

Investor Myopia and CEO Horizon Incentives

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Abstract

We examine the impact of investor horizon on the design of compensation contracts. Using a sample of IPO firms, we contrast horizon incentives provided to CEOs across firms held by venture capital (VC) investors who are short-horizon investors that have significant ownership and control with other firms where such controlling short-horizon investors are absent. We construct several new measures of horizon incentives of the compensation that take into account vesting schedules. We find that VC-backed firms provide incentives that correspond with their own investment horizons, by granting equity payments with vesting periods that correspond with their anticipated distributions. However, we find that the presence of institutional investors restricts VCs' ability to provide such short-horizon incentives. We also explore the long-run consequences of horizon incentives. We find that long-run (short-run) performance is higher (lower) for CEOs with short-horizon incentives relative to those with long-horizon incentives.

1. Introduction

In this paper, we examine the use of horizon incentives in CEO compensation contracts and shed light on the role of investors' horizons on these incentives. We define *horizon incentives* as features of compensation contracts that alter the decision horizon of managers. An important source of agency conflicts between managers and shareholders is the divergence of investment horizons. Information asymmetry between managers and shareholders regarding the availability of projects and their expected values distorts project selection if value realizations extend beyond managers' horizons.¹ Further, information asymmetry restricts the ability to directly monitor manager's actions.

Contracts help reduce the divergence in horizons between managers and shareholders. Prior literature suggests that equity-based pay increases the investment horizon of managers.² However, the horizon incentives of equity payments vary with their vesting terms. Shorter vesting schedules influence exercise behavior and make the compensation available in the short-run (Huddart and Lang, 1996; Kole, 1997). In addition, investors' horizons and their abilities to influence contract design vary. This paper examines the mechanisms by which compensation provides horizon incentives and how these incentives vary with investors' horizons.

Our study investigates three research questions on this issue. First, what are the specific CEO compensation features that provide horizon incentives and how are they influenced by investors' horizons? To answer this, we construct novel measures of the horizon or duration of annual compensation that considers the equity payment vesting schedules. We then examine whether these measures are systematically related to investors' horizons. Second, we examine the role of market monitoring in mitigating the agency problems associated with short-horizon

¹ Therefore managers may avoid positive NPV projects that the market under-values in the short-run or undertake negative NPV projects that the market over-values in the short-run.

² See Murphy, 1985; Jensen and Murphy, 1990; Lambert and Larcker, 1991; Dechow and Sloan, 1991.

controlling investors. Third, we provide evidence on the consequences of horizon incentives on the stock returns and accounting returns over the short- and long-run.

We address these research questions by examining horizon incentives in CEO contracts for firms around their initial public offering (IPO) with venture capitalist investors (VCs). This is a rich setting and provides several advantages over prior work. First, VCs have short investment horizons because they typically distribute a significant portion of their shares within one year after the IPO (Gompers and Lerner, 1998, 1999; Field and Hanka, 2001), making them myopic. Second, VCs have the ability to influence executive contracts because they generally own a significant proportion of the firm, and sit on the board of directors and compensation committees.³ Third, the initial public offering marks a significant inflow of cash that requires important investment decisions by managers, which exacerbates the importance of aligning managerial investment horizons.

The IPO firm is also subject to intense market monitoring subsequent to the IPO. Investors in the stock market price the equity considering the incentive effects of observable managerial contracts when valuing the firm. Also, block ownership by large institutional investors with longer horizons alter the external monitoring environment and improve governance. As a result, we expect executive compensation contracts to include more long-term incentives in the presence of external market monitoring and large institutional ownership. This creates an interesting tension between the short-horizon of VCs and the long-horizon of external shareholders. We exploit this tension by comparing the horizon incentives of contracts put in place prior to the firm going public (when VCs have significant influence), with the contracts following the IPO (when market monitoring is in effect).

³ In our sample of firms with venture capitalist financing, the venture capitalist sits on the board in 92% of the observations, and is on the compensation committee in all of the observations in which a VC is present and there exists a compensation committee.

We hypothesize that, in the fiscal year prior to the IPO, VC-backed firms grant a greater proportion of pay in the form of equity to provide managers with incentives to take the firm public.⁴ At the same time, we predict that the equity payments of VC-backed firms provide short-horizon incentives. However, once the firm is public, we expect short-horizon incentives of VC-backed firms to be restricted by large institutional investors. However, in the absence of large institutions, because VCs have significant control of the firm, we predict shorter-horizon incentives despite additional monitoring by market participants. In addition, we expect VC-backed firms to anticipate the potential loss of control following the IPO and therefore put in place contracts prior to the IPO that vest around lockup expiration.⁵ For firms that go public without VC-backing, we predict a significant increase in long-horizon incentives following the IPO because of market monitoring by shareholders including institutional investors.

We measure horizon incentives of compensation in two alternative ways. First, we compute three metrics of horizon incentives based on annual compensation: (i) the proportion of annual compensation composed of equity-based payments, (ii) the proportion of annual compensation composed of unvested equity payments, and (iii) an estimate of the duration of the annual compensation, where duration is a function of the vesting schedule of the equity grants and cash represent durations of zero. Second, recognizing that contracts from prior periods also provide horizon incentives through their effect on the portfolio of equity holdings, we measure the proportion of CEO option portfolios that have not vested. Unvested option holdings provide long-horizon incentives because they limit executives' abilities to benefit from short-term performance, while vested options provide more short-horizon incentives.

⁴ According to Gompers and Lerner (1999), taking a firm public is the most profitable exit strategy for VCs.

⁵ The lockup expiration, which is typically 180 days after the IPO is the first instance when shareholders from prior to the IPO, including the CEO and VC, can sell their stock.

We identify a sample of firms that go public between 2000 and 2004. We then hand-collect detailed data on CEO compensation including the vesting schedule of options and restricted stock grants, VC-backing, and equity holdings for the fiscal year prior to the IPO and the fiscal years following the IPO leading up to and including the lockup expiration year. We then compare the horizon incentives of VC-backed firms with those of non VC-backed firms prior to the IPO and following the IPO.

Consistent with our predictions, in the year prior to the IPO we find that CEOs of VC-backed firms receive 18 percentage points more of their pay in the form of equity relative to our sample firms without VC-backing, after controlling for cash constraints and other firm characteristics. We also find that a significant proportion of the equity granted prior to the IPO vests soon after the offering. These findings suggest that VC-backed firms grant their executives incentives to take the firm public, and align CEOs' investment horizons with their own.

Further, consistent with institutions mitigating the short-horizon incentives of VCs, we find that VC-backed firms with high institutional ownership grant 9 percentage points more equity with longer-horizon incentives than VC-backed firms without institutional ownership. Comparing VC- and non VC-backed firms with low institutional holdings in the years following the IPO we find that 27% more of the equity grants vest within a year for VC-backed firms. Taken together this suggests that in the absence of monitoring by large institutions, VCs continue to provide short-horizon incentives subsequent to the IPO. Finally, the proportion of unvested options is up to 29 percentage points lower for VC-backed firms relative to non VC-backed firms in the years following the IPO. This evidence is consistent with VCs timing the vesting of pre-IPO grants to induce short-horizon managerial behavior after the offering when they may no longer be able to influence the annual compensation.

For firms without VC ownership, we find that they grant up to 31 percentage points more equity in the years following the IPO compared with the year prior to the offering, consistent with increased market monitoring. In addition, for firms without VC-backing, the average duration of the annual compensation increases by over one year relative to the annual compensation prior to the IPO.

We then explore the consequences of providing horizon incentives on short- and long-term performance. This is challenging because managerial actions and the available investment opportunity sets are unobservable. We therefore compare the market-adjusted stock return and return on assets over short- and long-term horizons and relate them to our metrics of long-term incentives. We find that accounting performance in the first year is significantly greater for firms with short-horizon incentives, while both accounting and stock return performance in the third year are significantly lower. This evidence is consistent with our conjecture that managers with short-horizon incentives sacrifice future performance in favor of current performance.

