CHANGES IN COMPENSATION STRUCTURE, CORPORATE GOVERNANCE, AND SHORT-RUN OPERATING PERFORMANCE IN IPO FIRMS

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Abstract

The IPO process may potentially introduce or increase agency costs. The newly public firm must deal with these agency problems. We find that following an IPO, the CEO compensation structure on average becomes more pay and performance-sensitive, and the board of directors becomes more independent. Venture capitalist participation seems to positively influence these findings. However, these post-IPO changes do not lead to better short-run operating performance.

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Introduction

Going public through an IPO transforms a firm from a closely held private company to one that is publicly traded. An IPO entails or increases the separation of ownership and control, giving rise to the potential for increased agency problems. Manager-owner incentives may be clear before an IPO, but after the IPO, managers and owners can have diverging goals (Jensen and Meckling, 1976.)

Managers in publicly held firms control key decisions that are critical for the survival and profitability of the firm. If their incentives to maximize shareholder wealth are weak, managers will pursue activities that maximize their own utility. Since the IPO process either introduces agency costs or exacerbates them, how the newly public company handles these issues may be an important determinant of its ultimate success.

Mechanisms to mitigate the agency cost problem and to align the interests of managers and shareholders, may include, for example, appointment of an efficient board of directors to monitor managers; design of an efficient incentive compensation system; or institution of executives' stock ownership.[1] [1]Performance-related compensation may be critical in reducing agency problems, and for IPO firms in particular, the link between pay and performance is suddenly important.

The purpose of this paper is to examine compensation structure changes and changes in board of director composition that occur as a response to the new agency problems for IPO firms. To mitigate agency problems, compensation policies need to be designed to provide the right incentives for managers to act in the best interests of shareholders (Jensen and Murphy, 1990b). We propose that following an IPO, CEOs' pay-performance sensitivities will increase. We also expect IPO firms to realign their boards to make them more independent. Finally, we expect that the IPO firms that relate CEO pay to performance and realign their boards will perform better than firms that do not make these changes or that make smaller changes.

Our focus is on initial public offerings for two reasons. First, the empirical research on executive compensation focuses primarily on large and established public firms. There is relatively little published empirical evidence on the compensation structure for young firms, those characterized by greater information asymmetry, newly introduced agency problems, and greater uncertainty (Beatty & Zajac, 1994 is a notable exception). Second, here may be more need for explicit incentives for CEOs of newly traded firms than for larger, and more mature firms. Baker and Gompers (1999) show, for example, that the ratio of private benefit consumption to the firm's market value is higher for IPO firms than it is for larger, publicly held, established firms, probably reflecting greater incentives to consume perquisites in IPO firms. Moreover, CEO activities may be more critical to the success of a new publicly traded firm than to an established firm with well-established decision-making.

Our results show that both CEO compensation structure and board structure change following an IPO. Compensation structure becomes more equity-based after the IPO, with increased performance sensitivity. The board becomes less insider-dominated

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[1] Jensen and Meckling (1976) note that potential methods to control the behavior of the owner-manager include auditing, monitoring, formal control systems, budget restrictions, and the establishment of an incentive compensation plan.

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and more independent outsider-dominated. These are rational changes for a firm that goes public and that wants to mitigate agency problems, but they may simply be a response to stock exchange requirements for outsider director representation on boards (e.g. Nasdaq requires three outside directors). In addition, these findings occur to a greater extent when the IPO firm is backed by venture capitalists.

We do not find, however, that these compensation structure and board changes are associated with better performance. Instead, IPO firm industry-adjusted operating performance worsens after the IPO year, regardless of changes in compensation structure or board composition.

1. Hypothesis Development

We develop separate hypotheses relating to boards and executive compensation. These appear below.

A. The Role of the Board of Directors

Before the IPO process, the privately owned firm is generally managed by its owners. Unless there is a separation of ownership from management in these firms, the board may be largely ceremonial. Once the IPO occurs, management and ownership are separate, and with the increased potential for agency conflicts, the board is likely to take a more active role in monitoring management.

The board of directors of a publicly traded company must monitor the performance of managers and align the interests of management with those of the shareholders (Fama & Jensen, 1983). Board composition has been shown to influence the outcome in some situations with potential for agency conflicts (Baysinger & Butler, 1985; Rosenstein & Wyatt, 1990 & 1997; Byrd & Hickman, 1992; Lee, Rosenstein, Rangan, & Davidson, 1992; and Milliron, 2000; among others). However, Mikkelson, Partch and Shah (1997) find no relation between operating performance and governance variables in IPO firms.

Studies of board characteristics and their relation to compensation have provided mixed evidence. Core, Holthausen, and Larcker (1999) examine the association between the level of CEO compensation and the quality of firms' corporate governance. They find that certain board characteristics – ownership structure, size, and domination – are linked to the level of CEO compensation. Specifically, CEO compensation is a decreasing function of the percentage of the board dominated by insiders, and an increasing function of board size and the percentage of board that is dominated by outsiders in established firms. Lambert, Larcker, and Weigelt (1993) find a positive relation between CEO compensation and the percentage of the board dominated by outsiders. Boyd (1994) finds higher CEO salaries in firms with lower levels of control, while Finkelstein and Hambrick (1989) report that compensation is not related to the percentage of outside directors. Boyd (1994) finds no significant relation between CEO compensation to firm size or performance.

One way to link pay to performance is to tie executive compensation to equity price performance (Jensen & Murphy, 1990a). A properly composed board that is sensitive to shareholder concerns may be more likely to establish this link. We therefore hypothesize that boards in IPO firms with a greater proportion of independent outsiders will design compensation packages that are more equity-based than cash-based. When board insiders retain greater control, we would then expect that a greater proportion of CEOs' salaries to be cash-based compensation. Finding this result would be consistent with the results in Lambert, Larcker and Weigelt (1993) and show that this result applies to IPO firms as well as to the more established public firms in their sample.

