsilon_{it}, \tag{14}$$

where $ROA_{it}^j$ stands for return on assets for firm $i$ in period $t$. Throughout the section, we use superscript $j$ to indicate that manager $j$ was working for firm $i$ during year $t$. $X_{it}^j$ are some time variant firm characteristics that include size, book leverage, cash, interest coverage, dividend earnings, Tobin's $q$ and governance measures. $\delta_t$ are time fixed effects. $z_{ind/i}$ are either industry ($ind$) or firm ($i$) level dummies, respectively. The parameter $\widetilde{\gamma}_j$ is a fixed effect for a CEO-firm match, i.e., a dummy variable that takes value one when a given CEO worked for a given firm and zero otherwise. This is our measure of managerial ability as it captures the unobserved (and time invariant) managerial effect on return on assets. As we have discussed above, $\widetilde{\gamma}_j = \gamma_j - \overline{\gamma_j}$ or, in words, $\widetilde{\gamma}_j$ is the difference between the ability of CEO $j$ and average CEO ability for the industry or the firm. Hence, $\widetilde{\gamma}_j$ does not capture absolute CEO ability, but *relative* CEO ability. If return on assets is different from the value predicted from its

time varying and time invariant characteristics while a specific CEO was employed, then we assume this is due to the CEO ability.

We use the estimated fixed effects $\widehat{\widehat{\gamma}}_j$ as regressors in the following specification:

$$\text{Governance}_{it}^j = \beta_G \times \widehat{\widehat{\gamma}}_j + \chi_t + z_{ind/i} + \xi_{it} \tag{15}$$

where $\text{Governance}_{it}^j$ is a measure of corporate governance, $\widehat{\widehat{\gamma}}_j$ are the CEO-firm match coefficients estimated from regression (14) and $\chi_t$ and $z_{ind/i}$ are time and either industry ($ind$) or firm ($i$) dummies, respectively. Our model would predict $\beta_G < 0$. Time dummies should control for any time pattern in the governance measure while industry and firm dummies control for the average quality of CEOs hired in a given industry or firm. These are crucial for our analysis since we can only analyze governance up to the reference subsample average. Additionally, regression (15) presents a problem of generated regressors. We partially correct for this problem by adjusting the weight of each observation by the inverse of the $\widehat{\widehat{\gamma}}_j$ standard error from the first-stage estimation.

There are two additional empirical implications of our model, which can be tested is a similar fashion. First, we expect that better managers are paid more:

$$\text{Total Compensation}_{it}^j = \beta_C \times \widehat{\widehat{\gamma}}_j + \chi_t + z_{ind/i} + \varsigma_{it} \tag{16}$$

with $\beta_C > 0$. Second, given that they invest less than is optimal, we expect firms with better managers to have greater marginal value of investment (or greater marginal $q$), which can be proxied by the Tobin's $q$:

$$\text{Tobin's q}_{it}^j = \beta_Q \times \widehat{\widehat{\gamma}}_j + \chi_t + z_{ind/i} + \nu_{it} \tag{17}$$

with $\beta_Q > 0$.

To sum up, we test the main prediction of the model by running a within-firm (or within-industry) two-stage analysis. In the first stage, we obtain from specification (14) individual CEO skills relative to the other CEOs employed by the firm (or the industry). In the second stage, we run regressions (15), (16) and (17) to test whether these relative CEOs abilities are correlated with corporate governance, total compensation and investment opportunities, as predicted by our model.

## 4.3   Data description

In this section we describe the data used in our empirical tests.

We use firm-level financial variables from the annual Compustat database and follow Bertrand and Schoar (2003) for most of its specifications: *ROA* is the ratio of EBITDA (item `ib`) over lagged total assets (item `at`); *Cash* is cash and short-term investments (item `che`) over net property, plant, and equipment at the beginning of the fiscal year (item `ppent`); *Interest Coverage* is earnings before depreciation, interest, and tax (item `oibdp`) over interest expenses (item `xint`) ; and *Dividend Earnings* is the ratio of the sum of common dividends and preferred dividends (items `dvc` and `dvp`) over earnings before depreciation, interest, and tax (item `oibdp`) . We define *Book Leverage* as the ratio of long and short term debt (items `dltt` and `dlc`) to the sum of long and short term debt plus common equity (items `dltt`, `dlc` and `ceq`) and Tobin's *q* as the ratio of firm's total market value (item `prcc_f` times the absolute value of item `csho` plus items `at` and `ceq` minus item `txdb`) over total assets (item `at`). *Market Cap* is the firm's total market value (item `prcc_f` times the absolute value of item `csho` plus items `at` and `ceq` minus item `txdb`). All variables are winsorized at the 1 percent level.

As usual, we exclude financial, utilities and governmental and quasi governmental firms (SIC codes from 6000 to 6999, from 4900 to 4999 and bigger than 9000; respectively) both because their measure of return on assets may not be appropriate and/or because their competition for managerial talent may be distorted. Given that Cremers and Grinstein (2009) data is constructed at the 49 Fama French Industry level, we follow this classification. Our final sample includes 36 different industries.

Our principal measure of firm corporate governance is the Gompers et al. (2003) governance index, which we obtain from RiskMetrics. The *GIM* index ranges from 1 to 24 and one point is added for each governance provision restricting shareholders right with respect to managers (for further details see Gompers et al. (2003)). A higher *GIM* index score indicates more restrictions on shareholder rights or a greater number of anti-takeover measures. Therefore, a higher value of the *GIM* index corresponds to a lower $g$ in our theoretical representations. Hence, all coefficient signs on the empirical predictions using the *GIM* index switch sign with respect to the ones using our theoretical $g$ governance measure. To fill the gaps between reported values, we choose to linearly interpolate the *GIM* index in order to obtain a corporate governance measure with annual frequency.

As a robustness check, we consider the Bebchuk et al. (2008) entrenchment index (*E-index*) instead of the *GIM* index. The *E-index* is based on six of the twenty-four *GIM* index provisions: supermajority merger, classified board, poison pill and golden

parachute, supermajority by-law, and supermajority charter. Also in this case, we use linear interpolation to fill the gaps in the *E-index*. Additionally, we construct the following variables: *GIM-Index Max* is the average Gompers et al. (2003) governance index of the 20 firms with the lowest GIM index in that year; *GIM Change Sign* takes value one if the firm GIM index has increased, value zero if it has not changed and value minus one if it has decreased; *GIM Change Up* takes value one if the firm GIM index has increased, zero otherwise and *GIM Change Down* takes value one if the firm GIM index has decreased, zero otherwise.

For some of our specifications, we need the *GIM* index of a given firm to change across time. Hence, Figure (3) reports the within-firm *GIM* index standard deviation histogram. We can see that 25% of the firms do not change their *GIM* index while about 40% of the firms have *GIM* index standard deviation between 0 and 0.5. The question we are trying to answer is whether these changes in *GIM* index correspond to the employment of new CEOs as our model would predict. The *E-index* behaves similarly except that it concentrates more firms at the zero standard deviation.

We obtain our measures of executive compensation from ExecuComp focusing on the CEO as the "manager" we study (even though our theory may apply to other top managers also). We measure *Total Compensation* as natural logarithm of item `tdc1`, *Bonus* as natural logarithm of item `Bonus`, *Stock Option* as natural logarithm of the Black Scholes value of options granted (item `option_awards_blk_value`) and *Salary* as the natural logarithm of item `salary`.

To define a CEO's outside option, we need to define the firms she could potentially work for and the probability that she will actually end up working in one of those potential firms if she is to leave the current firm. We do so at the level of each year. We match the firm for which the CEO is currently working with one firm in each of the 49 Fama-French industries, according to their market capitalization. Specifically, we select the biggest firm in that industry that is smaller than the firm the CEO is currently working for. If no match according to this criteria is found, a missing value is allocated. We obtain the probability that the manager is to actually end up working in one of those potential firms from the Cremers and Grinstein (2009) matrix of CEO movements and we define it as the following ratio. In the numerator, we have the number of CEOs that went from the industry where the CEO's firm operates to the potential firm's industry. In the denominator, we have the total number of CEOs that went from the industry where the CEO's current firm operates to any other industry (including its own industry) for which we have non-missing matching values. Once we

have these weights (interpreted as transition probabilities) and firms that constitute a CEO's outside option, we use them to calculate the *Outside Governance*, using those firms' *GIM* index, and the *Outside Size*, using those firms' total market value.

An example may clarify our definition. Suppose that, according to Cremers and Grinstein (2009), 15 CEOs moved from a company in industry 10 to another firm. Out of them, 8 were employed by a firm in industry 10, 2 went to industry 5, 4 went to industry 6, and 1 went to industry 47. Suppose the firm has a market capitalization of 9 and its matches have market capitalization as follows: 8.8 for industry 10, 7.2 for industry 5, 8 for industry 6 and no smaller firm is found in industry 47. These firms' GIM index has values of 14, 12 and 8, respectively. Then, the CEO's Outside Option Size would be 8.34 and this CEO Outside Option Governance would be 12, calculated respectively as

$$8/14 * 8.8 + 2/14 * 7.2 + 4/14 * 8 = 8.34,$$

and

$$8/14 * 14 + 2/14 * 12 + 4/14 * 8 = 12,$$

where we have used 14 in the denominator instead of 15 as for one firm (industry 47) no matching firm could be found.

Two final remarks may be relevant in regarding our outside option calculation. First, even if the potential firms a CEO could work for change at the year level, the weights allocated to each industry are fixed and arise from the Cremers and Grinstein (2009) time-invariant matrix of CEO movements. A time-varying matrix of movements would be more interesting but there are not enough movements to calculate this matrix at the year level. Second, we acknowledge that the Cremers and Grinstein (2009) transition matrix represents realized moves and not potential moves, the ones we should ideally use. In this sense, a time-invariant matrix helps us since a long enough time span would ensure that all potential moves may end up being realized at a point in time.