Overall, our paper makes several contributions. We provide new evidence on the mechanisms through which compensation schemes provide horizon incentives. We construct new measures of horizon incentives that capture the duration of the compensation and highlight the role of vesting periods on providing horizon incentives. Contrary to extant beliefs that all equity payments provide long-horizon incentives, we highlight the importance of vesting terms on the horizon incentives of equity. Utilizing these measures, we find evidence consistent with VCs providing short-horizon incentives that coincide with their own investment horizons for newly public firms. In the years following the IPO, we find that market monitoring, in particular the presence of large blockholders, results in contracts with longer-horizon incentives. Finally, we provide evidence that short-horizon incentives induce more myopic behavior as evident by

lower long-run performance relative to short-term performance for firms with short-horizon incentives.

Prior studies that examine the impact of shareholder investment horizon on managerial myopia typically focus on institutional investors and infer short-horizon incentives from the investment decisions of firms (Wahal and McConnel, 2000; Bushee, 1998; Shin, 2006). Our paper adds to this stream of literature in two important ways. First, we directly examine the horizon incentives provided to executives by focusing on detailed components of compensation contract rather than inferring it from managerial actions. Second, our short-horizon investors, VCs, can influence the compensation contracts since they have significant control over the management through board and compensation committee membership.

The rest of the paper is as follows: Section 2 discusses related literature and research questions, Section 3 lays out the research design and variables, Section 4 presents the results and Section 5 concludes.

2 Related Literature and Research Question

Existing theories on managerial myopia suggest that managers have shorter investment horizons than shareholders. The divergence in investment horizons among managers and shareholders leads to agency costs because of information asymmetries and other agency problems between managers and shareholders (e.g. Stein, 1988, 1989; Shleifer and Vishny, 1990; Thakor, 1990; Narayanan, 1985, 1996; Bebchuk and Stole, 1993). Specific sources of managerial myopia include the threat of managerial turnover arising from takeovers, risk aversion, liquidity constraints, and the need to access capital markets (Stein, 1988 and Bar-Gill and Bebchuk, 2003).

When managers' investment horizons are shorter than shareholders', executives are likely to choose projects and take actions that benefit the firm in the short-term at the expense of investment opportunities and actions that would otherwise benefit the firm in the long-run. Consequences of managerial myopia involve improving short-run profits to increase the stock price at the cost of long-run profits (Stein, 1988). Also, with information asymmetries between shareholders and managers and no *ex post* settling up, managers may invest in bad long-term projects that increase the stock price in the short-term (Bebchuk and Stole 1993). Empirical research has found mixed evidence of managerial myopia and the role of investor horizon. Wahal and McConnell (2000) find that capital expenditures and R&D investments are increasing in institutional holdings and conclude that executive short-term investment behavior declines in the presence of institutional shareholders. In contrast, Bushee (1998) finds evidence that firms myopically reduce R&D expenses to protect earnings in order to attract transient (short-term) investors, and Shin (2006) finds that firms with transient institutions grant more options.

Prior literature suggests that managerial myopia can be mitigated by linking executive wealth to the firm with equity compensation. Murphy (1985), Jensen and Murphy (1990), Lambert and Larcker (1991), and Dechow and Sloan (1991) suggest that equity pay encourages the selection of long-term risky projects by tying executive wealth to the value of the firm. Indeed, restrictions on the sale of these equity payments indicate that they are used, at least in part, as a mechanism to bond managers' wealth with the firm over long horizons.

At the same time, horizon incentives of equity payments vary with vesting periods and other contract terms. For example, Bizjack, Brickley, and Coles (1993) indicate that if equity compensation is tied to short- rather than long-term stock returns, equity provides incentives to invest in short-term projects. Kole (1997) points out that short vesting schedules for some equity

payments indicate equity compensation may be granted for compensatory purposes rather than long-term incentives. Consistent with vesting periods altering the horizon of equity payments, Huddart and Lang (1996) find evidence that executives exercise their options relatively early in the term, and soon after the options vest. Similarly, Hall and Murphy (2002) indicate that executives with relatively undiversified holdings are more likely to exercise their options soon after vesting.

VCs provide a unique setting in which to investigate how investor horizon relates to the structure of executive contracts because they have the motivation and ability to directly influence the design of executive compensation contracts to match their own investment horizons. VCs generally own significant proportions of the firm, and benefit when the firm goes public. In addition, they typically distribute their ownership to their VC fund investors or sell their shares in the open market soon after the initial public offering. Using a proprietary dataset that allows them to observe actual VC distributions, Gompers and Lerner (1998) find evidence that the median VC distribute their shares approximately one year after the IPO and rarely retain their shares for more than two years. Tracking changes in beneficial ownership from the IPO prospectus and the first proxy statement, Field and Hanka (2001) find that VCs sell or distribute 29% of their holding within this period.⁶ They also find that trading volume is much larger in the year following the IPO when the firm is financed by venture capital, and that VCs sell more aggressively than other shareholders. Not only are VCs exiting soon after the IPO, but maximizing the returns from the distribution or sale of stock is an important objective of venture capitalists since their reputation and subsequent investor inflows are increasing in recent returns on investment (Gompers and Lerner, 1998).

⁶ This potentially understates the level of VC distribution since the time between the IPO date and the fiscal year end covered by the first proxy statement is likely to be less than one year, and fall within the lockup period in some cases.

VCs also have significant control of the firm and the ability to influence executive contract design. They generally own large proportions of the firm, and sit on the board and compensation committees. Furthermore, venture capitalists generally exit from their board duties once they distribute their shares (see Gompers and Lerner 1998), which insulate them from negative long-term consequences of their contract choices.

Going public is the most profitable exit strategy for VCs (Gompers and Lerner, 1999). Therefore, we predict that firms held by VCs provide greater proportions of executive annual compensation in the form of equity prior to the IPO to motivate the firm to go public. At the same time, because VCs have short investment horizons, we predict that these equity payments vest around the lockup expiration. In contrast, we predict that executives of firms without VC financing receive fewer incentives to go public (fewer equity payments), but once public receive longer-horizon incentives. This leads to our first hypothesis (stated in the alternative form):

H1: VC Myopia Hypothesis

H1_a: Firms with VC-backing provide greater proportions of equity payments prior to the IPO.

H1_b: A greater proportion of the equity payments vest around the lockup expiration for VC-backed firms.

Once the firm is public, increased scrutiny by the market and significant institutional ownership influence horizon incentives. Because institutions and other shareholders do not have well-specified short-term investment horizons, they prefer the firm to invest in positive net present value projects regardless of horizon, and avoid value decreasing investments. In particular, institutions that hold significant proportions of the firm have the ability and incentive to monitor the firm and the compensation schemes. Therefore, we predict that the horizon incentives provided by the annual compensation increase following the IPO. Further, we predict

that institutional ownership restricts VCs from providing short-horizon incentives following the IPO. This leads to our second set of hypothesis (stated in alternative form):

H2: Market Monitoring Hypotheses

H2_a: Market monitoring subsequent to the IPO leads to longer-horizon incentives for CEOs without VC-backing.

H2_b: Long-horizon incentives are increasing in the extent of market-monitoring for VC-backed firms.

In perfect markets, the current stock price incorporates the impact of all investment decisions, and there is no difference between maximizing short-run and long-run stock prices. However with information asymmetry between managers and investors, the market is unable to unravel myopic behavior, and short-run stock price benefits can result from managerial myopia. Evidence of such actions can be seen in prior literature on the effects of meeting/beating earnings targets. For example, Matsunaga and Park (1998) find that executives earn greater cash compensation when they meet earnings targets, suggesting that cash compensation is associated with short-term performance.

We predict that executives with short-horizon incentives take actions that benefit the firm in the short-run at the potential cost of long-term performance. Because investment opportunities and deferred actions are unobservable, we focus on the outcomes of executive behavior to measure the affect of horizon incentives. Specifically, we investigate two performance metrics, market-adjusted stock returns and return on assets over short and long-term horizons in relation to the horizon incentives. We predict that executives with short-horizon incentives take actions that exhibit greater performance in the short-term, but weaker performance in the long-term relative to executives of firms with longer-horizon incentives. We test the following hypothesis (stated in the alternative form):

H3: Performance Horizon Hypothesis

Short- (long-) horizon incentives are associated with higher short- (long-) run performance.