Board committees typically influence actions taken by a board by controlling the agenda of the board and by making specific recommendations to the board. Prior research has documented the role of board committees (Klein, 1998; Xie, Davidson,& DaDalt 2003). The compensation committee is charged with designing and implementing senior executive compensation packages and will recommend compensation policies for board approval so the composition of the compensation committee may influence CEO compensation contracts in a similar way. Thus, it is important to understand the role of the compensation committee and its influence on board decisions in compensation matters. Research in this area has also produced equivocal results. Newman and Moses (1997) document reduced pay-performance sensitivity when insiders sit on this committee, and Anderson (1997) finds the opposite relation. Given the new agency problems that occur in IPOs, both the board as a whole and the compensation committee may be involved in redesign of the compensation structure.

B. Executive Compensation

Economic theories of compensation posit that there should be a positive relation between executive pay and corporate performance. Efforts to document this link have sometimes found only a weak link (e.g., Jensen & Murphy, 1990b). Other research, however, has documented a positive relation between pay and performance, for example, Murphy, 1985; Barro and Barro, 1990; Jensen and Murphy, 1990a; Houston and James, 1992; Rosen, 1992; Rose and Shepard, 1994; and Hall and Leibman, 1997).

We examine changes in compensation structure after an IPO. Two analogous situations, have received some attention by researchers, deregulation and spin-offs. Regulation may mitigate the agency problem between executives and shareholders in firms in regulated industries. When deregulation occurs, there may be an increased potential of agency problems. Empirical research supports this idea. Joskow, Rose, and Shepard (1992) find greater pay-performance sensitivity in non-regulated firms than in regulated firms. In addition, Crawford, Ezzell, and Miles (1995) report that CEO compensation has become more

sensitive to performance as the banking industry has become less regulated. Similarly, spin-offs may increase the potential of agency problems much like IPOs. Hovakimian (2000) finds that within a year following spin-offs 88% of sample firms adopted new CEO compensation contracts, most of them are based on equity prices.

If deregulation and spin-offs pose new agency problems, and companies respond by making pay more contingent on pay performance, we suggest that as agency problems increase in IPO firms, pay-performance sensitivity will also increase. We therefore hypothesize that pay- performance sensitivity will be greater after an IPO than before. This relation may hold even if agency problems do not increase following an IPO. The firm may initiate an IPO to be able to reward managers with stock-based compensation to align manager and stockholder interests. In these cases, the stock-based rewards provide meaningful compensation packages that would reduce the extent or prevent agency problems from occurring.

Linking pay to performance creates incentives for managers to run an IPO firm more efficiently. It is possible that IPO firms that create pay performance-sensitive contracts will have improved operating performance, and that the greater the pay-performance sensitivity, the better the post-IPO performance may be. However, some firms use option-based compensation when they have high growth potential. In these cases, short-run operating performance may not be affected positively by these plans.

2. Sample and Data

A. Sample Selection
The sample comes from the Security Data Corporation for the four year period 1995-1998. We found 2312 IPOs that were not dual class issues, ADRs or ADSs, international limited partnerships, finance or real estate companies, or spin-offs from other corporations.

[Insert Table 1 About Here]

As shown in Table 1, we eliminated 53 firms that had no registration statement on EDGAR. Not all registration statements give complete board and or compensation data, and we were forced to eliminate 1691 firms with registration statements but incomplete data in them. We eliminated 180 IPOs not listed on Compustat. Finally, we eliminated 33 IPOs that became targets of mergers within the study period and 62 for miscellaneous missing data. The final sample consists of 293 firms.

[Insert Table 2 About Here]

Table 2 shows selected frequency statistics on the final sample by listing exchange and by four-digit SIC codes. Panel A classifies the sample according to the listing exchange. Although the NYSE changed its listing rules in 1983, making it easier for IPOs to meet the listing requirements, the majority of the sample (90.8%) is listed on Nasdaq, while only 8.2% of the sample is listed on NYSE. Corwin and Harris (2001) find that the listing decision of IPO firms is heavily influenced by the listings of industry peers. Their sample includes only IPOs that meet the NYSE listing requirements.

Panel B classifies the sample according to their (SIC) codes. The sample is concentrated in two major industries, computer equipment manufacturing and high tech services (38.6%), and medical device manufacturing (28%).

B. Pay-Performance Sensitivity
To measure the sensitivity of pay to performance, we use a pay-performance sensitivity model modified from Yermack (1995). We estimate pay-performance sensitivity as the product of two terms, the Black-Scholes formula's partial derivative with respect to stock price change times the fraction of equity represented by the option awards:

$$PPS \approx \Delta \left(\frac{\text{shares represented by option award}}{\text{shares outstanding at start of year}} \right)$$

where: $\Delta = \dfrac{\partial \left(Black - Scholes\,Value \right)}{\partial P}$

$$=$$

$$\begin{cases} e^{-dT}\Phi(Z) - e^{-rT}\Phi\left(Z - \sigma\sqrt{T}\right), \text{ for Pre-IPO,} \\[2em] e^{-dT}\Phi(Z) + \dfrac{e^{-dT}\phi(Z)}{\sigma\sqrt{T}} - \dfrac{X\,e^{-rT}\phi\left(Z - \sigma\sqrt{T}\right)}{P\sigma\sqrt{T}}, \end{cases}$$

for Post-IPO,

This formula is an estimate of the change in the value of the CEO's total stock option award for every dollar change in the value of the firm's common equity. It thus measures the sensitivity of CEO pay to changes in shareholder wealth.

The partial derivative Δ is the well-known hedge ratio used in Black-Scholes applications. The difference between this estimate and the original estimate used by Yermack (1995) is that the stock option exercise price is set equal to the closing price on the first day of trading, obtained from the Center for Research in Security Prices. (See Appendix A for more specifications on the computation of the pay-performance sensitivity measure.)