As a robustness, we calculate other measures of a CEO outside option. We define *Outside Size Min* as the average market capitalization of the smallest and second smallest firm in the industry where the CEO is currently working. We also construct *Market Cap 220* as the market capitalization of the firm ranked 220th in that year when ordered by market capitalization and *GIM-Index Max* as the average Gompers et al. (2003) governance index of the 20 companies with the lowest GIM index. We also define these variables at the year level.

We also use ExecuComp to define CEO tenure and turnover. We define *CEO Tenure* as the difference between the current year and the year the executive became CEO (item `becameceo`) and *Turnover* as a dummy variable that takes value one if, for a given firm, the `execid` variable changes during that year, and zero otherwise.

Statistics regarding the number of firms and CEOs are as follows. Our complete merged sample contains 9147 firm-year observations that correspond to 2162 different CEOs and 1335 different firms. When using firm fixed effects, due to multicollinearity problems, we cannot identify those CEOs who are employed only in one firm if this firm only employed one CEO. This means we are left with 7609 firm-year observations, with 1916 CEOs and 1038 firms and a total of 1956 different CEO-firm match. Additionally, there are only 64 CEOs changing firms, of which around 40% are the only CEO in one of the firms. We do not think this multicollinearity problem causes any bias in our regressions using firm fixed effects as we focus on within-firm analysis in that case. Specifically, we do not think that firms changing CEO more often do it because they face higher competition for managerial talent. Even if low managerial turnover may be a consequence of hiring better managers, this does not bias our results as long as these firms face competition to retain these better managers and so have to compensate them as another firm would do.

Summary statistics for all the variables are reported in Table 1. Our dataset spans the period from 1993 to 2007 as this corresponds to the RiskMetrics data availability.

## 4.4   Results

Table 2 tests for the presence of a positive externality in the choice of corporate governance across firms, by estimating specification (10). The dependent variable is Total Compensation in firm $i$ at year $t$. In Column 1, we show that, as predicted by our model, firms with weaker governance and with lower Outside Option Governance (that is, a higher GIM score) pay their CEOs more. In other words, a worsening of governance standards in the competitors for managerial talent is costly for the firm (even after controlling for its own governance), as it is associated with higher CEO compensation.

The basic results are robust to several changes in specifications. First, as shown in Columns 2 to 3, the finding that governance matter for executive compensation is not due to spurious correlation with firm size. We confirm the result in Gabaix and Landier (2008) that executive compensation is highly correlated with firm size

but we show that the correlation between executive compensation and governance is statistically significant even after controlling for firm size and for different measures of a manager outside option in terms of size. Second, in Column 4, we drop the smallest three firms for each industry-year to make sure our results are not driven by the smallest firms in our sample. The reason for this robustness check is that these firms are the ones more likely to have the CEO outside option that is more distant from that originally estimated by Cremers and Grinstein (2009) matrix of CEO moves (see the data description section 4.3 for further details). Third, the inclusion of firm fixed effects in Column 5 leads to similar point estimates but weaker statistical significance. However, this is to be expected given that most of our variables are not changing much over time at the firm level. Finally, the results are robust to different specifications for clustering the standard errors; the table reports standard errors clustered at the firm and at the year level.[6]

Table 3 offers evidence that governance and executive compensation are substitutes. To produce a clean test, we isolate all effects discussed above by controlling for both firm and year fixed effects. As argued in Section 4.1, if indeed governance is chosen as part of an optimal compensation package, we expect it to affect compensation only when there is a change of control. As shown in Column 1, a turnover of CEO is associated with no significant change in compensation. This result is entirely consistent with the model as the new manager may be better or worse than the previous one, in which case compensation may increase or decrease. Similarly, in Column 2 we find that the change in governance (as measured by an indicator variable that takes value 1 if there is an increase in GIM, -1 is there is a decrease, and 0 if there is no change in GIM during year $t$) is associated with a small (but marginally significant) increase in compensation. This is also consistent with our model since without turnover, the compensation should already be at the optimal level.

The interesting result is in Column 3, where we show that the change in compensation occurs when there is both turnover and a change in corporate governance. Specifically, we find that turnover and a decrease in corporate governance (that is, an increase in GIM) is associated with a significant increase in compensation. This is consistent with the prediction of the model that governance and compensation are

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[6]In terms of economic magnitude, Table 2, column 2 implies that a one standard deviation higher GIM index of CEO's outside option is in equilibrium associated with a 2.65% higher total compensation for the CEO.

substitutes. In Columns 4 and 5, we allow for asymmetric effects between the cases when governance went up and cases in which it went down. Interestingly, the effect is limited to the cases in which governance went down at the time of the turnover, which are the more common cases (264 cases compared to 119 cases for improvement in governance).[7]

This finding might seem somewhat surprising: Why would a firm decrease corporate governance when they hire a new manager? Our model suggests that it may do so to attract a better manager. To test this prediction, we first need to estimate CEO fixed effects. In Table 4, we show the results from regression (14) with different time dependent regressors $(X_{it}^j)$ and time independent control variables $(z_{ind/i})$. We report the regression coefficients, information on the overall fitting of the model and some descriptive statistics on the CEO fixed effects obtained. We report the mean, minimum, maximum and standard deviation of the CEO fixed effects to show that CEO choice does indeed matter for firm performance. As one would expect, the distribution of CEO abilities in the specification using industry dummies has higher dispersion than in the specification using firm fixed effects as some of the firm specific components are captured by the CEO ability measures. However, these differences are relatively small, suggesting that within-industry firm differences are well captured by our control variables. The lower managerial talent dispersion could also be a consequence of the additional restrictions the model with firm fixed effects imposes, such as the mean CEO fixed effect being equal to zero.[8]

Table 5 presents the results of regressions (15), (17) and (16). Specifically, we test regression (15) in Columns 1 and 2; regression (17) in Column 3 and regression (16) in Columns 4 and 5. In panels A to C, we use Ordinary-Least-Squares estimators,

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[7]In terms of economic magnitude, Table 3 column 5 implies that when turnover is associated with a decrease in governance, it is also associated with incoming CEO earning 17% more in terms of total compensation.

[8]We are aware that the inclusion of *GIM* index in the first stage regression specification (3) may cause an identification problem. If our model is correct and corporate governance is used as a selection mechanism to attract managerial ability, corporate governance can be re-expressed as a function of CEO-firm fixed effects. Therefore, the coefficients on *GIM* index and CEO-firm fixed effects cannot be identified. The reason for its inclusion is as follows: we want to make sure that our managerial ability is not capturing any direct relation between *GIM* index and return on assets nor any unobserved characteristic that is related to corporate governance and performance (which could then be influencing our second stage regression). As there is always noise in any selection process, when both corporate governance and manager fixed effects are introduced in a regression, any unobserved characteristic that is correlated with corporate governance will be captured by this variable and not by the manager fixed effect.

giving the same weight on all observations, while in panels D to E we use Weighted-Least-Squares estimators, where the weights are the inverse of the standard deviation of the CEO fixed effects estimated in the first stage. We report both for robustness and do not find significant difference in the results between the two approaches.

First, we focus on Columns 1 and 2, as they test the main empirical prediction of our paper: the relation between corporate governance and managerial ability. To undertake this test, we use the *GIM* index and the *E-index* as dependent variables in Columns 1 and 2, respectively. We use the CEO fixed effects obtained in the different specifications of regression (14) as independent variables across the different panels. The sign of the coefficients are as predicted by our model and they are generally statistically significantly different from zero. Additionally, the magnitude of the coefficient when the dependent variable is the *GIM* index is larger than when the dependent variable is the *E-index*, consistent with the fact that the *GIM* index has a wider range than the *E-index*. Hence, this finding supports the main prediction of the model: increases in managerial quality are indeed associated with decreases in governance.

Column 3 sheds light on the relation between investment opportunities and managerial talent. The positive relation between investment opportunities and managerial talent is widely supported by all our specifications A possible criticism of this finding is that *ROA* and Tobin's $q$ are positively related in an unconditional regression of *ROA* on Tobin's $q$ and other control variables. This may even be a mechanical finding as both variables have the same denominator. Precisely to reduce this concern, we had introduced Tobin's $q$ in the first stage regression as a control variable.

In Columns 4 and 5, we report the correlations between managerial talent (as proxied by the CEO fixed effect) and total compensation and salary, respectively. Overall, we find support for our empirical prediction that better managers get paid more. The results are stronger for total compensation but are also there for salaries.[9]

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[9] In terms of economic magnitude, Table 5 panel A implies that holding all else constant, one standard deviation increase in CEO talent implies a one point increase in GIM index (decrease in governance) and a 56% increase in CEO's total compensation.

# 5 Robustness checks and discussion

## 5.1 Alternative methodology for CEO's outside option

In Table 6, we analyze the externality in the choice of corporate governance across firms from a different (although related) perspective. While in Table 2 we focused on each CEO's outside option using the Cremers and Grinstein (2009) transition matrix of CEO mobility across industries, we employ in Table 6 the governance of the worst governed firms in the economy. Intuitively, we can think of these firms as the firm that hire the $H$-type managers of our model. In Column 2, we can see the relationship between CEO compensation in a firm and *GIM Index Max*, the average GIM index for the 20 worst-governed firms in year $t - 1$. As predicted by our model, we find that an increase in *GIM Index Max* (namely, a deterioration of corporate governance in the economy) is associated with a significant increase in executive compensation.

As in Table 2, the basic results are robust to different specifications. As shown in Columns 3 to 5, the finding that governance of the firm as well as of worse-governed firms in the economy matters for executive compensation is not due to spurious correlation with firm size. Also, the results are robust to different specifications for clustering the standard errors: at the firm and at the year level. The only difference is that in columns 2 and 5, the significance of the coefficients on *GIM Index Max* weakens with year-level clusters. However, this is to be expected given that *GIM Index Max* is constant across firms in a given year and varies very little over time.