3. Sample Selection, Variable Measurement, and Research Design

3.1 Sample

Our sample of IPO firms is obtained from the *Securities Data Corporation* (SDC) database from 2000 through 2004 with coverage on the Hemscott's *CoreCompensation* database.⁷ To be included in the final sample, we also require COMPUSTAT data for the fiscal year prior to the IPO and fiscal years following the IPO including lockup-expiration year. This selection results in a sample of 294 firms. For each firm we hand-collect compensation data for the fiscal year immediately preceding the IPO from the prospectus and the vesting periods of the equity payments for all sample years. We also hand collect the VC related information since Ljungqvist and Wilhelm (2003) point out there are significant errors in the SDC database with respect to VC-backing.

Firm years in our sample span three potential event-time periods, because we are interested in the CEO's compensation design before and after the IPO. There are three potential periods in our sample: the fiscal year that ends prior to the IPO ($t=0$), the fiscal year in which the IPO occurs or the post-IPO year ($t=1$), and the fiscal year in which the lockup expires ($t=1$ or $t=2$). For example, if the lockup period expires in the fiscal year after the fiscal year of the IPO, we also include the fiscal year of the lockup expiration, $t=2$. However, in some cases the lockup expires in the year immediately following the IPO, $t=1$. For each firm in the sample, we observe the CEO's compensation in the pre-IPO year, the fiscal year in which the IPO occurs and the

⁷ CoreCompensation provides executive compensation data for a broad set of firms. See Cadman et al. (2006) for a discussion of this dataset compared with the Standard and Poor's ExecuComp database.

lockup expiration year if the lockup expires in the next year.⁸ Because some lockup periods expire in the year immediately following the IPO, while others expire in the second fiscal year following the IPO, our final sample consists of 800 CEO-firm years.

3.2 *Variable Measurement*

As described in Section 2, our primary objective is to measure the dimensions of compensation and equity holdings that provide horizon incentives and relate these incentives with investors' horizons. We construct several measures related to the horizon incentives of the annual compensation and executive equity portfolios held in the firm.

3.2.1 *Compensation Duration Metrics*

We compute and study three metrics of horizon incentives provided by annual compensation. First, we examine the ratio of the value of options and restricted stock payments to the total annual compensation, *%Equity Pay*. Prior literature argues that equity based compensation provides long-term incentives to myopic managers, while greater proportions of cash pay induce shorter investment horizons.

However, the terms of equity payments provide various investment horizons. In particular, the vesting schedules of equity based compensation influence investment horizon incentives. To capture the influence of vesting periods on the horizon incentives, we construct several measures of annual compensation duration based on the vesting periods of the equity payments. We hand-collect detailed vesting data of the annual compensation from prospectuses and proxy statements and measure the duration of the equity payments based on the number of years until the equity vests. We account for vesting schedules of annual equity payments by constructing a weighted average of the vesting periods of the stock and option grants. For options, we calculate the duration of the grant as follows:

⁸ The lockup expiration dates were hand-collected when SDC had missing data on the lockup expiration.

$$Soptgrnt_Duration = \frac{1}{TotalSoptgrnt} \sum_{t=0}^K t \times Vest_t$$

Where t denotes the year in which part of the option ($Vest_t$) vests, where the sum of $\{Vest_t, Vest_{t+1}, \dots, Vest_K\}$ equals the annual stock option grant ($Soptgrnt$).

Using a similar logic we compute the weighted average vesting period of the restricted stock grant, $Rstkgmnt_Duration$. We then compute the duration of the weighted average of the total annual compensation considering cash payments as zero-duration payments as follows:

$$CompDuration = \frac{Soptgrnt_Duration * Blk_valu + Rstkgmnt_Duration * Rstkgmnt}{Salary + Bonus + Othann + Blk_valu + Rstkgmnt}$$

Where Blk_valu represent the Black-Scholes value of the option grant and $Rstkgmnt$ is the value of the restricted stock grant. In this measure cash payments exhibit durations of zero years because they are immediately available to the executive. Therefore, the formula assumes that all cash payments have durations of zero and are excluded from the numerator.

Cash payments are not necessarily rewards for short-term performance. However, bonus rewards are based on performance metrics that are not publicly available. Therefore, assuming that cash payments are zero duration payments introduce potential downward bias to our measure. To isolate the duration of the equity payments, we also construct a measure of equity duration, omitting cash payments as follows:

$$EquityDuration = \frac{Soptgrnt_Duration * Blk_valu + Rstkgmnt_Duration * Rstkgmnt}{Blk_valu + Rstkgmnt}$$

Because VCs generally exit the firm within one to two years after the IPO, their investment horizon is focused on this period. To more directly measure the horizon incentives that correspond with this period, we also measure the proportion of an equity grant that vests within one year. This measure, $\%VestIYR$, captures the proportion of the equity grant that

becomes available to the executive soon after the IPO and corresponds with the horizon of the VC.

Our fourth measure of horizon incentives is the proportion of compensation that is not immediately convertible to cash. The *Non-current Compensation* is defined as 1 minus the ratio of current compensation (cash plus immediately vested equity) to total compensation as follows:

$$Non - current Compensation = 1 - \left(\frac{Salary + Bonus + Othann + Vest_{0,options} + Vest_{0,restrictedstock}}{Totalcompensation} \right)$$

This measure captures the proportion of compensation associated with future performance because it vests in future periods restricting the executive from benefiting from short-term increases in firm-value.

3.2.2 *Wealth-based duration metric*

The measures of annual compensation described above focus solely on current compensation. However, equity grants with long vesting periods continue to provide long-horizon incentives over multiple periods. Furthermore, the amount of unvested (or vested) wealth in the firm accumulates over time, and may constitute significant long-horizon incentives. We are unable to observe vesting periods of previously granted equity holdings because detailed information about these equity holdings are not readily available. However, proxy statements provide summary measures of vested and unvested stock options. To measure the horizon incentives provided by existing equity portfolios, we calculate the proportion of options that have not vested as of the fiscal year-end as follows:

$$\%Unvested = \frac{Unvested _ option _ holdings}{Vested _ option _ holding + Unvested _ option _ holdings}$$

The wealth-based metric provides an advantage over the annual compensation metric because the wealth-based measure reflects the vesting terms of current and prior year equity

grants. In addition, the summary measure captures the result of any changes in vesting periods from previously granted equity due to performance vesting or any other changes in the terms of the contract. Finally, the wealth measure accounts for compensation schemes implemented in prior years that may be designed to vest at times coinciding with the investment horizons of the venture capitalists.

3.2.3 *IPO Characteristics*

We define a firm as VC backed with an indicator variable (*VC*) that equals 1 if the firm is held by venture capital investor in the year prior to the IPO, and zero otherwise. To identify the investment horizon of the venture capitalist, we use the lockup expiration date. This date is available on SDC and we define *Lock expire* as the fiscal year in which the lockup expiration date falls. We also measure several IPO related characteristics to capture the potential incentives of the VC. *Log proceeds*, which is the natural log of the IPO proceeds, is a proxy for the success of the IPO. *Shares locked (%)* is the estimated fraction of pre-IPO insider shares locked, computed as (1- percentage of shares offered) (see Field and Hanka, 2001). The fraction of the insider shares locked at the IPO captures insider selling incentives at the lockup expiration because they are restricted from selling before the lockup expiration.

3.2.4 *Other variables*

We hand-collect executive ownership information for the fiscal year prior to the IPO from the beneficial holdings information of the prospectus. We control for the CEO's equity ownership using a dichotomous variable *CEO own*, which is equal to 1 when the CEO ownership exceeds 10% and zero otherwise. This measure is a proxy for the intensity of the manager's control of the firm. This measure also captures potential myopia of the manager. When the CEO holds a large proportion of wealth in the firm, and expect to liquidate the shares in the near-

term, myopic tendencies persist. We also include a dummy variable *Founder* which takes on the value 1 if the CEO is a founder of the firm, and zero otherwise. We obtain the founder information in the biography of the CEO in the prospectus. Founder may increase myopic tendencies because founders are more likely to hold large proportions of their wealth in firm. At the same time, founders may behave less myopic to preserve the long-run value of the firm for following family members or other forms of human capital. Because turnovers influence the contract design of exiting executives as well as new executives, we identify firm-years in which a new CEO enters the firm and control for this change with an indicator variable *Turnover*.

We then control for firm characteristics that are likely to influence the design of executive contracts. We measure firm size with the natural log of total assets (*Logassets*). Growth opportunities and the investment opportunity set are measured by R&D expenditures scaled by assets, *R&D/Assets*. We measure profitability as earnings divided by assets, *NI/Assets*. Finally we measure the cash constraints of the firm with the operating cash flows divided by assets, *CFO/Assets*.