B.1. Valuation of Stock Option Awards
We use the Black-Scholes formula to value the stock options (Merton, 1973):

$$C = Pe^{-dT}\Phi(Z) - X\,e^{-rT}\Phi\left(Z - \sigma\sqrt{T}\right)$$

where:

P is the price of common stock on the day of the grant; specifically, it is the CRSP share price at the close of the first day of trading. We assume that *P* is equal to the exercise price because setting the exercise price equal to the common stock price is a common practice among U.S. corporations;

C is the option value;

X is the exercise price;

T is the time to maturity of granted options;

r is equal to ln(1 + risk-free rate), where the risk-free rate is the annual yield on 10-year U.S. Treasury bonds during the last month of the fiscal year of the award;

d is the expected dividend yield over the life of the options defined as

$$\ln\left[1+\frac{\text{dividend per share}}{\text{closing price}}\right]$$

σ is the annualized expected stock return volatility over the life of the option. Since there is no available stock return information for firms pre-IPO, σ is estimated using the monthly stock return standard deviation of the IPO firm over the 36-month period starting one month after going public. Alternatively, it can be proxied by the industry median standard deviation. In the calculations we used both methods and found no significant difference between them;

Φ is the cumulative probability function for normal distribution.

$$Z = \frac{\ln(P/X) + T(r - d + \sigma^2/2)}{\sigma\sqrt{T}}$$

B.2. CEO Compensation Data

The CEO compensation data come from the firm registration statements for the pre-IPO period and from proxy statements for the post-IPO period. CEO compensation includes two major components. The first is cash-based compensation, including salary, bonus, and other forms of cash compensation. The second is the equity-based compensation, including stock options granted, stock appreciation rights, and restricted shares.

[Insert Table 3 About Here]

Panel A of Table 3 compares CEO compensation data in the pre- and post-IPO periods. CEO cash salaries (both mean and median) increase significantly after the IPO. The mean bonus size increases significantly, as does the mean of total cash-based compensation. Similarly, both the mean and median equity-based compensation increase significantly after the IPO. Before the IPO, the mean proportion of CEO equity-based pay is 37.1% of total compensation; it increases to 50.8% following the IPO.

C. Board of Director Data

We obtain "before" board of director data from the registration statements for year –1, the year before the IPO. We obtain "after" data from the proxy statement filed one year after the IPO. We wait one year to obtain this data to give firms time to change their boards after the IPO. Panel B of Table 3 provides summary statistics for boards for pre- and post-IPO periods. Not shown in the Table are board size statistics. Prior to the IPO, boards average 4.91 members and average 6.37 after. The difference in means is significant at the 0.001 level (t = 12.41).

We categorize directors into the three groups following previous research, inside directors, affiliated outsiders, and independent outsiders (e.g., Baysinger & Butler, 1985; Byrd & Hickman 1999; and Lee, Rosenstein, Rangan, & Davidson, 1992). We also create a fourth category for this study, venture capital directors. These are directors employed by or representing the venture capital firms that have supplied capital to the IPO companies.

The median of inside board members drops significantly (z = -10.3) from 40% before the initial offering event to 25% after the offering. The mean also drops significantly, from 45.1% to 28.2% (t = -11.4). This result suggests that, after being exposed to monitoring of the market and to meet exchange listing requirements, IPO firms reduce the proportion of insiders on their boards.

The other categories of directors exhibit significant changes as well. The median and mean of affiliated directors drop significantly. The mean percentage of venture capital directors falls from 17.8% before the IPO to 10.6% after (t = -7.6), possibly reflecting the reduced venture capital ownership that often occurs shortly after an IPO (Lerner, 1994). The mean proportion of independent outside directors increases significantly from 16.5% to 44.3% (t = 21.88), and the median increases from 0% to 33.3% (z = 13.89). Overall, the boards of IPO firms become less insider dominated and more outsider dominated following IPOs. This is consistent with our hypothesized relation.

D. Compensation Committee Composition

We examine compensation committees because they can have an impact on the nature of the compensation contracts. We expect that when a compensation committee consists primarily of outsider directors, CEO compensation contract will be set to more closely reflect performance. If the compensation committee were to be under the influence of the CEO and other insiders, compensation arrangements might more suit their interests and be less sensitive to performance. We use the same four classifications of board committee members in this analysis.

Panel C of Table 3 shows that insiders control a mean of 39.3% of the committee seats before the IPO. The mean falls to 5.4% after the IPO, and the difference is significant (t = -12.71). The mean percentage of independent outsiders increases from 14.8% before the IPO to 59.3% after the IPO. This difference is also significant (t = 19.80). The median differences in compensation committee composition

are also significant from before to after the IPO for both inside and outside directors.

E. Ownership Data

Panel D of Table 3 shows ownership statistics before and after the IPO for four groups of owners, the CEO, directors and officers, venture capitalists, and blockholders.. For each ownership category, we divide the number of shares held by the number of shares outstanding on the proxy date.

CEOs own a mean of 28.2% of stock before the IPO and 16.8% after. Directors and officers average 35.6% ownership before and 17.5% after. Ownership for venture capital firms drops from 14.6% to 3.7% after the IPO. These changes are all statistically significant at better than 1%, and comparisons of the medians demonstrates a similarly significant pattern. Thus, ownership by CEOs, directors and officers, and venture capital firms all drops significantly after the IPO. Ownership of non-venture capital outside blockholders also drops (from 2.4% to 2.0%) but the change is statistically insignificant.

F. Financial Performance Data

To examine changes in operating performance following IPO issues, we compare firms' operating performance from three years before to up to three years after the IPO. We use accounting measures of operating performance rather than market measures, because measuring stock market performance before the IPO event is not possible. Operating performance can be measured both before and after the event.

We obtain pre-IPO accounting data manually from the registration statement before the event. This registration statement (Form S1) includes all financial data for up to three years before the IPO event. After the IPO, the accounting data come from Compustat.