## 5.2 Governance and different forms of compensation

Table 7 takes a closer look at how different components of CEO pay relate to CEO quality. Our model predicts not only higher total compensation but also higher salary for higher quality managers. Column (1) repeats the results from Table 5 for total compensation whereas columns (2) to (4) take a closer look at the different components of pay, respectively Bonus, Stock Option and Salary. Bonus and Stock Option are the performance-sensitive components of total pay.

We find in columns (2) and (3) that higher quality managers are generally paid higher value in bonus and stock option grants but the evidence is statistically less significant for the value of stock options granted. One data issue we face is that we only observe the flow of the value of stock options granted each year while the stock of the value of stock options held might be more relevant (given that these options

vest over time and are often exercised). Column (4) reports empirical support for the hypothesis that better managers are paid a higher salary.

## 5.3    Tenure and governance

In our model, governance is chosen by firms as part of an optimal compensation arrangement taking account also of governance choices of other firms. Weak governance arises in the model as a mechanism for attracting better CEOs. This is consistent with the models by Almazan and Suarez (2003) and Marino and Zabojnik (2008), and the evidence in Rajan and Wulf (2006). Almazan and Suarez (2003) show that under certain conditions, shareholders find it optimal to relinquish some power to the CEO in order to save on the overall compensation costs. Marino and Zabojnik (2008) argue that perks may be part of an efficient incentive scheme when there are complementarities between consumption of perks and managerial effort. Rajan and Wulf (2006) consider a broad range of perks that are offered to CEOs and divisional managers and provide evidence that perks are used to enhance productivity.

A plausible alternative is that weak governance is not chosen by firms but is in fact an outcome of influence exercised by entrenched CEOs over time, a view that is consistent with Hermalin and Weisbach (1998) and Bebchuk and Fried (2004). If higher quality CEOs are more likely to get entrenched, one would empirically observe that CEO talent and pay are higher in firms where governance is weaker.

Though the two effects are not mutually exclusive, our tests appear to rule out the possibility that we are mistakenly claiming the effect of CEO tenure on weakening of governance as an optimal arrangement by the firm when the CEO was hired. The direct test of this claim is in Table 3 where we study the association of corporate governance and CEO compensation. We find there that high compensation is associated with weak governance only when there is a CEO turnover and when firm governance declines, an effect that cannot arise due to CEO tenure as by construction it is zero at time of hiring a new CEO.

To alleviate concerns that tenure is the missing variable that explains the spurious correlation between pay and governance, we control for CEO tenure in Table 5 and Table 7 which link CEO quality to firm's governance, performance and CEO pay. Columns (1) and (2) of Table 5 suggest that controlling for CEO quality, longer CEO tenure is associated with *lower* GIM- and Entrenchment-index, that is, with higher corporate governance, contrary to the alternative explanation proposed above.

Column (3) of Table 5 suggests no linkage between CEO tenure and performance. Finally, Table 7 provides some (albeit weak) evidence that after controlling for CEO quality, CEOs with higher tenure seem to receive a higher salary and bonus, but lower stock-based grants, so that there is little overall relationship between CEO tenure and total pay.

## 5.4   Compensation versus governance trade-off

A key feature of our model is the assumption that there is a trade-off each firm faces in providing incentives to managers through pay and through stronger governance. If the costs of designing and enforcing governance were relatively low, such trade-off would not have much bite. At a fundamental level though, such costs are at the heart of agency problems due to separation of ownership and control. Acharya and Volpin (2010) model such costs as arising due to the dispersed nature of ownership of firms. Intuitively, each owner does not internalize the full benefit of her investment in monitoring or information generation and thereby incentives to govern are weak. The owners may choose delegated monitors, e.g., Board of Directors, but this delegation involves its own set of monitoring needs and agency problems. Conversely, if firms were financially constrained, then the costs of providing incentives through pay might become enormously high relative to costs of governance.

While we did not fully explore the relative costs of pay and governance in setting optimal compensation arrangements, this seems to be a fruitful avenue for further research. In particular, it would be interesting to test if the governance externality we have highlighted is even more perverse in financially constrained firms. Such firms cannot afford to raise their CEO pay in response to weak governance of competitors, and must weaken their governance as well. As Acharya and Volpin (2010) point out, this may render these firms even more financially constrained, precipitating their exit (or precluding their entry in the first place). Studying financially constrained firms may thus also help investigate the full efficiency costs of firms being forced by the labor market to pick weak governance while hiring better talent.

## 5.5   Implications for regulation of corporate governance

Finally, it is interesting to consider implications of our model and results for regulation of governance. At a direct level, it provides a rationale for why governance standards might help. It would prevent firms from weakening governance too much

for luring better managers and thereby allow all firms to retain stronger governance practices. In equilibrium, this would imply lower reservation wages for top management. As discussed above, when firms are financially constrained, this can free up pledgeable cash flows, lead to greater external financing and investments, and potentially even greater entry of new firms.

However, our model and results are not structurally calibrated to provide a firm recommendation on what this level of governance standards might be. Indeed, if they were picked to be too high, the ability of firms to use pay for providing incentives would get curbed excessively and the governance costs might in themselves reduce pledgeable cash flows and ability to invest. Subject to this important caveat, since the weak governance in our model is an outcome of externality and coordination problem between firms, it provides a more reasonable justification for governance regulation than one that is based on according greater contracting powers to regulators relative to investors.

## 6 Conclusion

In this paper, we theoretically explored the joint role played by corporate governance and competition among firms to attract better managers. In our principal agent problem, there are two ways to induce the manager to make the right decision: paying compensation in case of better performance and investing in corporate governance to punish managers if things go badly. We showed that when managerial ability is observable and managerial skills are scarce, competition among firms to hire better managers implies that in equilibrium firms will choose lower levels of corporate governance. Intuitively, the result follows from the fact that managerial rents cannot be influenced by an individual firm but instead are determined by the value of managers when employed somewhere else. Hence, if a firm chooses a high level of corporate governance, the remuneration package will have to increase accordingly to meet the participation constraint of the manager. It is therefore firms (and not managers) that end up bearing the costs of higher corporate governance with little benefit.

We provided novel empirical evidence supporting our model. Consistent with the presence of externality in corporate governance, executive compensation in a given firm is decreasing in the quality of firm's own corporate governance as well as in the governance of a matched competitor firm. In support of the assumption that executive compensation and corporate governance are chosen as part of an optimal

compensation package, executive compensation changes significantly when a new CEO is hired only if corporate governance is changed at the same time. Finally, the allocation of CEOs and firms is consistent with the model: we provided an empirical measure of managerial talent and found it is negatively correlated with indicators of corporate governance.

Our finding that corporate governance affects the matching between managers and firms has important implications for the debate on executive pay and governance. Specifically, while better governance may incentivize managers to perform better, it also reduces firms' ability to attract the best managers. These two effects offset each other and may explain why it has proven so hard so far to find direct evidence that corporate governance increases firm performance. A notable exception is the link between governance and performance found in firms owned by private equity: Private equity ownership features strong corporate governance, high pay-for-performance but also significant CEO co-investment, and superior operating performance.[10] Since private equity funds hold concentrated stakes in firms they own and manage, they internalize better (compared, for example, to dispersed shareholders) the benefits of investing in costly governance. Our model and empirical results can be viewed as providing an explanation for why there exist governance inefficiencies in firms that private equity can "arbitrage" through its investments in active governance.

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[10]See, for example, Jensen (1989) for theoretical argument, Kaplan (1989) for evidence on operational improvements due private equity ownership in early wave of leveraged buyouts (LBOs), and Acharya, Hahn and Kehoe (2008) on the LBOs during 1995 to 2005 (in the U.K. and the Western Europe).

# Appendix

**Proof of Lemma 1:** First, consider the probability of hiring each type of manager. The probability of hiring an $L$-type manager if the firm would like to do so is 1 as there are more $L$-type managers than firms. Let $\gamma$ be the probability of hiring a $H$-type manager for a representative firm with a given $g$ and $I$: this probability is the product of two components. First, the firm needs to prefer hiring a $H$-type rather than a $L$-type: this happens if

$$(1-e)\left[Y(I)-(1-g)\delta I\right]-B+e\xi(e)\geq b_H$$

Second, the $H$-type must be applying for the job posted by the specific firm: if we define as $\chi$ such probability, then $\chi$ will be a function of the bonus $b_H$, the outside option $\overline{u}_H$, as well as $g$ and $I$:

$$\chi=\begin{cases} 1 & \text{if } b_H > \overline{u}_H - B - (1-g)\delta I \\ \kappa \in (0,1) & \text{if } b_H = \overline{u}_H - B - (1-g)\delta I \\ 0 & \text{if } b_H < \overline{u}_H - B - (1-g)\delta I \end{cases}$$

In other words:

$$\gamma = \chi I_{\{(1-e)[Y(I)-(1-g)\delta I]-B+e\xi(e)\geq b_H\}} =$$
$$= \begin{cases} 1 & \text{if } b_H \in (\overline{u}_H - B - (1-g)\delta I, (1-e)\left[Y(I)-(1-g)\delta I\right]-B+e\xi(e)] \\ \kappa \in (0,1) & \text{if } b_H = \overline{u}_H - B - (1-g)\delta I \leq (1-e)\left[Y(I)-(1-g)\delta I\right]-B+e\xi(e) \\ 0 & \text{otherwise} \end{cases}$$