We predict that institutions with significant ownership monitor the firm and impose longer horizon contracts to mitigate managerial myopia. We measure the fraction of institutional ownership (*Inst_own*) from Thompson's database of 13F filings measured on the latest quarter coinciding with the fiscal year-end date. In addition we identify whether the firm is underwritten by a "toptier" bank. Toptier analysts are identified as investment banks with a modified Carter Manaster Rank of 8.1 or 9.1. The ranks are constructed by Jay Ritter based on the original Carter Manaster Reputation Ranks.⁹ Since underwriters presumably choose their clients, *Toptier* controls for a number of firm characteristics associated with the selection by these banks to underwrite the IPO. In addition, these underwriters particularly in the late 90's are thought to

⁹ These ranks are available from Jay Ritter's web site <http://bear.cba.ufl.edu/ritter/ipolink.htm>

pressure management to keep the stock price high. Finally, to determine whether the firm has incentives to keep the price high following the IPO, we include an indicator variable for whether the firm had a secondary offering within one year of the IPO.

3.3 Research Design

We examine the effect of VC ownership on the horizon incentives of executive compensation in multivariate analyses to control for other potential determinants of executive horizon incentives. We estimate the following regression of our compensation duration metrics:

$$\begin{aligned}
 \text{Compensation Duration} = & \beta_0 + \beta_1 VC \times \text{Pre-IPO} + \beta_2 \text{Post-IPO} + \beta_3 VC \times \text{Post-IPO} \\
 & + \beta_4 VC \times \text{Post-IPO} \times \text{Inst_Own} + \beta_5 \text{Inst_Own} + \beta_6 \text{Toptier} \\
 & + \beta_7 \text{Secondary Shares} + \beta_8 \text{CFO/Assets} + \beta_9 \text{Log(Assets)} \\
 & + \beta_{10} \text{NI/Assets} + \beta_{11} \text{R\&D/Assets} + \beta_{12} \text{CEO Turnover} \\
 & + \beta_{13} \text{Founder} + \beta_{14} \text{CEO Own} + \varepsilon_1
 \end{aligned} \tag{1}$$

The duration metrics that we examine are *%Equity Pay*, *Non-current Compensation*, *Comp Duration*. We also estimate Eq. (1) with the proportion of unvested options, *%Unvested* as the dependent variable. We include industry indicator variables and the standard errors are cluster-adjusted, based on each firm as a single cluster. Because a large number of observations exhibit durations of zero, we estimate Eq. (1) using a tobit estimation that jointly determines whether the duration is greater than zero and the magnitude of the duration.¹⁰

We predict that VC-backed firms grant greater proportions of equity in the year prior to the IPO to encourage the firm to go public. Because equity payments have greater durations than cash, this also increases the duration of the annual compensation ($\beta_1 > 0$). H2_a predicts that compensation duration increases in the years following the IPO because of market monitoring

¹⁰ We recognize that venture capitalist backing is assumed to be exogenous in our model. Because we cannot observe firm characteristics prior to the presence of the venture capitalist, we can not observe the determinants of venture capital backing. Therefore, we are unable to identify exogenous determinants of venture capital ownership. Rather than impose additional econometric issues by including a poorly specified instrumental variables approach (Larcker and Rusticus, 2006) we control for firm-characteristics that prior literature predicts would be correlated with the contract horizon and are related with whether the firm is backed by a venture capitalist.

($\beta_2 > 0$). While we expect VC-backed firms to provide shorter duration contracts ($\beta_3 < 0$), the market monitoring hypothesis predicts that institutions restrict the VC's ability to provide short-horizon incentives. To test the influence of institutions on the horizon incentives for VC-backed firms, we compare the duration of VC-backed firms with and without significant institutional ownership with an F-test.

One problem with the measures of compensation durations tested above is that they assume cash payments to be rewards for current performance. However, bonus rewards are based on performance metrics that are not publicly available, and may be tied to long-term performance. Therefore, assuming cash payments provide short-horizon incentives may bias our measure downwards. To focus solely on the duration of the equity payments, we estimate the duration of the equity payments using a two-stage selection model (Heckman, 1979) in which we first control for the determinants of an equity grant. It is important to first control for the determinants of an equity grant because firms grant equity in only 57% of the observations in our sample. We estimate the following system of equations:

$$\begin{aligned} \text{Grant} = & \beta_0 + \beta_1 \text{VC} \times \text{Pre-IPO} + \beta_2 \text{Post-IPO} + \beta_3 \text{VC} \times \text{Post-IPO} \\ & + \beta_4 \text{VC} \times \text{Post-IPO} \times \text{Inst_Own} + \beta_5 \text{Inst_Own} \\ & + \beta_6 \text{CFO/Assets} + \beta_7 \text{Log(Assets)} + \beta_8 \text{NI/Assets} + \beta_9 \text{R\&D/Assets} \\ & + \beta_{10} \text{CEO Turnover} + \beta_{11} \text{Founder} + \beta_{12} \text{CEO Own} + \varepsilon_2 \end{aligned} \quad (2)$$

$$\begin{aligned} \text{Equity Duration|Grant} = & \beta_0 + \beta_1 \text{VC} \times \text{Pre-IPO} + \beta_2 \text{Post-IPO} + \beta_3 \text{VC} \times \text{Post-IPO} \\ & + \beta_4 \text{VC} \times \text{Post-IPO} \times \text{Inst_Own} + \beta_5 \text{Inst_Own} \\ & + \beta_6 \text{Toptier} + \beta_7 \text{Secondary Shares} + \varepsilon_3 \end{aligned} \quad (3)$$

The first stage of the model, Eq. (2), includes industry indicator variables and estimates whether there was an equity grant. The second stage, Eq. (3), estimates the duration of the grant given an equity grant estimated in Eq. (2). The tests of our hypotheses and the corresponding predictions of the coefficients in Eq. (3) are consistent with those indicated for Eq. (1). As an

additional test of whether VC-backed firms grant equities that vest around the lockup expiration, we also estimate the proportion of the equity grants that vest within one year.

4. Results

4.1 Univariate Results

The annual distribution of our sample of IPOs is provided in Table 1 Panel A. The sample is skewed towards IPOs in 2004 (47%). The skewed distribution of IPOs results from *CoreCompensation* coverage increasing during the sample period. Further tests comparing the number of IPOs in our sample with the total number of IPOs documented by SDC indicates that the proportional coverage also increases in 2004 (results untabulated). Panel B of Table 1 presents the industry distribution of our sample, where industries are identified as in Barth et al. (2001). In our tests that follow, we control for variations in industry with indicator variables for the 12 industries identified here.

Panel C of Table 1 provides summary statistics on the initial public offerings in our sample. Venture capitalists have significant ownership in 205 firms (67.2%). Of the VC-backed firms, VCs own 58% of the firm on average, sit on the board 92% of the time, and have a representative on the compensation committee in all firms with such a committee.¹¹ These results confirm our conjecture that VCs have a controlling interest in the firm and the ability to influence executive compensation practices.

Table 2 provides a summary of firm characteristics separately for VC-backed and non VC-backed firms over the pre and post IPO periods. In the fiscal year prior to the initial public offering, VC-backed firms hold smaller cash balances than firms without VC-backing (mean of \$47.24 million compared to \$170.28 million), and are smaller (mean assets is \$382 million

¹¹ A compensation committee is specified in 158 (79%) of the VC-backed firms, of which a representative of the VC sits on the committee in all 158 firms.

compared with \$4159 million). While the average profits are negative across both samples, VC-backed firms earn lower profits, on average. However, firms that go public with VC financing invest more heavily in research and development and capital expenditures. These differences generally persist in the years following the IPO.

The focus of our analysis is on the annual compensation of VC and non VC-backed IPOs. Table 3 provides initial evidence on this issue. We find that VC-backed firms compensate their executives with greater proportions of equity pay, lower levels of cash pay, and greater levels of equity pay. While the amount and proportion of equity pay suggests that VCs provide more long-term incentives than firms without VC-backing, another explanation for this difference is that equity compensation is a substitute for cash payments when the firm is cash constrained (see for example Smith and Watts 1992). Therefore, the greater amount and proportion of equity payments in the VC-backed firms may be the result of cash constraints in these firms.