G. Measuring Financial Performance

Following Barber and Lyon (1996), we use operating income rather than net earnings for two reasons. First, operating income represents a cleaner measure for operating performance than net income. Operating performance can be obscured in net income by things such as special and extraordinary items, tax considerations, and/or the accounting for minority interests. Second, an IPO generally affects the capital structure of the firm, and thus causes changes in interest expenses that can severely affect net earning. Operating income will not be affected by these significant leverage changes. Panel E of Table 3 shows that leverage does change significantly after the IPO. The mean and median debt ratios drop significantly following the IPO.

We, therefore, use operating income divided by the book value of total assets as a measure of performance. [2] Operating income is equal to sales less

cost of goods sold, less selling, general, and administrative expenses, less depreciation, depletion, and amortization. We use operating income after deducting the non-cash expenses, depreciation, depletion, and amortization instead of operating income before depreciation, depletion, and amortization. We do this because operating income before deducting these non-cash expenses is not available in the registration statements for all of the sample firms for the period before the IPO.[3] The cash-based measure of operating income would cause us to drop a large number of firms from the sample.

H. Industry Control

Direct comparisons of a company's operating performance post- and pre-IPO could provide a benchmark for change in performance. Some observed changes in performance, however, could be due to economy-wide or industry-wide factors. Therefore, we adjust the operating performance measure for industry performance.

Following the methodological approaches discussed in Barber and Lyon (1996), and used by Healy and Palepu (1988), Kaplan (1989), Healy, Palepu, and Ruback (1992), Jain and Kini (1994), Denis and Denis (1995), and Cole and Mehran (1998), among others, we constructed a control sample. For each sample company, we identify a control sample consisting of all firms listed on Compustat with the same four-digit Standard Industrial Classification (SIC) code and a book value of total assets that is within 30% of the sample company. From this list of potential control firms, we eliminate any firm that was itself an IPO firm during the years 1993-2000.

To help alleviate the mean reversion tendency in the operating performance measure, the control sample firms were matched within 30% of that sample company performance.[4] If this matching criterion produces no matching firms, we relax the performance matching criterion to up to 50%. If this search produces no matching firms, we relax the size matching criteria to up to 50%. If no match is found, we next relax the SIC code restriction first to three digits and then to two digits if necessary. Finally, if

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[2] Many researchers use end-of-period assets, however, Barber and Lyon (1996) use the average of beginning-and ending-period book value of assets. When they use both methods, the general tenor of their conclusion is unaffected. Therefore, we use the end of physical year book value of total assets reported on Compustat.

[3] Many authors use different measures of operating performance measures and reached the same results. For example, Kaplan (1989), Denis and Denis (1993), DeGeorge and Zeckhauser (1993), Mikkelson and Partch (1994), and Holthausen and Larcker (1994) used the OI measure of operating performance along with other proxies for operating performance, and generally have found that it is an efficient estimate of performance. We believe using operating income after deducting the non-cash expenses will not bias our results.

[4] The mean reversion is the tendency for an accounting performance measure to revert to its mean. Barber and Lyon (1996) note that "if there is a high level of operating income for a particular firm, there is likely a temporary component to its operating income. Over time, the return on assets reverts toward a population mean as the temporary component dissipates."

the search yields no matching firms, we relax both the size and performance criteria.

When the search criteria produce more than one firm for the control group, we use the firm closest to the sample firm in asset size and performance as a matching firm. We compute the industry-adjusted levels in operating performance as the difference between sample firm and control firm operating income.[5]

[Insert Table 4 About Here]

Panel A of Table 4 shows the performance measures. The first set of data is unadjusted and the second set is industry-adjusted operating income, IAOI. The highest level of unadjusted operating income occurs in year 1. Industry-adjusted operating income also peaks in year 1. It is negative in all years except year −1 and year 1.

Panel B of Table 4 compares operating income between various years. Both the median unadjusted and median industry-adjusted operating income increase significantly from years – 3 to – 1, – 2, to – 1, and – 1 to 1.

The deteriorating operating performance after year 1 is consistent with the long-run under performance of IPO firms documented in Jain and Kini (1994). The data are also consistent with the findings in Loughran and Ritter (1997) and Teoh, Welch and Wong (1998), who demonstrate that operating performance improves prior to the IPO but deteriorates in the subsequent years, and with the notion that IPO managers time IPOs to coincide with good performance is good to produce high equity valuations (Lerner 1994).

3. Results

A. *Determinants of Equity-Based Compensation and Pay-Performance Sensitivity*

[Insert Table 5 About Here]

Table 5 presents results on determinants of the percentage of equity-based CEO compensation. We first examine this variable before the IPO. Our three models differ only by the definition of outsiders. Model 1 defines outsiders as the proportion of independent board members. Model 2 combines independent outsiders with directors representing venture capital companies. Model 3, defines independent directors as the proportion of

independent outside directors on the compensation committee instead of on the board.

In all three models, pre-IPO CEO ownership is negatively related to the percentage of equity-based pay. CEOs with a high ownership percentage appear to be compensated with more cash-based pay. When CEOs own a relatively large block of stock, there may be less perceived need to offer them equity-based pay, since their personal wealth is already influenced by equity prices through ownership.

Venture capital backing is positively related to the percent of equity-based compensation. Like other blockholders, venture capitalists have both the incentive and the influence to relate performance to pay. The venture capital variable is not significant in model 2 when the outside director variable includes venture capital directors. The relation appears to be captured by the percentage of outside director variable (which includes venture capital directors) in this case.

Finally, we find that all definitions of outside director are positively related to the percent equity-based compensation pre-IPO. That is, independent outsiders are associated with higher levels of equity-based pay. We find this whether we define outsiders in the traditional manner or when we include venture capital directors. Furthermore, the percentage of independent outsiders on the compensation committee also positively influences the proportion of equity-based pay. Pre-IPO, venture capitalists and outside directors appear to serve as monitors, at least in designing CEO pay packages.