Firms can affect $\gamma$ via their choice of $b_H$ and $g$. Hence, they face the following problem:

$$\max_{\gamma,b_H,g}\left\{\gamma+(1-\gamma)e\right\}\left[Y(I)-(1-g)\delta I\right]+(1-\gamma)(1-e)g\delta I-\gamma(b_H+B)-(1-\gamma)e\xi(e)-k\frac{g^2}{2}I$$

subject to

$$\gamma=\begin{cases} 1 & \text{if } b_H \in (\overline{u}_H - B - (1-g)\delta I, (1-e)\left[Y(I)-(1-g)\delta I\right]-B+e\xi(e)] \\ \kappa & \text{if } b_H = \overline{u}_H - B - (1-g)\delta I \leq (1-e)\left[Y(I)-(1-g)\delta I\right]-B+e\xi(e) \\ 0 & \text{otherwise} \end{cases}$$

Notice that the objective function is strictly decreasing in $b_H$. If $\overline{u}_H > (1-e)Y(I) + e\xi(e) + e(1-g)\delta I$, then $b_H = 0$, $\gamma = 0$ and $g = \frac{\delta}{k}$. If $\overline{u}_H \leq (1-e)Y(I) + e\xi(e) + e(1-g)\delta I$, there are three cases to compare: (i) $b_H = 0$, $\gamma = 0$, $g = \frac{\delta}{k}$, then the profit is $e\left[Y(I)-\delta I-\xi(e)\right] + \frac{\delta^2}{2k}I$; (ii) $b_H = \overline{u}_H - B - (1-g)\delta I$, which implies that $\gamma = \kappa$ and profits are: $\kappa Y(I)+(1-\kappa)e\left[Y(I)-\delta I-\xi(e)\right]+(1-\kappa)g\delta I-\kappa\overline{u}_H-\frac{kg^2I}{2}$. In this case, the optimal choice of governance is $g = \frac{(1-\kappa)\delta}{k}$ (from first order conditions); and (iii) $b_H = \overline{u}_H - B - (1-g)\delta y I + \varepsilon$ for $\varepsilon > 0$ small, then $\gamma = 1$ and $g = 0$, then the profit is $Y(I) - \overline{u}_H - \varepsilon$. Hence,

$$(b_H,g,\gamma)=\begin{cases} \left(0,\frac{\delta}{k},0\right) & \text{if } \overline{u}_H > (1-e)Y(I) + e\xi(e) + e(1-g)\delta I \\ \left(\overline{u}_H - B - (1-g)\delta I, \frac{(1-\kappa)\delta}{k},\kappa\right) & \text{if } \overline{u}_H = (1-e)Y(I) + e\xi(e) + e(1-g)\delta I \\ \left(\overline{u}_H - B - (1-g)\delta I + \varepsilon, 0, 1\right) & \text{if } \overline{u}_H < (1-e)Y(I) + e\xi(e) + e(1-g)\delta I \end{cases}$$

The associated profit (net of investment cost) is:

$$\Pi\left(I,\overline{u}_H\right)=\begin{cases}e\left[Y(I)-\delta I-\xi(e)\right]+\frac{\delta^2}{2k}I\\ \left\{\kappa+(1-\kappa)\,e\right\}Y(I)-\kappa\overline{u}_H-(1-\kappa)\,e\xi(e)+(1-\kappa)\left(\frac{(1-\kappa)\delta}{k}-e\right)\delta I\\ Y(I)-\overline{u}_H\end{cases}$$

Notice that the intermediate case is always dominated as

$$\left\{\kappa+(1-\kappa)\,e\right\}Y(I)-\kappa\overline{u}_H-(1-\kappa)\,e\xi(e)+(1-\kappa)\left(\frac{(1-\kappa)\,\delta}{k}-e\right)\delta I$$

$$<\quad\max\{Y(I)-\overline{u}_H,e\left[Y(I)-\delta I-\xi(e)\right]+\frac{\delta^2}{2k}I\}$$

Hence, firms prefer to hire $H$-type managers if $\overline{u}_H<(1-e)\,Y(I)+e\left[\delta I+\xi(e)\right]-\frac{\delta^2 I}{2k}$, $L$-type managers if $\overline{u}_H>(1-e)\,Y(I)+e\left[\delta I+\xi(e)\right]-\frac{\delta^2 I}{2k}$ and are indifferent if $\overline{u}_H=(1-e)\,Y(I)+e\left[\delta I+\xi(e)\right]-\frac{\delta^2 I}{2k}$. The corresponding optimal incentive contract is:

$$(b,g,p)=\begin{cases}\left(0,\frac{\delta}{k},(1-\frac{\delta}{k})\delta I+\xi(e)\right)&\text{if }\overline{u}_H>(1-e)\,Y(I)+e\left[\delta I+\xi(e)\right]-\frac{\delta^2 I}{2k}\\ \left(\overline{u}_H-B-\delta I,0,\delta I+B\right)&\text{if }\overline{u}_H\le(1-e)\,Y(I)+e\left[\delta I+\xi(e)\right]-\frac{\delta^2 I}{2k}\end{cases}$$

and the profit is:

$$\Pi\left(I,\overline{u}_H\right)=\begin{cases}e\left[Y(I)-\delta I-\xi(e)\right]+\frac{\delta^2}{2k}I&\text{if }\overline{u}_H>(1-e)\,Y(I)+e\left[\delta I+\xi(e)\right]-\frac{\delta^2 I}{2k}\\ Y(I)-\overline{u}_H&\text{if }\overline{u}_H\le(1-e)\,Y(I)+e\left[\delta I+\xi(e)\right]-\frac{\delta^2 I}{2k}\end{cases}$$

∎

**Proof of Proposition 1:** First, we will prove by contradiction that there is no symmetric equilibrium in pure strategies. Then, we will build the asymmetric pure strategy equilibrium (which is also the unique symmetric equilibrium in mixed strategies).

As shown in Lemma 1, a symmetric pure strategy equilibrium (where all firms choose the same $I$) requires that $\overline{u}_H=(1-e)\,Y(I)+e\left[\delta I+\xi(e)\right]-\frac{\delta^2 I}{2k}$. Otherwise, all firms will strictly prefer either the $H$- or the $L$-types and this cannot be an equilibrium because: (i) if all firms prefer the $H$-types, there are not enough of them to hire; (ii) if all firms prefer the L type, $\overline{u}_H=0$ and so all firms would deviate and hire the $H$-type.

In a symmetric equilibrium each firms would hire a H type with probability $\frac{m_H}{n}$. Hence, if $\overline{u}_H=(1-e)\,Y(I)+e\left[\delta I+\xi(e)\right]-\frac{\delta^2 I}{2k}$, the problem becomes:

$$\max_I\ \frac{m_H}{n}\left[Y(I)-\overline{u}_H\right]+\left(1-\frac{m_H}{n}\right)\left\{e\left[Y(I)-\delta I-\xi(e)\right]+\frac{\delta^2}{2k}I\right\}-rI$$

The solution is:

$$I^* = Y'^{-1} \left( \frac{r + \left(1 - \frac{m_H}{n}\right) e\delta - \left(1 - \frac{m_H}{n}\right) \frac{\delta^2}{2k}}{\frac{m_H}{n} + \left(1 - \frac{m_H}{n}\right) e} \right) \equiv I_\mu$$

For this to be an equilibrium, $\overline{u}_H = (1 - e) Y(I_\mu) + e [\delta I_\mu + \xi(e)] - \frac{\delta^2 I_\mu}{2k}$. However, suppose that all firms choose the above $I$. Then, a firm will have an incentive to deviate to $I = I_H^*$, where $I_H^* = Y'^{-1}(r)$, as this strategy would lead to an increase in profits. The argument is as follows. First, we need to analyze which type of manager this firm will hire. As shown in Figure 2, a firm with higher $I$ will beat the competition for the $H$-type manager. Hence, if all firms choose $I_\mu$ and one firm deviates to $I = I_H^*$, this firm will hire the $H$-type manager for sure.

Second, we need to show that this deviation increases profits. Since profits obtained by the firm if the $H$-type manager is hired are maximized for $I = I_H^*$, we know that this deviation increases profits from the proposed symmetric equilibrium when the $H$-type is hired. Because the profits from hiring the $H$-type manager are equal to the profits of hiring the $L$-type manager (in the proposed symmetric equilibrium), the profits with $I_\mu$ are smaller than with the suggested deviation to $I = I_H^*$. Hence, there is no equilibrium in symmetric strategies.

We will now present an equilibrium in which firms choose different $I$, and - as a consequence - target different managers with different incentive packages. The discussion above suggests an asymmetric equilibrium in which a fraction $\mu$ of firms target the $H$-type managers by choosing $I = I_H^*$, where $I_H^* = Y'^{-1}(r)$, and the remaining ones target $L$-type managers by choosing $I = I_L^*$, where $I_L^* = Y'^{-1} \left(\delta + \frac{r}{e} - \frac{\delta^2}{2ke}\right)$. For this to be an equilibrium, the profits from the two strategies must be the same, that is

$$\overline{u}_H = Y(I_H^*) - e [Y(I_L^*) - \delta I_L^* - \xi(e)] - \frac{\delta^2}{2k} I_L^* - r (I_H^* - I_L^*)$$

Moreover, we need to ensure that the equilibrium is time consistent. It could be that under the choices of $I$ defined above, firms would end up not hiring the mangers stated by the proposition. This could happen because at $t = 1$ the choice of $I$ is sunk. From Lemma 1 we know that the firms who are supposed to hired the $L$-type will do so if $\overline{u}_H > (1 - e) Y(I_L^*) + e [\delta I_L^* + \xi(e)] - \frac{\delta^2 I_L^*}{2k}$. Notice that $I_H^* > I_L^*$ since $r \geq 1 > \delta + \frac{r}{e} - \frac{\delta^2}{2ke}$. Given the equilibrium condition on $\overline{u}_H$, this requires

$$Y(I_H^*) - Y(I_L^*) > r (I_H^* - I_L^*)$$

This is satisfied since for continuous function: $\frac{Y(I_H^*) - Y(I_L^*)}{I_H^* - I_L^*} = Y'(\widehat{I})$ for some $\widehat{I} \in [I_L^*, I_H^*]$ and given the definition of $I_H^*$ and $I_L^*$, $Y'(\widehat{I}) \in \left(r, \delta + \frac{r}{e} - \frac{\delta^2}{2ke}\right)$.