Our metrics of long-term incentives that include cash and equity based payments are not consistently significantly different across VC- and non VC-backed firms. Allowing for the influence of cash compensation (which have durations of zero in our metrics), the compensation duration for VC-backed firms is significantly greater. The difference in compensation duration is likely due to the difference in the proportion of equity compensation. Therefore, we also examine the duration of equity grants separately, which is about 2 years for both groups

While the evidence suggests that VC backed firms grant greater proportions of equity pay with greater durations in the year prior to the IPO, these differences do not persist in the years following the IPO. The duration of annual compensation increases for VC and non VC-backed firm when the duration is based solely on the equity payments. In addition, the proportion of unvested equity held by CEOs of a non VC-backed firm increases significantly in

the years following the IPO to 62%. In contrast, the proportion of unvested options significantly declines following the IPO for VC-backed firms and is significantly lower than non VC-backed firms. This is indirect evidence that VCs grant equity prior to the IPO that vests around the lockup expiration.

To provide further evidence on the vesting periods of the equity granted in the year prior to the IPO. We investigate the equity grants in the year prior to the IPO and the year following the IPO to determine the proportions that vest over four annual periods following the grant.¹² Table 2 Panel B indicates that 42% and 46% of a grant prior to the IPO vests within one year, for non VC-backed and VC-backed firms, on average. In the year following the IPO, the proportion of equity grants that vest within 1 year declines to 33% and 38% for non VC- and VC-backed firms, respectively. Overall, the evidence is consistent with a significant proportion of equity grants providing short-horizon incentives as evident by the large proportion that vest within 1 year. In addition, VC-backed firms provide contracts with shorter horizons in the year following the IPO, while non VC-backed firms increase the horizon incentives in the years following the IPO. This is consistent with the smaller proportion of unvested equity for CEOs of VC-backed firms found in Table 3 Panel A, and our prediction in the VC myopia hypothesis (H1_b) that VCs provide horizon incentives by issuing equity payments that mature over periods they expect to distribute their shares (around the lockup expiration).

4.2 *Multivariate Results*

4.2.1 *Evidence on the compensation and shareholder investment horizon*

Table 4 presents results from estimating the duration of annual compensation. Consistent with our univariate results and the VC myopia hypothesis (H1_a), the positive coefficients on *VC x Pre-IPO* indicates that firms with VC-backing provide greater proportions of pay in the form

¹² We only found two equity grants with vesting periods greater than 4 years.

of equity which results in longer horizon incentives prior to the IPO. Consistent with firms increasing investment horizons following the IPO as in the market monitoring hypothesis (H2_a), we find a positive and significant coefficient on *Post-IPO*. However, we do not find that VC-backed firms provide significantly shorter horizon incentives than non VC-backed firms in the years following the IPO. One explanation for the lack of difference is the monitoring once the firm is public

To investigate the role of institutions in VC-backed firms more specifically, we test whether the contracts of VC-backed firms without high institutional ownership differ from VC-backed firms that have significant institutional ownership following the IPO. An F-test of the difference between the coefficients *VC x Post IPO* and *VC x Post-IPO x Inst_Own* indicates that VCs held by institutions grant significantly greater proportions of equity pay with longer horizon incentives. This is consistent with the market monitoring hypothesis (H2_b). In addition, among the firms with high institutional ownership, we do not find a significant difference between VC-backed and non VC-backed firms.

The results from estimating Eq. (1) are consistent with our hypothesis that market monitoring increases the horizon incentives granted to executives, and specifically that they mitigate the tendency for VC-backed firms to provide shorter horizon incentives (H2_b). We also find evidence consistent with VC-backed firms granting greater proportions of equity prior to the IPO. To explore the duration of the equity payments more precisely, we investigate the duration of the equity grants with a Heckman (1979) two-step procedure of equity grant duration based on a selection model of equity grants described in Eqs. (2) and (3).

Table 5 Column 1 presents results on the determinants of an equity grant. We find evidence that firms with VC ownership are more likely to grant equity both before and after the

IPO. Columns 2 and 3 provide results of the second stage where the dependent variable is the proportion of options that vest within one year of the grant and the duration of the equity grant, respectively. Consistent with H1_b, VC-backed firms grant their executives contracts with equity payments that vest around the lockup expiration, the coefficient on *VC x Pre-IPO* and *VC x Post-IPO* are positive and significantly related with the proportion of equity grants that vest within 1 year. We do not find evidence of a difference between the duration of the equity payments for VC- and non VC-backed firms. However, consistent with the market-monitoring hypothesis, we find that the duration of equity grants increase in the years following the IPO. Comparing VC- and non VC-backed firms with low institutional holdings in the years following the IPO we find that 27% more of the equity grants vest within a year for VC-backed firms.

As further evidence that VC-backed firms grant equity that vest soon after the IPO, Table 6 presents results of estimating Eq. (1) with the proportion of unvested options, *%Unvested*, as the dependent variable. Consistent with our first hypothesis, negative and significant coefficients on *VC x Pre-IPO* and *VC x Post-IPO* indicate that a higher proportion of executives' option portfolios are vested for VC-backed firms. Also, consistent with H2_b, we find that the proportion of unvested options is significantly greater for VC-backed with high institutional ownership compared with other VC-backed firms following the IPO.

4.2.2 *Robustness and sensitivity tests*

One of the potential concerns about our results is the sample selection bias since VC-backing is endogenous resulting from a choice of the IPO firm. We estimate the specifications in Table 4 controlling for the selection problem using a Heckman selection model. The results are reported in Table 7. The results for the post-IPO period are qualitatively similar to the main results discussed above. We find that in the absence of monitoring by institutions, VC-backed

firms continue to grant shorter horizon incentives relative to non VC-backed firms. Institutional investors appear to increase the horizon incentives for VC backed firms though the results are weaker after controlling for endogenous VC-backing. However, we find that prior to the IPO VC-backed firms provide equity pay that is of similar proportion to that of non-VC backed firms while the duration of the compensation is shorter. The limitation of this approach however, is the lack of a good selection model for VC-backing. Most of the observed firm variables are forward-looking relative to the VC funding decision and the firm characteristics at the time that the firm approached the VC are not observable. As a result, consistent with prior literature, we include industry dummies and headquarter state dummies. Given that we do not have a good model for the first-stage selection, and in light of the results in Larcker and Rusticus (2006), we do not place too much interpretation on these results.¹³

Another potential concern is the sudden increase in the assets of the firm after the IPO due to the inflow of cash from the IPO. Therefore we scale all our control variables by pre-IPO assets in our main analyses. However we check the sensitivity of our results to this assumption by scaling R&D, cash flow from operations, and net income by sales. We also control for firm age since VC-backed firms tend to be younger than non-VC-backed firms.¹⁴ We exclude this from our main analysis since we lose 24% of all observations. In untabulated results we find that our results are robust to both of these changes in the specifications.

4.3 Evidence on post-IPO returns and investment horizon incentives

To provide evidence that executives with short-horizon incentives focus more on short-term performance, we investigate annual market-adjusted stock returns and return on assets in the year following the IPO and in the third year following the IPO. We conjecture that

¹³ The pseudo-R² from the first-stage selection model is only 15%.

¹⁴ We thank Jay Ritter for making the data on firm age available.

executives with more short-term contracts have greater performance in the year following the IPO compared to the period three years after the IPO. In contrast, we predict that executives with more long-term incentives experience greater annual returns in the later period than in the year following the IPO.

Table 8 Panel A provides statistics of the returns in the year following the IPO and the annual return three years after the IPO for the top and bottom quartile of our measures of contract horizon, *Compensation Duration* and *% Unvested*. We find mixed evidence of a significant difference amongst the short- and long-horizon groups in the short-term. The difference is significant for the *% Unvested* based metric, but not significant for the *Compensation Duration* metric. However, we find that the long-term performance is significantly lower for firms with short-horizon incentives under both metrics. In fact, the median short-horizon firm exhibits negative returns for the long-run, while the short-run return is positive. In contrast, the median long-horizon firm exhibits positive returns in the long-run, but negative returns in the first year. Panel B of Table 8 repeats the analysis measuring performance with the change in the return on assets. Consistent with the findings of market returns, we find that firms that grant short-horizon incentives exhibit significantly higher performance in the near-term, but significantly lower performance in the long-run.