The second set of columns reports test results based on the percent of CEOs' equity-based pay after the IPO for the same three models. We again find a negative relation between CEO ownership and equity-based pay. We find a significant and negative relation between (non-CEO) officer and director stock ownership and equity-based pay. This may, perhaps, suggest a tradeoff between compensation packages and ownership so that in firms with considerable officer ownership there may be less need for equity based compensation.

Larger firms in the post-IPO period are associated with a greater proportion of CEO equity-based pay. As in the pre-IPO period, the venture capital-backed firms positively influence the equity-based portion of pay in the post-IPO period. Venture capital firms seem to be effective monitors in designing CEO pay packages.

The percentage of outside directors is not related to the percentage equity pay in the post- IPO period, indicating a reduced monitoring role after an IPO. Recall that the proportion of outside directors increases significantly after the IPO. It could be that the increase in outside directors reduces the variability in this variable. Or, new outside directors added after the IPO may have little experience as directors and not be as effective monitors. Once market forces are assumed to influence the post-IPO firm, perhaps the director monitoring role diminishes. This appears to be the case for CEO compensation contracts.

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[5] This approach is similar to that in Kaplan (1989), Jain and Kini (1994), and Denis and Denis (1995). We compute changes by subtracting control group change in performance from the sample firms change in performance over the same time window.

[Insert Table 6 About Here]

Table 6 repeats the analysis in Table 5 replacing the dependent variable with the pay-performance sensitivity variable modified from Yermack (1995). In the pre-IPO period, only the proportion of outside directors is significant, and it is positively related to PPS. Models with each of the three definitions of outside director produce positive and significant results but at varying significance levels.

After the IPO, we find PPS to be significantly negatively related to CEO ownership in all three models and to non-CEO officer and director ownership. This is similar to the findings in Table 5. Again we find the percentage of outside directors unrelated to PPS after the IPO.

The results differ according to firm size. PPS is negatively related to firm size. While Table 5 demonstrates that larger firms use more equity-based CEO compensation, smaller firm pay-performance sensitivity is greater.

B. Effect of Stock Option Plans on Operating Performance

Table 7, compares the industry-adjusted operating income changes in various years according to whether the IPO firm has equity-based compensation. We define four groups of IPO firms. Group 1, denoted (0,0) is firms with no stock option plans for the CEO both before and after the IPO event. Group 2, denoted (0,1), includes firms that converted from no stock option plan before the IPO event to a stock option plan for the CEO after the IPO. Group 3, denoted (1,0), is firms that have stock option plans for the CEO before the offering and have no stock option plan after the offering. The last group, (1,1), identifies firms with stock option plans both before and after the IPO.

[Insert Table 7 About Here]

The ANOVA F-statistics and Kruskal-Wallis Z-statistics in Table 7 show that for the three years after the IPO in comparison to year –1 there is a significant difference in the IAOI among the four groups. There are no significant differences in the year –3 to 1 and –2 to 1.

To determine which group causes the significant difference, we perform a Mann Whitney test. The results in Table 8 indicate that group 4, (firms with stock option plans before and after the IPO) has the significant Z-statistics in the three years after the IPO.

The higher mean ranks for group 4 in the three years after the IPO (shown in Table 7) reflect better operating performance as well. Group 2 (firms that add stock option compensation plans after the IPO) has the second-highest mean rank in years 2 and 3 after the IPO, indicating better operating performance for this group than the other two groups. These results suggest that implementation of a stock option

plan may provide an incentive. Table 8, shows results of pair-wise comparisons of the four groups. The third pair of columns describes the change in IAOI from year –1 to year 1. Group 4 (firms with stock option plans in both periods) has a significantly higher increase in IAOI than group 1 (firms with no stock option compensation plans in either period) and a greater increase than group 2 (firms that add stock options).[6]

[Insert Table 8 About Here]

C. Pay-Performance Sensitivity and Industry-Adjusted Operating Performance

In Table 9, we test whether PPS influences IAOI.[7] We divide the sample into two groups, firms with pre-and post-IPO PPS measures less than or equal to the sample's median level of PPS and firms with PPS above the median. For the pre-IPO period in Panel A, the mean IAOI is nominally greater for firms with below-median PPS. The difference in means is marginally significant (at the 10% level) in years –3 and –2 but not in year –1. There are no significant differences in the medians between the two groups.

This difference is not what we would expect. Firms with above-average PPS have lower IAOI. Higher PPS does not seem to be associated with better short-run operating performance.

[Insert Table 9 About Here]

In Panel B, we find no significant difference in the IAOI between the two groups in any year after the IPO. PPS does not seem to impact operating performance after the IPO.

In Table 10, we measure the impact on IAOI from changes in PPS. We first compute the PPS for each firm in the pre-IPO and post-IPO periods. We then determine whether the PPS measure increases (positive change) or decreases (negative change). PPS increases for 171 firms and decreases for 33 firms in the post-IPO period.[8]

[Insert Table 10 About Here]

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[6] We would have expected that firms adding stock options (group 2) would have a greater increase in IAOI than those without stock option compensation plan in either period (group 1), but this is not the case from year –1 to 1 or for any of the other periods.

[7] The sample sizes decrease in Tables 9 and 10 because some firms had no stock option plans in either period or in one of the periods. Other firms experienced no change in PPS between periods.

[8] If we assume that a random distribution of increases and decreases would be expected and compare the actual to the expected values (171 increases and 33 decreases to expected, 102 increases and 102 decreases), we get a chi-square statistic of 93.35 (significant at better than 0.01). We can conclude that PPS increases, for most IPO firms after the IPO.

We then compare the IAOI in each year –3 to 3 between the two groups. Neither mean nor median differences in IAOI are significantly different from zero. Increases in PPS do not significantly improve operating performance.