The firms who are supposed to hire the H type will do so if $\overline{u}_H < (1-e)Y(I_H^*) + e[\delta I_H^* + \xi(e)] - \frac{\delta^2 I_H^*}{2k}$. Given the equilibrium condition on $\overline{u}_H$, this requires

$$e\left[Y(I_H^*) - Y(I_L^*)\right] < r\left(I_H^* - I_L^*\right) + e\delta\left(I_H^* - I_L^*\right) - \frac{\delta^2\left(I_H^* - I_L^*\right)}{2k}$$

or

$$\frac{Y(I_H^*) - Y(I_L^*)}{I_H^* - I_L^*} < \frac{r}{e} + \delta - \frac{\delta^2}{2ek}$$

which is satisfied since $\frac{Y(I_H^*)-Y(I_L^*)}{I_H^*-I_L^*} = Y'(\widehat{I}) \in \left(r, \delta + \frac{r}{e} - \frac{\delta^2}{2ke}\right)$. ∎

**Proof of Proposition 3:** As before, the severance payment is $s = (1-g)\delta$. If the manager chooses action $A = M$, output will always equal 0 and his utility equals

$$U_M(M) = b + (1-g)\delta I + B$$

If he chooses action $S$, then his utility equals

$$U_M(S) = b + (1-g)\delta I + \overline{e}\left[p - (1-g)\delta I\right] - \frac{1}{2}A\overline{e}(1-\overline{e})\left[p - (1-g)\delta I\right]^2$$

Hence, we can derive the incentive compatibility condition $U_M(S) \geq U_M(M)$ as follows

$$[p - (1-g)\delta I] - \frac{1}{2}A(1-\overline{e})[p - (1-g)\delta I]^2 \geq \frac{B}{\overline{e}} \tag{A1}$$

The corresponding participation constraint is

$$b + (1-g)\delta I + \overline{e}[p - (1-g)\delta I] - \frac{1}{2}A\overline{e}(1-\overline{e})\left[p - (1-g)\delta I\right]^2 \geq 0 \tag{A2}$$

At $t = 1$, the founder chooses $p$ to minimize the incentive pay subject to the incentive compatibility condition (A1) and participation constraint (A2):

$$\min_{(b,g,p)} b + (1-g)\delta I + \overline{e}[p - (1-g)\delta I] - \frac{kg^2 I}{2}$$
$$s.t.(A1) \text{ and } (A2)$$

Given that there are enough managers of both types, there is no competition for them. Since any contract offered to a manager must give them utility equal to, at least, $B > 0$, to ensure they do not choose $A = M$, the participation constraint is redundant and the incentive compatibility condition is strictly binding for both managers. Given this, we can write the incentive compatibility condition as

$$\xi - \frac{1}{2}A(1-e)\xi^2 = \frac{B}{\overline{e}}$$

where $\xi = [p - (1-g)\delta I]$. By solving this second order equation in $\xi$, we find that

$$\xi = \frac{1 - \sqrt{1 - 2AB\frac{1-\overline{e}}{\overline{e}}}}{A(1 - \overline{e})} \equiv \xi(\overline{e})$$

This implies that:

$$p = (1-g)\delta I + \xi(\overline{e})$$

and the associated profit is:

$$\Pi_i = \overline{e}\left[Y - \delta I\right] - \overline{e}\xi(\overline{e}) + g\delta I - rI - \frac{kg^2 I}{2}$$

Governance is chosen to maximize this expression:

$$g^* = \frac{\delta}{k}$$

At $t = 0$, the founder chooses $I$ to maximize the expected profits:

$$\max_I \ \overline{e}\left[Y - \delta I\right] - \overline{e}\xi(\overline{e}) + \frac{\delta^2}{2k}I - rI$$

so we can solve for the optimal level of investment using the first order condition $I^*$ :
$Y'(I^*) = \delta\left(1 - \frac{\delta}{2\overline{e}k}\right) + \frac{r}{\overline{e}}$. $\blacksquare$

# References

[1] Acharya, Viral, Moritz Hahn and Conor Kehoe, 2008, "Corporate Governance and Value Creation: Evidence from Private Equity," Working Paper, NYU-Stern.

[2] Acharya, Viral, and Paolo Volpin, 2010, "Corporate Governance Externalities," *Review of Finance*, 14, 1-33.

[3] Almazan, Andres, and Javier Suarez, 2003, "Entrenchment and Severance Pay in Optimal Governance Structures," *Journal of Finance* 58, 519-547.

[4] Bebchuck, Lucian, Alma Cohen, and Allen Ferrell, 2008, "What Matters in Corporate Governance?," *Review of Financial Studies* 22, 783-827.

[5] Bebchuk, Lucian, and Jesse Fried, 2004, *Pay Without Performance: The Unfulfilled Promise of Executive Compensation*, Harvard University Press, Cambridge, MA.

[6] Bertrand, Marianne, and Sendhil Mullainathan, 2001, "Are CEOs Rewarded for Luck? The Ones Without Principals Are," *Quarterly Journal of Economics* 116, 901-32.

[7] Bertrand, Marianne, and Antoinette Schoar, 2003, "Managing with Style: the Effect of Managers on Firm Policies," *Quarterly Journal of Economics* 118, 1169-1208.

[8] Cheng, Ing-Haw, 2009, "Corporate Governance Spillovers," unpublished manuscript, University of Michigan.

[9] Chung, Hae Jin, 2008, "Board Independence and CEO Incentives," unpublished manuscript, New York University.

[10] Core, John E., Robert W. Holthausen, and David F. Larcker, 1999, "Corporate Governance, Chief Executive Officer Compensation, and Firm Performance," *Journal of Financial Economics* 51, 371-406.

[11] Cremers, Matijn, and Yaniv Grinstein, 2009, "The Market for CEO Talent: Implications for CEO Compensation," Working paper, Yale School of Management.

[12] Dicks, David, 2009, "Executive Compensation, Incentives, and the Role for Corporate Governance Regulation," mimeo.

[13] Edmans, Alex, Xavier Gabaix, and Augustin Landier, 2009, "A Multiplicative Model of Optimal CEO Incentives in Market Equilibrium," *Review of Financial Studies*, forthcoming.

[14] Fahlenbrach, Rüdiger, 2009, "Shareholder Rights, Boards, and CEO Compensation," Review of Finance 13, 81-113.

[15] Frydman, Carola, and Raven Saks, 2008, "Executive Compensation: A New View from a Long-Term Perspective, 1936-2005," *Review of Financial Studies*, forthcoming.

[16] Gabaix, Xavier, and Augustin Landier, 2008, "Why Has CEO Pay Increased So Much?," *Quarterly Journal of Economics* 123, 49-100.

[17] Gompers, Paul, Joy Ishii, and Andrew Metrick, 2003, "Corporate Governance and Equity Prices," *Quarterly Journal of Economics* 118, 107-155.

[18] Graham, John, Si Li, and Jiaping Qiu, 2008, "Managerial Attributes and Executive Compensation," Working Paper, Duke University.

[19] Hermalin, Benjamin and Michael Weisbach, 1998, "Endogenously Chosen Boards of Directors and Their Monitoring of the CEO," *American Economic Review* 88, 96-118.

[20] Hermalin, Benjamin and Michaeil Weisbach, 2006, "A Framework for Assessing Corporate Governance Reform," working paper, University of California at Berkeley, Berkeley, CA.

[21] Holmstrom, Bengt, 1979, "Moral Hazard and Observability," *The Bell Journal of Economics* 10, 74-91.

[22] Jensen, Michael, 1989. "Eclipse of the Public Corporation," *Harvard Business Review*, Sept.-Oct., 61-74.

[23] Jensen, Michael, and Kevin J. Murphy, 1990, "Performance Pay and Top-Management Incentives," *Journal of Political Economy* 98, 225-264.

[24] Kaplan, Steven, 1989, "The Effects of Management Buyouts on Operations and Value," *Journal of Financial Economics* 24, 217-254

[25] Kuhnen, Camelia M., and Jeffrey H. Zwiebel, 2009. "Executive Pay, Hidden Compensation and Managerial Entrenchment," Working Paper.

[26] Marino, A. M., Zabojnik, Jan, 2008, "Work-related perks, agency problems, and optimal contracts," *RAND Journal of Economics* 39, 565-585

[27] Murphy, Kevin J., and Ján Zábojník, 2007, "Managerial Capital and the Market for CEOs," Working Paper.

[28] Nielsen, Anders, 2006, "Evolution of Corporate Governance, Externalities and Multiple Equilibria," mimeo.

[29] Rajan, Raghuram, and Julie Wulf, 2006, "Are perks purely managerial excess?", *Journal of Financial Economics* 79, 1-33.

[30] Rosen, Sherwin, 1981, "The Economics of Superstars," *American Economic Review* 71, 845-858.

[31] Rusticus, Tjomme O., 2006, "Executive Severance Agreements," Working Paper.