5. Conclusion

We provide new evidence on the role of investor horizon on CEO horizon incentives and the consequences of short- versus long-horizon incentives on firm performance. Our setting and new measures of horizon incentives allow us to more precisely examine the mechanisms by which firms provide horizon incentives and the role of investors' horizons on these incentives. We study the CEO compensation of firms with and without venture capitalist (VC) financing

around their initial public offering (IPO). The setting provides a research design that allows us to observe a unique set of short-horizon investors, the VC, with well-defined investment horizons and significant control of the firm. However, we recognize that the choice to have venture capital financing is endogenous. We believe the advantages of a “clean” test where the investment horizon of a controlling shareholder can be identified as is the case with the venture capitalist outweighs the limitation.

We construct novel measures of horizon incentives that consider not just the proportion of equity payments, but also the vesting schedules. Vesting is an important component of the horizon incentives because they restrict executives’ abilities to sell their equity holdings and reap the benefits of short-term gains. We find evidence that prior to the IPO VC-backed firms provide their executives with greater proportions of pay in the form of equity. While these equity payments provide longer-horizon incentives compared with cash payments, a significant proportion of the equity payments vest soon after the IPO. Together the results indicate that VCs provide incentives for the firm to go public, but with short-horizon incentives that correspond with their own investment horizons.

Once the firm is public, we find that market monitoring leads to longer-horizon incentives of CEO compensation for firms that go public with and without VC-backing. However, we find that VC-backed firms with high institutional ownership provide significantly longer-horizon incentives than VC-backed firms without institutional ownership. This evidence suggests that market monitoring plays a role in extending horizon incentives. In particular large institutional ownership restricts VCs from providing short-horizon incentives following the IPO. In anticipation of the market-monitoring, we find evidence that a significant proportion of equity granted prior to the IPO for VC-backed firms vests soon after the IPO.

We also examine two performance metrics market-adjusted stock returns and return on assets explore and find evidence that there are long-term consequences to myopic contracts. We find that long-run performance is lower for firms with shorter-horizon incentives. In contrast, short-term performance is greater when the annual compensation provides more short-term incentives.

Overall we shed light on the compensation contract mechanisms that influence CEO horizon incentives and show that investor horizon plays an important role in the design of horizon incentives. We also show that these horizon incentives appear to influence managerial behavior and consequently firm performance.

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Table 1: IPO characteristics:

Panel A: Distribution of sample initial public offerings by year

Year	VC Backed		Non VC Backed		Combined	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
2000	49	12.36	11	23.90	60	20.41
2001	15	4.49	4	7.32	19	7.13
2002	13	14.61	13	6.34	26	9.39
2003	33	17.98	16	16.10	49	17.9
2004	95	50.56	45	46.34	140	47.62
Total	205	100	89	100	294	100

Panel B: Industry distribution of the sample firms

Industry	VC Backed		Non VC Backed		Combined	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
Chemicals	2	0.98	1	1.12	3	1.02
Computer	20	9.76	2	2.25	22	7.48
Durable	29	14.15	8	8.99	37	12.59
Extract	4	1.95	2	2.25	6	2.04
Food	0	0.00	1	1.12	1	0.34
Other	27	13.17	49	55.06	76	25.85
Pharmaceutical	35	17.07	0	0.00	35	11.9
Retail	15	7.32	5	5.62	20	6.8
Services	55	26.83	16	17.98	71	24.15
Textile	4	1.95	1	1.12	5	1.7
Transport	13	6.34	3	3.37	16	5.44
Utilities	1	0.49	1	1.12	2	0.68
Total	205	100	89	100	294	100

Panel C: Statistics of ownership and distribution of the initial public offering

	VC-Backed		Non VC Backed	
	Mean	Median	Mean	Median
VC Ownership (%)	58.61	57.41	0	0
VC on board (%)	92.00	100.00	0	0
VC on Comp Committee (%)	79.00	100.00	0	0
Firm Age	14.67	7.00	23.01	14.00
Log Proceeds	4.68	4.49	4.80	4.85
Shares locked (%)	72.92	75.80	57.51	71.40
Secondary shares offered (%)	11.63	0.00	11.31	0.00

Industries are identified as in Barth et al. (2001). VC-backed = an indicator variable equal to 1 if the firm is held by a VC with at least five percent of the outstanding shares, VC Ownership (%) = the proportion of outstanding shares held by the venture capital firm, VC on board = an indicator variable equal to one if the venture capital firm has a representative on the board of directors, zero otherwise, VC on Comp Committee = an indicator variable equal to one if the venture capitalist has a representative on the compensation committee, zero otherwise, Firm Age is the number of years since incorporation. Log Proceeds = natural log of the proceeds from the IPO, Shares locked (%) = 1- the percentage of shares offered in the IPO, Secondary shares offered (%) = the proportion of secondary shares offered at the IPO.

Table 2: Summary of Firm Characteristics by VC-ownership

	Pre-IPO		Post-IPO				T-tests for difference in means	
	Year 0		Year 1		Lockup expiration year		Year1-Year0	Lockup-Year0
	Mean	Median	Mean	Median	Mean	Median		
<i>Non VC-backed</i>								
Cash (\$000s)	170.28 ***	9.50	201.76 ***	41.01	229.28	45.62	***	***
Assets (\$MMs)	4159.01 ***	186.92	4922.31 **	392.89	5342.98	521.89	***	***
NI	27.99	5.22	31.78	5.98	45.24	10.15		
NI/Assets _{t0}	-0.01	0.01	0.00	0.02	0.02	0.05		
R&D	1.53 ***	0.00	2.16 **	0.00	2.39	0.00		
R&D/Assets _{t0}	0.04 ***	0.00	0.09 ***	0.00	0.14	0.00	***	***
Capex	9.03	1.32	15.54 ***	3.17	22.58	4.31		
Capex/Assets _{t0}	0.04	0.02	0.41	0.03	0.16	0.03	***	***
Founder	0.40	0.00	0.36	0.00	0.22	0.00		
CEO own (%)	17.00 ***	3.82	13.38 ***	3.36	13.48	3.10		
Institutional Ownership (%)	0.00	0.00	0.43	0.33	0.28	0.25	***	***
<i>VC- backed</i>								
Cash (\$000s)	47.24	13.55	99.97	62.62	104.04	55.82	***	***
Assets (\$MMs)	382.81	62.87	551.06	160.81	612.16	193.08	***	***
NI	-3.96	-2.97	4.09	2.38	9.83	7.09		
NI/Assets _{t0}	-0.26	-0.03	-0.42	0.01	-0.40	0.04		
R&D	8.76	2.40	13.84	3.81	14.72	3.82		
R&D/Assets _{t0}	0.24	0.05	0.38	0.08	0.45	0.06	***	***
Capex	14.73	2.30	25.57	4.61	28.22	5.71	**	**
Capex/Assets _{t0}	0.06	0.03	0.15	0.06	0.19	0.07	**	**
Founder	0.31	0.00	0.29	0.00	0.26	0.00		
CEO own (%)	8.89	4.20	6.95	3.50	6.84	3.50	***	***
Institutional Ownership (%)	0.00	0.00	0.36	0.30	0.36	0.33	***	***

T-tests of significant differences between the means of the VC and non VC-backed observations are reflected by the stars (*) on the statistics. */**/** indicates significant difference in means at the 10%, 5%, and 1% levels respectively. The sample consists of 800 firm-years from 294 IPOs spanning 2000-2004. 205 of the IPOs are VC-backed, and 89 are not backed by a VC. Lockup expiration year is the fiscal year in which the lockup expires. Each column contains 294 observations. Cash = the cash balance at the fiscal year end in thousands of dollars, Log (Assets) = the natural log of the assets reported by the firm, NI is the reported annual income, R&D = the annual research and development expense, Capex = the annual capital expenditures, Founder = 1 if the CEO is a founder of the firm, zero otherwise, CEO own = the proportion of outstanding shares owned by the CEO, Inst_Own = an indicator variable equal to 1 if at least 20% of the firms outstanding shares are held by an institution.