Overall, these results support the idea that firms with incentive stock option plans in their CEO contracts both before and after an IPO exhibit the highest levels of industry-adjusted operating performance in the post-IPO period. There is also some limited evidence that firms adding stock option incentive plans for their CEOs following an IPO have somewhat higher operating income in the post-IPO period. Because we do not find a positive relation between PPS and IAOI, while a stock option plan appears to improve operating performance, the level of sensitivity of these plans does not impact operating performance

4. Conclusions

The agency problem between stockholders and managers receives constant attention. Mechanisms companies have used to mitigate the agency problem include establishment of a compensation structure that better aligns interests of managers and shareholders and independent board monitoring of management's effectiveness. The agency problem should be less severe in privately held firms because senior managers are also the owners or, with concentration of ownership in few hands, owners closely monitor management performance.

When a company goes public, ownership generally becomes dispersed across more owners, and the agency problem may intensify. Our examination of how IPO companies respond to this introduction of the agency problem compares 293 IPO firms' compensation structures, boards and compensation committee structures, with operating performance before the IPO to after the IPO event.

We first find that CEO total compensation increases in the year after the IPO. A CEO's job may become more difficult after an IPO, and potential shareholder reaction to agency problems may compromise the CEO's job security. Thus, a higher CEO salary is consistent with the increased risk and responsibilities following the IPO.

We do find that a greater percentage of CEO salaries become more related to equity performance after the IPO. Combined with the finding that post-IPO boards become less insider- dominated and more independent outsider-dominated, this evidence suggests that IPO firms, on average, take steps to remedy the agency problem. Or, it may mean that IPO firms go public to provide meaningful compensation packages that align manager and shareholder interests which was not possible prior to the IPO. However, this would also lessen the possibility for agency problems.

Percentage of equity-based compensation both before and after the IPO is negatively related to CEO stock ownership. When CEOs own large amounts of company stock, their personal wealth is already tied to company performance. In this case, there may be less need for equity-based compensation.

The proportion of equity-based compensation is positively related to venture capital financing. Both before and after an IPO the CEOs of venture capital backed firms earn a greater percentage of their income from equity-related instruments. This result is consistent with the idea that venture capital firms have incentives to be effective monitors and that they influence the ways the agency problem is controlled.

We find that board composition influences the percentage of compensation and that a more independent board and a more independent compensation committee positively influence the percentage of equity compensation but only before the IPO. After the IPO, we do not find this relation, yet after the IPO, when we would expect agency problems to become more acute, the board's influence would be needed more. While boards become more outsider-dominated after the IPO, perhaps the new boards in IPO firms are inexperienced. Or, the finding could suggest that CEO compensation structure is dictated by factors other than the board in the early years following an IPO. Regardless, this evidence is consistent with that in Mikkelson, Partch, and Shah (1997) in that governance structure does not seem to influence operating performance. It could be that the CEOs have bargained for or established their post-IPO salary before the IPO.

We do not find that CEO salary structure and pay-performance sensitivity influences operating income. On average, industry-adjusted operating income falls in the years after the IPO, but this seems unrelated to the compensation structure of the firm. Equity-based compensation in firms with high growth potential may not experience improved operating performance in the short-run and this may explain the relation that we found. Firms with incentive stock option plans in CEO's contracts both before and after the IPO, however, have the highest levels of IAOI in the post-IPO period. These results suggest, overall, that firms with stock option plans appear to improve operating performance.

References

1. Anderson, R., 1997, Compensation committees: It matters who sets pay. Washington and Lee University, Working Paper.
2. Baker, M., and Gompers, P. A., 1999, An analysis of executive compensation, ownership and control in closely held firms. Harvard Business School and NBER.
3. Barber, B. M., and Lyon, J., 1996, Detecting abnormal operating performance: The empirical power and specification of test-statistics. *Journal of Financial Economics* 41, 359-399.

4. Barro, J., and Barro, R. J., 1990, Pay performance and turnover of bank CEOs. *Journal of Labor Economics* 8, 448-481.

5. Baysinger, B. D., and Butler, H. N., 1985, Corporate governments and the board directors: Performance effects of changes in board composition. *Journal of Law, Economics and Organization* 1, 101-124.

6. Beatty, R.P. and Zajac, E.J. 1994, Managerial Incentives, Monitoring, and Risk Bearing: A study of executive compensation, ownership, and board structure in initial public offerings. *Administrative Science Quarterly* 39, 313-335.

7. Boyd, B. K., 1994, Board control and CEO compensation. *Strategic Management Journal* 15, 335-344.

8. Byrd, J. W., and Hickman, K. A., 1992, Do outside directors monitor managers? Evidence from tender offer bids. *Journal of Financial Economics* 32, 195-221.

9. Cole, R. A., and Mehran, H., 1998, The effect of changes in ownership structure on performance: Evidence from the thrift industry. *Journal of Financial Economics* 50, 291-317.

10. Core, J. E., Holthausen, R. W., and Larcker, D. F., 1999, Corporate governance, chief executive officer compensation, and firm performance. *Journal of Financial Economics* 51, 371-406.

11. Corwin, S. A., and Harris, J. H., 2001, The initial listing decisions of firms that go public. *Financial Management* 30, 35-55.

12. Crawford, A. J., Ezzell, J. R., and Miles, J. A., 1995, Bank CEO pay-performance relations and the effects of deregulation. *Journal of Business* 68, 231-256.

13. DeGeorge, F., and Zeckhauser, R., 1993, The reverse LBO decision and firm performance: Theory and evidence. *Journal of Finance* 48, 1323-1348.

14. Denis, D. J., and Denis, D. K., 1993, Managerial discretion, organization structure, and corporate performance: A study of leveraged recapitalizations. *Journal of Accounting and Economics* 16, 209-236.

15. Denis, D. J., and Denis, D. K., 1995, Causes of financial distress following leveraged recapitalization. *Journal of Financial Economics* 37, 129-157.