[32] Terviö, Marko, 2008, "The Difference That CEOs Make: An Assignment Model Approach," *American Economic Review* 98, 642–668.
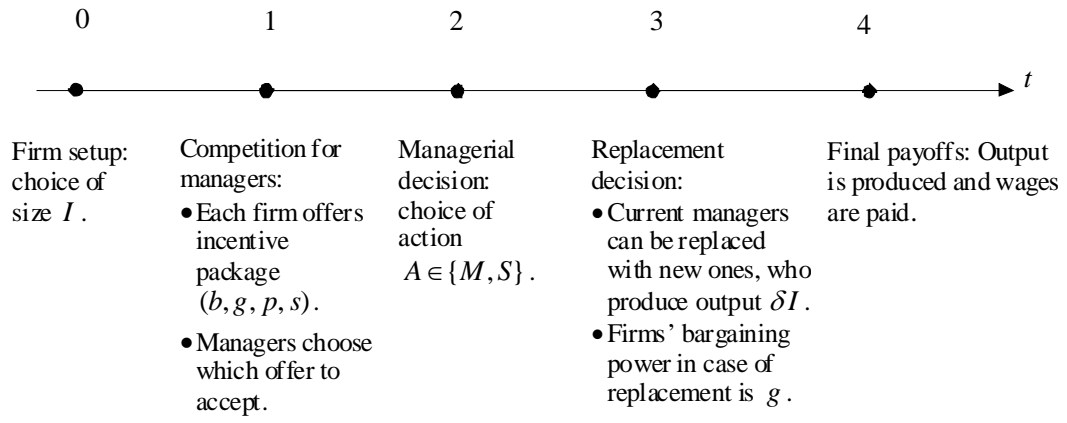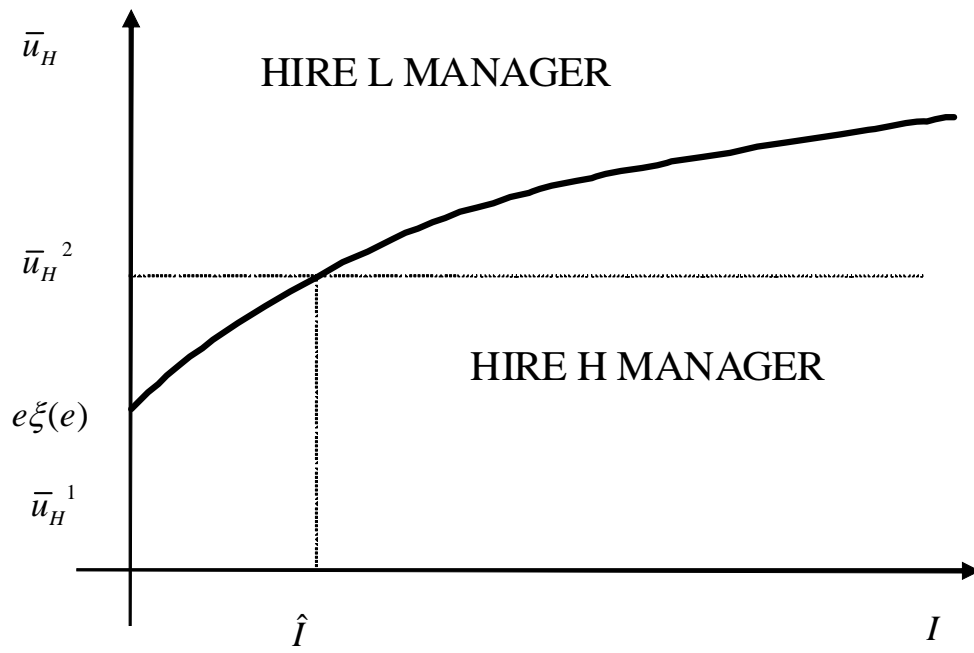
Figure 1: Timeline

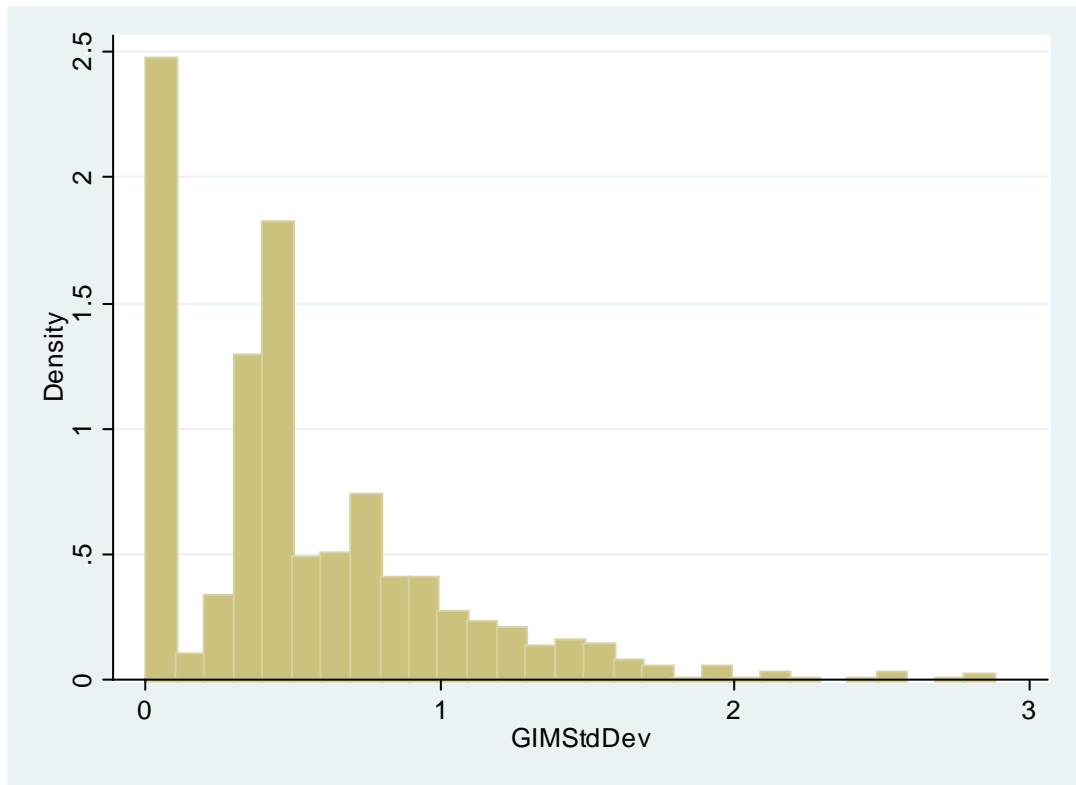Figure 2: Choice of managers' type when there is competition for scarce talent

Figure 3: GIM index within-firm standard deviation

## Table 1. Summary Statistics.

This table presents the summary statistics for the variables used in the empirical section. *Return on Assets* is the ratio of operating cash flow over lagged total assets. *Book Leverage* is the ratio of long and short term debt to the sum of long and short term debt plus common equity. *Cash* is the sum of cash and short-term investments over net property, plant, and equipment at the beginning of the fiscal year. *Interest Coverage* is earning before depreciation, interest, and tax over interest expenses. *Dividend earnings* is the sum of common dividends and preferred earnings over earning before depreciation, interest, and tax. *Tobin's q* is the ratio of firm's total market value over total assets. *GIM-Index* is the Gompers et al. (2003) governance index and *E-Index* is the Bebchuk et al. (2008) entrenchment index. *Total Comp* is the logarithm of CEO total compensation. *Bonus* is the natural logarithm of CEO bonus. *Stock Option* is the natural logarithm of the value of stock options awarded to the CEO in a given year. *Salary* is the natural logarithm of CEO salary. *Market Cap* is the firm market capitalization, *Outside Governance* is the Gompers et al. (2003) governance index of the CEO outside option, *Outside Size* is the market capitalization of the CEO outside option and *Outside Size Min* is the is the market capitalization of the smallest and second smallest firm in a given industry-year. *CEO Tenure* is the difference between the current year and the year the executive became CEO and *Turnover* is a dummy variable that takes value one if the company has changed CEO during that year and zero otherwise. *GIM Change Sign* takes value one if the firm GIM-Index has increased, value zero if it has not changed and value minus one if it has decreased, *GIM Change Up* takes value one if the firm GIM-Index has increased, zero otherwise and *GIM Change Down* takes value one if the firm GIM-Index has decreased, zero otherwise. *GIM-Index Max* is the average Gompers et al. (2003) governance index of the 20 companies with the lowest GIM-Index in that year and *Market Cap 220* is the market capitalization of the firm ranked 220th in that year when ordered by market capitalization. The final sample consists of 9147 firm-year observations that correspond to 2162 different CEOs and 1335 different firms.

| Variable | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|
| ROA | 0.051 | 0.097 | -0.470 | 0.319 |
| Book Leverage | 0.361 | 0.249 | 0 | 1.329 |
| Cash | 0.949 | 2.780 | 0.001 | 40.827 |
| Interest Coverage | 51.154 | 184.598 | -31.232 | 1545.536 |
| Dividend Earnings | 0.082 | 0.104 | -0.061 | 0.615 |
| Tobin's q | 1.906 | 1.202 | 0.737 | 9.181 |
| GIM-Index | 9.415 | 2.624 | 2 | 18 |
| E-index | 2.262 | 1.273 | 0 | 6 |
| Total Comp. | 7.827 | 1.027 | 4.738 | 9.864 |
| Bonus | 6.254 | 1.130 | -5.521 | 8.582 |
| Stock Option | 7.036 | 1.343 | -0.627 | 9.935 |
| Salary | 6.378 | 0.537 | 3.433 | 7.090 |
| Market Cap. | 7.442 | 1.437 | 3.885 | 12.146 |
| Outside Governance | 9.434 | 1.705 | 0 | 14.667 |
| Outside Size | 7.799 | 1.402 | 0 | 12.100 |
| Outside Size Min | 5.840 | 0.711 | 4.521 | 9.225 |
| CEO Tenure | 7.985 | 7.545 | 0 | 56 |
| Turnover | 0.108 | 0.310 | 0 | 1 |
| GIM Change Sign | 0.120 | 0.539 | -1 | 1 |
| GIM Change Up | 0.212 | 0.409 | 0 | 1 |
| GIM Change Down | 0.077 | 0.266 | 0 | 1 |
| Market Cap. 220 | 8.791 | 0.448 | 6.165 | 9.123 |
| GIM Index Max | 15.174 | 0.216 | 14.3 | 15.5 |