Table 3 Panel A: Annual Compensation Statistics by VC-ownership

	Pre-IPO		Post-IPO						T-tests for difference in means	
	Year 0		Year 1		Lockup expiration year		Year1-Year0	Lockup-Year0		
<i>Non VC-backed</i>	Mean	Median	Mean	Median	Mean	Median				
Salary	437,384 ***	325,000	452,274 ***	310,273	451,283 ***	360,000	**	**		
Bonus	304,072 ***	110,333	488,043 ***	182,780	447,477 ***	217,711	***	***		
Option grant_dum	0.28 ***	0.00	0.59	1.00	0.59 *	1.00	***	***		
Option grant (\$)	321,164 ***	0	354,918 ***	0	279,117 ***	0	**			
Restricted stock grant (\$)	19,150 ***	0	427,489 ***	0	307,499 ***	0	***	**		
% Equity pay	0.16 **	0.00	0.29	0.13	0.24 *	0.15	***	***		
Grant Incentives	12,330.14 ***	0.00	15,267.44 ***	0.00	11,220.95	0.00				
Portfolio Incentives	31,995.78 ***	0.00	47,651.57 ***	3,016.25	46,339.20	13,837.60				
Option grant duration	1.93	2.00	2.15	2.00	2.08	2.00	***	***		
Equity grant duration	1.92	2.00	2.10	2.00	2.05	2.00				
Compensation duration	0.26 ***	0.00	0.56	0.06	0.53	0.00	***	***		
% Unvested	0.57	0.58	0.62 ***	0.65	0.63 ***	0.71		**		
<i>VC-backed</i>										
Salary	289,562	253,347	336,633	300,000	353,633	320,600	*	*		
Bonus	230,515	90,577	388,130	158,707	373,681	135,000	***	***		
Option grant_dum	0.53	1.00	0.67	1.00	0.65	1.00	***	***		
Option grant (\$)	531,186	35,141	442,858	130,850	381,741	135,797				
Restricted stock grant (\$)	42,039	0	238,623	0	119,901	0	***	***		
% Equity pay	0.26	0.12	0.31	0.28	0.29	0.29				
Grant Incentives	42,346.67	4,967.19	23,441.35	10,368.95	16264.11	5188.82	***	***		
Portfolio Incentives	81,945.69	25,042.02	109,408.80	47,999.76	115,165.80	50,764.48	***	***		
Option grant duration	1.96	2.50	2.07	2.00	2.06	2.00	**	**		
Equity grant duration	1.91	2.50	2.11	2.00	2.06	2.00				
Compensation duration	0.45	0.00	0.64	0.48	0.58	0.44	**	**		
% Unvested	0.53	0.61	0.47	0.50	0.44	0.40		***		

T-tests of significant differences between the means of the VC and non VC-backed observations are reflected by the stars (*) on the statistics. */**/** indicates significant difference in means at the 10%, 5%, and 1% levels respectively. Lockup expiration year is the fiscal year in which the lockup expires. Each column contains 294 observations. Salary = the annual salary, Bonus = the cash value of the annual bonus, Option grant_dum = an indicator variable equal to one if there was an option grant, zero otherwise, Option grant = the Black-Scholes value of the annual option grant, Restricted stock grant = the value of the annual restricted stock grant, %Equity pay = the sum of the value of equity pay by the total compensation, Option grant duration = the duration of the annual option grant, Compensation duration = the duration of the total compensation, % Unvested = the proportion of the executive option portfolio that is exercisable at the fiscal year-end.

Table 3 Panel B: Mean (Median) proportion of equity grant vesting periods for the fiscal year prior to and following the IPO:

	Vests within year 1	Vests from year 1 to year 2	Vests from year 2 to year 3	Vests from year 3 to year 4
<i>Pre-IPO:</i>				
Non VC-backed	0.46 (0.33)	0.20 (0.23)	0.18 (0.20)	0.09*** (0.00)
VC-backed	0.42 (0.25)	0.21 (0.25)	0.20 (0.25)	0.15 (0.20)
<i>Year 1:</i>				
Non VC-backed	0.33** (0.33)	0.23 (0.25)	0.2 (0.25)	0.12** (0.16)
VC-backed	0.38 (0.33)	0.22 (0.25)	0.22 (0.25)	0.15 (0.19)

Test of Differences

Year 1=Pre-IPO:

Non VC-backed	***		***	***
VC-backed	***			

T-tests of significant differences between the means of the VC and non VC-backed observations for a given vesting period are reflected by the stars (*) on the statistics. */**/** indicates significant difference in means at the 10%, 5%, and 1% levels respectively. Vesting periods are the value-weighted proportions of option and restricted stock payments where the vesting periods are hand-collected from the proxy statements. Pre-IPO are the observations from the fiscal year prior to the firm's initial public offering. Year 1 is the first fiscal year during which the firm is public.

Table 4: Tobit estimation results of annual compensation investment horizon metrics on VC-backing and high institutional ownership over pre and post-IPO periods.

	<i>Coef.</i>	<i>%Equity Pay</i>	<i>Non-current Compensation</i>	<i>Compensation Duration</i>
<i>VC x Pre-IPO</i>	β_1	0.178**	0.156**	0.563***
<i>Post-IPO</i>	β_2	0.177**	0.222**	0.942***
<i>VC x Post-IPO</i>	β_3	0.052	0.037	-0.035
<i>VC x Post-IPO x Inst_Own</i>	β_4	-0.043	-0.004	0.147
<i>Inst_Own</i>	β_5	0.135	0.093	0.09
<i>Toptier</i>	β_6	-0.006	0.006	0.051
<i>Secondary Shares Offered</i>	β_7	-0.084**	-0.061	-0.178
<i>CFO/Assets</i>	β_8	-0.011	-0.023	0
<i>Log(Assets)</i>	β_9	-0.016	-0.024	-0.037
<i>NI/Assets</i>	β_{10}	-0.017	-0.018	-0.053
<i>R&D/Assets</i>	β_{11}	0.035	0.001	-0.079
<i>CEO Turnover</i>	β_{12}	0.148	0.13	0.463
<i>Founder</i>	β_{13}	0.02	0.026	-0.016
<i>CEO Own</i>	β_{14}	-0.276***	-0.254***	-0.648***
<i>Constant</i>	β_0	-0.126	-0.093	-0.656
Industry Indicators		Yes	Yes	Yes
Test of differences:				
VC backed firms with and without high institutional ownership F-test that $Inst_Own + VC \times Post-IPO \times Inst_Own = 0$	$[\beta_0 + \beta_2 + \beta_3 + \beta_4 + \beta_5] - [\beta_0 + \beta_2 + \beta_3]$	3.35**	3.08**	2.95***
Firms with high institutional ownership with and without VC backing F-test that $VC \times Post-IPO + VC \times Post-IPO \times Inst_Own = 0$	$[\beta_0 + \beta_2 + \beta_3 + \beta_4 + \beta_5] - [\beta_0 + \beta_2 + \beta_3]$	0.02	0.23	0.36

*/**/** indicates significant coefficients at the 10%, 5%, and 1% levels respectively. Coefficients on industry indicator variables are not reported. *VC* = an indicator variable equal to 1 if the firm is held by a venture capitalist prior to the IPO, *Pre-IPO* = an indicator variable equal to 1 the year prior to the IPO, *Post-IPO* = an indicator variable equal to 1 the year of and following the IPO, *Toptier* = an indicator variable equal to 1 if the firm is underwritten by a top-tier institution at the IPO, the remaining variables are as defined in Tables 2 and 3.

Table 5: Two-stage estimation results of annual equity compensation investment horizon metrics on VC-backing and high institutional ownership over pre and post-IPO periods with Heckman selection of whether equity was granted.