16. Fama, E. F., and Jensen, M., 1983, Separation of ownership and control. *Journal of Law and Economics* 26, 301-325.

17. Finkelstein, S., and Hambrick, S., 1989, Chief executive compensation: A study of the intersection of markets and political pressure. *Strategic Management Journal* 10, 121-134.

18. Hall, B., and Leibman, J., 1997, Are CEOs really paid like bureaucrats? *Quarterly Journal of Economics* 111, 653-691.

19. Healy, P. M., and Palepu, K. G., 1988, Earnings information conveyed by dividend initiations and omissions. *Journal of Financial Economics* 27, 149-175.

20. Healy, P. M., Palepu, K. G., and Ruback, R. S., 1992, Does corporate performance improve after mergers. *Journal of Financial Economics* 31, 135-175.

21. Holthausen, R. W., and Larcker, D. F., 1994, The financial performance of reverse leveraged buyouts. Working paper, Wharton School, University of Pennsylvania.

22. Houston, J., and James, C., 1992, Managerial ownership, turnover and risk-taking in banking. Working paper, University of Florida.

23. Hovakimian, G., 2000, Managerial incentives and firm performance: Evidence from spin-offs and equity carve-outs. Working paper, Fordham University.

24. Jain, B., and Kini, O., 1994, The post-issue operating performance of IPO firms. *The Journal of Finance* 49, 1699-1726.

25. Jensen, M. C., and Meckling, W. H., 1976, Theory of the firm: Managerial behavior, agency costs ownership structure. *Journal of Financial Economics* 3, 305-360.

26. Jensen, M. C., and Murphy, K. J., 1990a, CEO incentives – It's not *how much*, but *how*. *Harvard Business Review* 3, 36-49.

27. Jensen, M. C., and Murphy, K. J., 1990b, Performance pay and top management incentives. *Journal of Political Economy* 98, 225-263.

28. Joskow, P. L., Rose, N. L., and Shepard, A., 1992, Regulatory constraints on CEO compensation. Brookings Papers on Economic Activity (Microeconomics).

29. Kaplan, S., 1989, The effects of management buyouts on operating performance and value. *Journal of Financial Economics* 24, 217-254.

30. Klein, A., 1998, Firm performance and board committee structure. Journal of Law and Economics 41, 275-303.

31. Lambert, R., Larcker, D., and Weigelt, K., 1993, The structure of organizational incentives. *Administrative Science Quarterly* 38, 438-461.

32. Lee, C. I., Rosenstein, S., Rangan, N., and Davidson, W. N., 1992, Board composition and shareholder wealth: The case of management buyouts. *Financial Management* 21, 58-72.

33. Lerner, J., 1994, Venture capitalists and the decision to go public. *Journal of Financial Economics* 35, 293-316.

34. Loughran, T., and Ritter, J., 1997, The operating performance of firms conducting seasoned equity offerings. *Journal of Finance* 52, 1823-1847.

35. Merton, R. C., 1973, Theory of rational option pricing. *Bell Journal of Economics and Management Science* 4, 141-183.

36. Mikkelson, W. H., and Partch, M. M., 1994, The consequences of unbundling managers' voting rights equity claims. *Journal of Corporate Finance* 1, 175-199.

37. Mikkelson, W.H., Partch, M.M., and Shah, K., 1997, Ownership and operating performance of companies that go public. *Journal of Financial Economics* 44, 281-307.

38. Milliron, J., 2000, Board of director incentive alignment and the design of executive compensation contracts. Working Paper, University of Chicago.

39. Murphy, K. J., 1985, Corporate performance and managerial remuneration. *Journal of Accounting and Economics* 7, 11-42.

40. Newman, H., and Mozes, H., 1997, Compensation committee composition and its influence on CEO compensation practices. Working Paper, Fordham University.

41. Rose, N. L., and Shepard, A., 1994, Firm diversification and CEO compensation: Managerial ability or executive entrenchment. Working Paper no. 4723, NBER.

42. Rosen, S. and, 1992, Contracts and market for executives. In L. Wein and H. Wijkander (eds.), *Contract Economics*. London Blackwell Publishers.

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43. Rosenstein, S., and Wyatt, J. G., 1990, Outside directors, board independence, and shareholder wealth. *Journal of Financial Economics* 26, 175-192.
44. Rosenstein, S., and Wyatt, J. G., 1997, Inside directors, board effectiveness, and shareholder wealth. *Journal of Financial Economics* 44, 229-250.
45. Teoh, S.H., Welch, I., and Wong, T.J., 1998, Earnings management and the long-run market performance of initial public offerings. *Journal of Finance* 53, 1935-1974.
46. Xie, B., Davidson III, W.N. and DaDalt, P.J., 2003, Earnings management and corporate governance: The role of the board and the audit committee. *Journal of Corporate Finance* 9, 295-316.
47. Yermack, D., 1995, Do corporations award CEO stock options effectively? *Journal of Financial Economics* 39, 237-270.

Appendices

Table 1. Reasons for elimination of IPO firms from the initial sample.

The initial sample of 3054 IPOs was identified from the SDC database. The process of presampling involved dropping all firms with multiple classes of common stock with different voting rights. All ADRs and ADSs are canceled since these firms represent international firms with harder data to be found, especially for German firms that do not have data available on Compustat files. Finally, all forms of financial institutions are also excluded in the presampling procedure. The second panel shows the second sampling procedure. Since the major data are collected from Form S1 on EDGAR on line, all IPOs not available on this electronic database are excluded from the sample. Also, IPOs with merger event around the IPO date and IPOs with no data available on Compustat or with no compensation data on the S1 Form are also excluded from the sample. Examples of other reasons include: new firm (not enough data for operating performance before the offerings), issuance of subordinate debt or second class of stocks, and incomplete data on the S1 filings. The final sample comprises 293 IPOs.