## Table 2. Corporate Governance Externality

This table shows the externality in corporate governance. We regress CEO total compensation (*Total Comp.*) on the manager lagged *Outside Option Governance*, the firm's lagged *GIM-Index* and other controls. The variables employed are as follows: *Total Comp* is the logarithm of total compensation, *Outside Governance* is the Gompers et al. (2003) governance index of the CEO outside option, *GIM-Index* is the Gompers et al. (2003) governance index, *Market Cap* is the firm market capitalization, *Outside Size* is the market capitalization of the CEO outside option and *Outside Size Min* is the is the market capitalization of the smallest and second smallest firm in a given industry-year. *CEO Tenure* is the difference between the current year and the year the executive became CEO. All regressions include year dummies and regressions (1) to (4) include Fama French industry dummies while regression (5) includes firm fixed effects. Standard errors are reported in brakets and are clustered at the firm level in the first line and at the year level in the second line. *, **, or *** indicates that the coefficient is statistically significantly different from zero at the 10%, 5%, or 1% level, respectively, under that clustering.

| Dependent Variable: | Total Comp. (1) | Total Comp. (2) | Total Comp. (3) | Total Comp. (4) | Total Comp. (5) |
|---|---|---|---|---|---|
| L. Outside Governance | 0.1265 | 0.0149 | 0.0159 | 0.0171 | 0.0085 |
| | (0.0089)*** | (0.0067)** | (0.0067)** | (0.0075)** | (0.0055) |
| | (0.0095)*** | (0.0041)*** | (0.0041)*** | (0.0056)*** | (0.0038)** |
| | | | | | |
| L. GIM-Index | 0.0572 | 0.0273 | 0.0272 | 0.0257 | 0.0086 |
| | (0.0086)*** | (0.0061)*** | (0.0061)*** | (0.0069)*** | (0.0135) |
| | (0.0045)*** | (0.0025)*** | (0.0024)*** | (0.0029)*** | (0.0096) |
| | | | | | |
| L. Market Cap. | | 0.4062 | 0.4481 | 0.3502 | 0.3317 |
| | | (0.0495)*** | (0.0103)*** | (0.0688)*** | (0.0496)*** |
| | | (0.0343)*** | (0.0067)*** | (0.0288)*** | (0.0511)*** |
| | | | | | |
| L. Outside Size | | 0.0449 | | 0.0837 | -0.0017 |
| | | (0.0512) | | (0.0734) | (0.0439) |
| | | (0.0341) | | (0.0318)** | (0.0222) |
| | | | | | |
| CEO Tenure | -0.0033 | -0.0000 | 0.0002 | -0.0007 | 0.0001 |
| | (0.0030) | (0.0022) | (0.0022) | (0.0025) | (0.0020) |
| | (0.0019)* | (0.0012) | (0.0012) | (0.0013) | (0.0014) |
| | | | | | |
| L. Outside Size Min | | | 0.0140 | | |
| | | | (0.0225) | | |
| | | | (0.0150) | | |
| Observations | 7774 | 7774 | 7762 | 6585 | 7774 |
| R-squared | 0.150 | 0.477 | 0.477 | 0.416 | 0.738 |

## Table 3. Corporate Governance and Executive Compensation Substitutability

This table provides evidence on the substitutability between corporate governance and executive compensation by studying changes on CEO compensation when firms change manager and/or corporate governance. We regress CEO total compensation (*Total Comp*) on different constructs for turnover and GIM Index changes and we include both firm fixed effects and year dummies to control for all other determinants of executive compensation. The variables employed are as follows: *Total Comp* is the logarithm of total compensation, *Turnover* is a dummy variable that takes value one if the company has changed CEO during that year and zero otherwise. *CEO Tenure* is the difference between the current year and the year the executive became CEO. *GIM Change Sign* takes value one if the firm GIM-Index has increased, value zero if it has not changed and value minus one if it has decreased, *GIM Change Up* takes value one if the firm GIM-Index has increased, zero otherwise and *GIM Change Down* takes value one if the firm GIM-Index has decreased, zero otherwise. All regressions include firm fixed effects and year dummies. Standard errors are reported in brakets and are clustered at the firm level in the first line and at the year level in the second line. *, **, or *** indicates that the coefficient is statistically significantly different from zero at the 10%, 5%, or 1% level, respectively, under that clustering. There are a total of 1117 cases of CEO turnover in our sample. There are 264 turnover cases associated with an increase in the GIM-Index and 119 cases associacied with a decrease in the GIM-Index. The sum of all the firms absolute changes in the GIM-Index in our sample is 1720. The sum of all firms absolute changes in GIM-Index around turnover is 408, a relevant 23.7 %.

| Dependent Variable: | Total Comp. (1) | Total Comp. (2) | Total Comp. (3) | Total Comp. (4) | Total Comp. (5) |
|---|---|---|---|---|---|
| Turnover | 0.0287 | 0.0289 | 0.0155 | 0.0288 | -0.0053 |
| | (0.0285) | (0.0285) | (0.0292) | (0.0284) | (0.0339) |
| | (0.0326) | (0.0325) | (0.0341) | (0.0323) | (0.0317) |
| | | | | | |
| TenureCEO | 0.0011 | 0.0013 | 0.0012 | 0.0013 | 0.0012 |
| | (0.0025) | (0.0025) | (0.0025) | (0.0025) | (0.0025) |
| | (0.0012) | (0.0012) | (0.0012) | (0.0012) | (0.0012) |
| | | | | | |
| GIM Sign | | 0.0251 | 0.0092 | | |
| | | (0.0164) | (0.0171) | | |
| | | (0.0114)** | (0.0101) | | |
| | | | | | |
| Turnover*GIM Sign | | | 0.1052 | | |
| | | | (0.0442)** | | |
| | | | (0.0465)** | | |
| | | | | | |
| GIM Sign Up | | | | 0.0300 | 0.0078 |
| | | | | (0.0228) | (0.0237) |
| | | | | (0.0177) | (0.0176) |
| | | | | | |
| GIM Sign Down | | | | -0.0173 | -0.0117 |
| | | | | (0.0327) | (0.0318) |
| | | | | (0.0369) | (0.0357) |
| | | | | | |
| Turnover*GIM Sign Up | | | | | 0.1556 |
| | | | | | (0.0610)** |
| | | | | | (0.0447)*** |
| | | | | | |
| Turnover*GIM Sign Down | | | | | -0.0213 |
| | | | | | (0.0845) |
| | | | | | (0.0982) |
| Observations | 8341 | 8341 | 8341 | 8341 | 8341 |
| R-squared | 0.731 | 0.731 | 0.731 | 0.731 | 0.731 |

## Table 4. First Stage Regression: Estimation of CEOs Ability

This table presents the technique used to estimate CEO ability. To do so, we regress *Return on Assets* on a set of control variables and a dummy variable for each CEO-Firm match. The coefficients on these dummies are our proxy for CEO ability. The variables employed are as follows: *Return on Assets* is the ratio of operating cash flow over lagged total assets. *Market Cap* is the market capitalization. *Book Leverage* is the ratio of long and short term debt to the sum of long and short term debt plus common equity. *Cash* is the sum of cash and short-term investments over net property, plant, and equipment at the beginning of the fiscal year. *Interest Coverage* is earning before depreciation, interest, and tax over interest expenses. *Dividend earnings* is the sum of common dividends and preferred earnings over earning before depreciation, interest, and tax. *Tobin's q* is the ratio of firm's total market value over total assets. *GIM-Index* is the Gompers et al. (2003) governance index. All regressions include dummy variables that take value one for a specific CEO-Firm match, zero otherwise. All regressions include year dummies. Standard errors are clustered at the firm level and *, **, or *** indicates that the coefficient is statistically significantly different from zero at the 10%, 5%, or 1% level, respectively. Summary statistics regarding the coefficients on the CEO dummies are presented.

| Dependent Variable: | ROA (1) | ROA (2) | ROA (3) |
|---|---|---|---|
| L.Market Cap. | -.0159*** | -0.0239*** | -0.0235*** |
| L.Book Leverage | .0058 | 0.0342** | 0.0342** |
| L.Cash | .0025 | -0.0001 | -0.0001 |
| L.Interest Coverage | -5.99e-06 | 3.26E-07 | -4.49E-07 |
| L.Dividend Earnings | -.0352** | -0.0215 | -0.0221 |
| L.Tobin's q | .0306*** | 0.0291*** | 0.0288*** |
| L.GIM-Index | -.0041** | | -0.0043* |
| Includes Year Fixed Effects? | Y | Y | Y |
| Includes Firm Fixed Effects? | N | Y | Y |
| Includes Industry Fixed Effects? | Y | N | N |
| Includes Firm-CEO fixed Effects? | Y | Y | Y |
| Observations | 9147 | 7609 | 7609 |
| Firm effects identified | 1335 | 1038 | 1038 |
| CEO effects identified | 2162 | 1916 | 1916 |
| Firm-CEO matches | 2271 | 1956 | 1956 |
| CEO F.E. Mean | 0.0140 | 0 | 0 |
| CEO F.E. Std. Dev. | 0.1467 | 0.0424 | 0.0423 |
| CEO F.E. Min | -0.7734 | -0.4225 | -0.4209 |
| CEO F.E. Max | 0.6674 | 0.3091 | 0.3063 |