	<i>Coef.</i>	<i>Selection Model: Equity Grant</i>	<i>Second Stage: %Vest1YR</i>	<i>Second Stage: Equity Grant Duration</i>
<i>Determinants of the duration of the equity grant:</i>				
<i>VC x Pre-IPO</i>	β_1	0.451**	0.151**	0.226
<i>Post-IPO</i>	β_2	0.332	-0.035	0.649**
<i>VC x Post-IPO</i>	β_3	0.383*	0.231***	-0.296
<i>VC x Post-IPO x Inst_Own</i>	β_4	-0.228	-0.13	0.196
<i>Inst_Own</i>	β_5	0.387	0.146*	-0.099
<i>Toptier</i>	β_6		-0.016	0.035
<i>Secondary Shares Offered</i>	β_7		0.02	0.141
<i>Determinants of an equity grant:</i>				
<i>CFO/Assets</i>	β_8	0.146		
<i>Log(Assets)</i>	β_9	-0.027		
<i>NI/Assets</i>	β_{10}	0.007		
<i>R&D/Assets</i>	β_{11}	0.056		
<i>CEO Turnover</i>	β_{12}	-0.083		
<i>Founder</i>	β_{13}	-0.103		
<i>CEO Own</i>	β_{14}	-0.227***		
<i>Constant</i>	β_0	-0.457	0.025	1.542***
<i>Industry Indicators</i>		Yes	No	No
<i>Test of differences:</i>				
<i>VC backed firms with and without high institutional ownership</i>	$[\beta_0 + \beta_2 + \beta_3 + \beta_4 + \beta_5] - [\beta_0 + \beta_2 + \beta_3]$			
<i>F-test that $Inst_Own + VC \times Post-IPO \times Inst_Own = 0$</i>			2.59**	0.55
<i>Firms with high institutional ownership with and without VC backing</i>	$[\beta_0 + \beta_2 + \beta_3 + \beta_4 + \beta_5] - [\beta_0 + \beta_2 + \beta_3]$			
<i>F-test that $VC \times Post-IPO + VC \times Post-IPO \times Inst_Own = 0$</i>			0.33	0.26

*/**/** indicates significant coefficients at the 10%, 5%, and 1% levels respectively.

Coefficients on industry indicator variables are not reported. Equity Grant = an indicator variable equal to 1 if the firm grants equity in a given year. VC = an indicator variable equal to 1 if the firm is held by a venture capitalist prior to the IPO, Pre-IPO = an indicator variable equal to 1 the year prior to the IPO, Post-IPO = an indicator variable equal to 1 the year of and following the IPO, Inst_Own = an indicator variable equal to 1 if at least 20% of the outstanding shares are held by institutions, Toptier = an indicator variable equal to 1 if the firm is underwritten by a top-tier institution at the IPO, the remaining variables are as defined in Tables 1 and 2.

Table 6: Estimation results of the proportion of unvested options on VC-backing and high institutional ownership over pre and post-IPO periods.

	<i>Coef.</i>	<i>%Unvested</i>
<i>VC x Pre-IPO</i>	β_1	-0.168*
<i>Post-IPO</i>	β_2	0.074
<i>VC x Post-IPO</i>	β_3	-0.295***
<i>VC x Post-IPO x Inst_Own</i>	β_4	0.071
<i>Inst_Own</i>	β_5	-0.105
<i>Toptier</i>	β_6	0.059
<i>Secondary Shares Offered</i>	β_7	-0.062*
<i>CFO/Assets</i>	β_8	0.026
<i>Log(Assets)</i>	β_9	-0.013
<i>NI/Assets</i>	β_{10}	-0.011
<i>R&D/Assets</i>	β_{11}	0.044
<i>CEO Turnover</i>	β_{12}	0.096
<i>Founder</i>	β_{13}	0.049
<i>CEO Own</i>	β_{14}	-0.117**
<i>Constant</i>	β_0	0.612***
Industry Indicators		Yes
Test of differences: VC backed firms with and without high institutional ownership F-test that $Inst_Own + VC \times Post-IPO \times Inst_Own = 0$	$[\beta_0 + \beta_2 + \beta_3 + \beta_4 + \beta_5] - [\beta_0 + \beta_2 + \beta_3]$	12.68***
Firms with high institutional ownership with and without VC backing F-test that $VC \times Post-IPO + VC \times Post-IPO \times Inst_Own = 0$	$[\beta_0 + \beta_2 + \beta_3 + \beta_4 + \beta_5] - [\beta_0 + \beta_2 + \beta_3]$	0.6

*/**/** indicates significant at the 10%, 5%, and 1% levels respectively. Variables are as defined in Tables 1 and 2. The sample is restricted to observations in which the executive held options in the firm.

Table 7: Estimation results of annual compensation investment horizon metrics on VC-backing and high institutional ownership over pre and post-IPO periods controlling for endogenously determined VC-backing

	Coef.	%Equity Pay		Non-current Compensation		Compensation Duration	
		Non VC	VC	Non VC	VC	Non VC	VC
<i>Post-IPO</i>	β_1	0.077	-0.009	0.080*	0.013	0.365***	0.068
<i>Inst_Own</i>	β_2	0.098*	0.064**	0.080	0.052*	0.054	0.112
<i>Toptier</i>	β_3	-0.046	0.036	-0.004	0.030	0.072	0.063
<i>Secondary Shares Offered</i>	β_4	0.009	-0.060**	-0.002	-0.038	-0.043	-0.083
<i>CFO/Assets</i>	β_5	-0.217**	0.088**	-0.173**	0.052	-0.327	0.112
<i>Log(Assets)</i>	β_6	-0.012	0.000	-0.023*	0.001	-0.057*	0.022
<i>NI/Assets</i>	β_7	0.000	0.000	0.000	0.000	0.000	0.000
<i>R&D/Assets</i>	β_8	-0.006	0.070***	-0.007	0.041**	-0.040	0.061
<i>CEO Turnover</i>	β_9	0.012	0.210**	0.028	0.151	0.702	0.380
<i>Founder</i>	β_{10}	0.034	0.030	0.020	0.033	0.054	0.038
<i>CEO Own</i>	β_{11}	-0.176***	-0.133***	-0.153***	-0.117***	-0.421***	-0.251***
<i>Constant</i>	β_0	0.392***	0.232***	0.376***	0.179***	0.941***	0.369***
Industry Indicators		No	No	No	No	No	No
Test of differences:							
VC and non VC-backed firms prior to the IPO			1.56		2.71*		3.22**
VC and non VC-backed firms post IPO (low institutional ownership)			3.16**		4.19**		6.56***
VC and non VC-backed firms post IPO (high institutional ownership)			3.21**		3.94**		5.20***

*/**/** indicates significant coefficients at the 10%, 5%, and 1% levels respectively. The endogenously determined VC-backing is adjusted for by using industry indicator variables, and headquarter state dummies as instrumental variables in the first-stage regression. Based on the parameter estimates in the first stage regression, we estimate the estimate the probability of VC-financing as Heckman selection model and estimate the model separately for VC and non VC-backed firms. Coefficients on industry indicator variables are not reported. *VC* = an indicator variable equal to 1 if the firm is held by a venture capitalist prior to the IPO, *Pre-IPO* = an indicator variable equal to 1 the year prior to the IPO, *Post-IPO* = an indicator variable equal to 1 the year of and following the IPO, *Toptier* = an indicator variable equal to 1 if the firm is underwritten by a top-tier institution at the IPO, the remaining variables are as defined in Tables 2 and 3.

Table 8 Panel A: Annual market-adjusted stock returns for the first and third year following the IPO by horizon-incentive quartiles.

<i>Compensation Duration</i>		0-12 months after the IPO	24-36 months after the IPO	Test of differences 24-36 compared with 0-12
1st Quartile	Mean	0.07	0.12***	**
	Median	(0.01)	(-0.08)***	***
4th Quartile	Mean	0.08	0.27	***
	Median	(-0.09)	(0.10)	***
<i>%Unvested options</i>				
1st Quartile	Mean	0.00***	-0.07***	**
	Median	(-0.05)***	(-0.14)**	**
4th Quartile	Mean	-0.05	0.19	***
	Median	(-0.10)	(0.04)	***

Table 8 Panel B: Annual change in return on assets for the first and third year following the IPO by horizon-incentive quartiles.

<i>Compensation Duration</i>		0-12 months after the IPO	24-36 months after the IPO	Test of differences 24-36 compared with 0-12
1st Quartile	Mean	-0.08***	0.02**	**
	Median	(0.01)	(-0.01)	
4th Quartile	Mean	-0.42	0.12	***
	Median	(-0.01)	(0.01)	
<i>%Unvested Options</i>				
1st Quartile	Mean	-0.08**	0.04**	**
	Median	(0.02)	(0.00)	
4th Quartile	Mean	-0.50	0.10	***
	Median	(-0.00)	(0.04)	**

*/**/*** indicates significant (t-tests for the means and Wilcoxon rank-sum tests for the medians) at the 10%, 5%, and 1% levels respectively. The market adjusted returns are the buy and hold returns minus the buy and hold return on the market portfolio over the same period excluding the day of the IPO on the 0-12 month period. The remaining variables are as defined in Table 2. Quartiles are determined based on the duration metric in the first year following the IPO.