## Table 5. Second Stage Regression: CEOs Ability and Firms Corporate Governance

This table presents the results on the relationship between CEO ability and firm's corporate governance, firm's Tobin's q and CEO total compensation. We regress firm's GIM-Index, firm's E-Index, firm's Tobin's q and CEO total compensation on the CEO ability obtained from the first stage regression. Each panel corresponds to a different specification in the first stage. The variables employed are as follows: *GIM-Index* is the Gompers et al. (2003) governance index and *E-index* is the Bebchuk et al. (2008) entrenchment index. *Tobin's q* is the ratio of firm's total market value over total assets. *Total Comp* is the logarithm of total compensation. *CEO Fixed Effects* are the CEO ability proxies obtained from the first stage regression model as specified. *CEO Tenure* is the difference between the current year and the year the executive became CEO. All regressions include year dummies and industry or firm fixed effects as required. Panel A, B and C report the OLS estimates when specification (1), (2) and (3) are used in the first stage, respectively. Panel D, E and F report the Weighted Least Squares estimates according to the specification (1), (2) and (3) for the first stage, respectively. Standard errors are reported in brackets, and *, **, or *** indicates that the coefficient is statistically significantly different from zero at the 10%, 5%, or 1% level, respectively. Standard errors are clustered at the CEO level in all panels.

| Dependent Variable: | GIM-Index | E-Index | Tobin's q | Total Comp |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **Panel A: OLS in Second Stage with Specification 1 in First Stage** | | | | |
| CEO Fixed Effects | 7.3254 | 1.6359 | 1.7851 | 3.8758 |
| | (0.6841)*** | (0.3283)*** | (0.5663)*** | (0.2620)*** |
| CEO Tenure | -0.0394 | -0.0196 | -0.0009 | -0.0091 |
| | (0.0090)*** | (0.0043)*** | (0.0034) | (0.0029)*** |
| **Panel B: OLS in Second Stage with Specification 2 in First Stage** | | | | |
| CEO Fixed Effects | 0.3502 | 0.4249 | 1.9899 | 1.1514 |
| | (0.3657) | (0.2420)* | (0.4899)*** | (0.3239)*** |
| CEO Tenure | -0.0006 | -0.0024 | -0.0011 | 0.0000 |
| | (0.0033) | (0.0019) | (0.0023) | (0.0019) |
| **Panel C: OLS in Second Stage with Specification 3 in First Stage** | | | | |
| CEO Fixed Effects | 1.0121 | 0.6605 | 1.9956 | 1.1846 |
| | (0.3669)*** | (0.2425)*** | (0.4915)*** | (0.3221)*** |
| CEO Tenure | -0.0008 | -0.0021 | -0.0012 | -0.0002 |
| | (0.0033) | (0.0019) | (0.0023) | (0.0019) |
| **Panel D: WLS in Second Stage with Specification 1 in First Stage** | | | | |
| CEO Fixed Effects | 9.0581 | 2.0094 | 2.4866 | 4.5818 |
| | (0.8600)*** | (0.4346)*** | (0.4877)*** | (0.3113)*** |
| CEO Tenure | -0.0306 | -0.0186 | -0.0016 | -0.0096 |
| | (0.0109)*** | (0.0048)*** | (0.0029) | (0.0031)*** |
| **Panel E: WLS in Second Stage with Specification 2 in First Stage** | | | | |
| CEO Fixed Effects | 0.1808 | 0.3920 | 2.3613 | 1.6173 |
| | (0.4439) | (0.2891) | (0.3714)*** | (0.3225)*** |
| CEO Tenure | -0.0031 | -0.0036 | -0.0022 | 0.0013 |
| | (0.0060) | (0.0024) | (0.0023) | (0.0020) |
| **Panel F: WLS in Second Stage with Specification 3 in First Stage** | | | | |
| CEO Fixed Effects | 0.9200 | 0.6088 | 2.4115 | 1.6748 |
| | (0.3898)** | (0.2674)** | (0.3769)*** | (0.3249)*** |
| CEO Tenure | -0.0002 | -0.0021 | -0.0022 | 0.0014 |
| | (0.0046) | (0.0022) | (0.0022) | (0.0020) |

**Table 6. Robustness: Corporate Governance Externality**

This table shows robustness analysis regarding the externality in corporate governance. Specifically, it shows that a decrease in the governance standards of the worst governed firms in the economy leads to an increase in all CEOs compensation. We regress CEO total compensation (*Total Comp*) on the lagged GIM-Index of the worst governed firms (*GIM-Index Max*), the firm lagged GIM-Index and other controls. The variables employed are as follows: *Total Comp* is the logarithm of total compensation, *GIM-Index* is the Gompers et al. (2003) governance index, *Market Cap* is the market capitalization, *GIM-Index Max* is the average Gompers et al. (2003) governance index of the 20 companies with the lowest GIM-Index in that year and *Market Cap 220* is the market capitalization of the firm ranked 220th in that year when ordered by market capitalization. All regressions include Fama French industry dummies. Standard errors are reported in brakets and are clustered at the firm level in the first line and at the year level in the second line. *, **, or *** indicates that the coefficient is statistically significantly different from zero at the 10%, 5%, or 1% level, respectively, under that clustering.

| Dependent Variable: | Total Comp. | Total Comp. | Total Comp. | Total Comp. | Total Comp. |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| L.GIM index | 0.0619 | 0.0619 | 0.0261 | 0.0259 | 0.0263 |
| | (0.0093)*** | (0.0093)*** | (0.0059)*** | (0.0059)*** | (0.0059)*** |
| | (0.0052)*** | (0.0050)*** | (0.0025)*** | (0.0023)*** | (0.0022)*** |
| L.GIM Index Max | | 0.1684 | | 0.3168 | 0.1254 |
| | | (0.0455)*** | | (0.0341)*** | (0.0462)*** |
| | | (0.1306) | | (0.0862)*** | (0.1111) |
| L.Market Cap | | | 0.4538 | 0.4565 | 0.4578 |
| | | | (0.0093)*** | (0.0093)*** | (0.0093)*** |
| | | | (0.0057)*** | (0.0046)*** | (0.0046)*** |
| L.Market Cap 220 | | | | | 0.1272 |
| | | | | | (0.0211)*** |
| | | | | | (0.0615)* |
| Observations | 8418 | 8418 | 8418 | 8418 | 8418 |
| R-squared | 0.102 | 0.103 | 0.496 | 0.501 | 0.503 |

## Table 7.  Robustness: Second Stage Regression: CEOs Ability and Different Components of Pay

This table presents the results on the relation between CEO ability and the different components of CEO pay. We regress CEO total compensation, CEO bonus, CEO stock options and CEO salary on the CEO ability obtained from the first stage regression. Each panel corresponds to a different specification in the first stage. The variables employed are as follows: *Total Comp* is the logarithm of total compensation. *Bonus* is the natural logarithm of bonus. *Stock Option* is the natural logarithm of the value of stock options awarded in a given year. *Salary* is the natural logarithm of salary. *CEO Fixed Effects* are the CEO ability proxies obtained from the first stage regression model as specified. *CEO Tenure* is the difference between the current year and the year the executive became CEO. All regressions include year dummies and industry or firm fixed effects as required. Panel A, B and C report the OLS estimates when specification (1), (2) and (3) are used in the first stage, respectively. Panel D, E and F report the Weighted Least Squares estimates according to the specification (1), (2) and (3) for the first stage, respectively. Standard errors are reported in brackets, and *, **, or *** indicates that the coefficient is statistically significantly different from zero at the 10%, 5%, or 1% level, respectively. Standard errors are clustered at the CEO level in all panels.

| Dependent Variable: | Total Comp | Bonus | Stock Option | Salary |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **Panel A: OLS in Second Stage with Specification 1 in First Stage** | | | | |
| CEO Fixed Effects | 3.8758 | 5.1443 | 3.3158 | 2.0424 |
| | (0.2620)*** | (0.3603)*** | (0.3545)*** | (0.1446)*** |
| CEO Tenure | -0.0091 | 0.0057 | -0.0067 | 0.0023 |
| | (0.0029)*** | (0.0030)* | (0.0043) | (0.0016) |
| **Panel B: OLS in Second Stage with Specification 2 in First Stage** | | | | |
| CEO Fixed Effects | 1.1514 | 1.9687 | 0.2632 | 0.4616 |
| | (0.3239)*** | (0.4244)*** | (0.4917) | (0.2539)* |
| CEO Tenure | 0.0000 | 0.0113 | -0.0064 | 0.0100 |
| | (0.0019) | (0.0025)*** | (0.0034)* | (0.0019)*** |
| **Panel C: OLS in Second Stage with Specification 3 in First Stage** | | | | |
| CEO Fixed Effects | 1.1846 | 1.9702 | 0.3418 | 0.5039 |
| | (0.3221)*** | (0.4269)*** | (0.4917) | (0.2536)** |
| CEO Tenure | -0.0002 | 0.0114 | -0.0071 | 0.0101 |
| | (0.0019) | (0.0025)*** | (0.0034)** | (0.0019)*** |
| **Panel D: WLS in Second Stage with Specification 1 in First Stage** | | | | |
| CEO Fixed Effects | 4.5818 | 6.1072 | 3.9030 | 2.2803 |
| | (0.3113)*** | (0.4234)*** | (0.4232)*** | (0.1714)*** |
| CEO Tenure | -0.0096 | 0.0065 | -0.0095 | 0.0018 |
| | (0.0031)*** | (0.0031)** | (0.0044)** | (0.0019) |
| **Panel E: WLS in Second Stage with Specification 2 in First Stage** | | | | |
| CEO Fixed Effects | 1.6173 | 2.5900 | 0.7616 | 0.5216 |
| | (0.3225)*** | (0.4816)*** | (0.5413) | (0.2626)** |
| CEO Tenure | 0.0013 | 0.0101 | -0.0031 | 0.0122 |
| | (0.0020) | (0.0030)*** | (0.0035) | (0.0021)*** |
| **Panel F: WLS in Second Stage with Specification 3 in First Stage** | | | | |
| CEO Fixed Effects | 1.6748 | 2.5539 | 0.8453 | 0.5861 |
| | (0.3249)*** | (0.4685)*** | (0.5353) | (0.2619)** |
| CEO Tenure | 0.0014 | 0.0103 | -0.0038 | 0.0125 |
| | (0.0020) | (0.0030)*** | (0.0034) | (0.0022)*** |