	Reason	freq.
	Initial sample	**2312**
1	No registration statement	53
2	Governance data or compensation data unavailable in registration statement	1744
3	Data unavailable on Compustat files	180
4	Merger events around the IPO date	33
5	Other missing data	62
	Final sample	**293**

Table 2. Frequency statistics for the sample (N = 293)

The initial sample was identified from the SDC database. The majority of the sample is concentrated in the last three years 1996, 1997, and 1998 because beginning in May 1996, the SEC made electronic filing mandatory for IPO firms. The sample is very representative of IPOs. The majority of the sample is concentrated in high tech (manufacturing SIC 3571-3699, services SIC 7352-7389) and the health care industry (manufacturing SIC 3812-3873, services SIC 8011-8099).

	SIC Codes	Freq.	%
Panel A: IPO Exchange			
Nasdaq		266	90.8
NYSE		24	8.2
ASE		3	1.0
Total		293	100.0
Panel B: Type of Industry (SIC)			
1. Manufacturing (Total)		123	42.0
Medical instrumental and surgical devices	3812-3873	60	20.5
Computer equipment	3571-3699	36	12.3
Others	3312-3499	27	9.2
2. Transportation, Communication, . . .	4011-4971	17	5.8
3. Wholesale and Retail Trade	5012-5995	32	10.9
4. Business Services (Total)		114	38.9
Advertising, motion pictures, . . .	7311-7349	15	5.1
Data processing, software, . . .	7352-7389	77	26.3
Health services	8011-8099	22	7.5
5. Others		7	2.4
Total		293	100.0

Table 3. Summary Statistics

Data in this table was compiled from two major sources: the registration statement on Form S1 available on EDGAR online database for the year before the offering and the proxy statements for the year following the IPO event. The first Panel shows the dollar values in thousands for the salary, bonus and other cash annual compensation as specified in the CEO's contract. The last row shows the total value of cash compensation. The second panel shows data on board composition. The board classification used in this study comprised four groups. The first group represents outside board members who are not full time employees of the company and do not have any business relation with the company. The second group represents inside board members who are full-time employees of the company. The third group represents affiliated board members who have business relations with the firm, or have family relation with executives of the firm, or are non executive founders. The last group identifies venture capital-backed board members who represent the venture capital firms which provide a major source of capital for the firm. This category is considered as a second type of affiliated board members in the analysis. The third panel shows summary statistic data on the percentages of compensation committee composition. The first group is defined as insiders who are full-time employees of the company (this grouping could also mean that there is no compensation committee, especially in the period before the offering. Under this circumstance, the CEO along with top executives with an occupation on the board set the compensation structure). The second group includes affiliated board members. This group could indicate any of the following board members: members who have business relation with the company, or non-CEO founders of the company, or VC-backed board members who are extremely active in this committee specifically in the pre-IPO period. The last group includes outside board members, those who have no relation with the firm or have been employed before by the company. The last panel in the table provides summary statistics on the percentages of ownership owned by four major groups. The first group is the percentage of stock ownership held by the firm CEO. The second group represents the percentage of stock ownership held by firm directors and board members excluding CEO stock ownership. The third group is the percentage of stock ownership held by venture capital-backed board members. The last group represents the percentage of stock ownership held by outside blockholders such as institutional investors and individual investors.

Variable		Min.	Lower Quartile	Median	Upper Quartile	Max.	Mean	Std. Dev.	z-stat (p-value)	t-stat (p-value)
Panel A: Compensation Components ($1,000)										
Salary	before	26.8	150.0	181.0	250.0	2,743.3	236.6	227.3	-2.47**	9.38***
	after	72.0	183.6	240.0	300.0	1,500.0	264.5	138.4	(0.014)	(0.000)
Bonus	before	0.0	0.0	25.0	79.6	1,816.4	95.0	218.3	-0.03	3.50***
	after	0.0	0.0	45.0	127.5	840.0	95.4	148.3	(0.973)	(0.000)
Other	before	0.0	0.0	1.8	11.0	1,769.3	21.1	110.4	-2.21	-1.12
	after	0.0	0.0	3.4	16.9	281.6	14.1	27.3	(0.027)	(0.262)
Total cash-based compensation	before	26.8	167.0	228.3	342.4	3.200.0	331.6	359.4	-1.60	7.13***
	after	72.0	220.5	291.2	411.1	1,500.0	359.9	228.4	(0.112)	(0.000)
Equity-based	before	0.0	0.0	0.0	1,125.4	64,363.2	1,472.6	5,348.0	-2.60**	6.41***
	after	0.0	0.0	470.0	2,477.5	152,062.7	3,392.2	11,998.0	(0.010)	(0.000)
Total compensation	before	26.8	232.1	562.5	1,484.6	64,538.2	1,830.2	5,362.7	6.71***	2.63**
	after	81.8	381.1	899.2	2,825.6	152,307.7	3,768.0	12,011.4	(0.000)	(0.009)
Percent equity of total	before	0.0	0.0	0.0	82.3	99.7	37.1	40.8	5.67***	6.00***
	after	0.0	0.0	60.7	87.4	99.8	50.8	38.6	(0.000)	(0.000)
Panel B: Board Composition (%)										
Insiders	before	0.0	22.2	40.0	61.3	100.0	45.1	28.5	-10.50***	-11.40***
	after	11.1	16.7	25.0	40.0	66.7	28.2	13.3	(0.000)	(0.000)
Affiliated	before	0.0	0.0	20.0	33.3	85.7	20.7	20.9	-2.60**	-2.80***
	after	0.0	0.0	16.7	25.0	62.5	17.0	15.4	(0.010)	(0.006)
Venture Capital	before	0.0	0.0	0.0	33.3	75.0	17.8	21.2	-7.0***	-7.60***
	after	0.0	0.0	0.0	20.0	66.7	10.6	15.1	(0.000)	(0.000)
Outsiders	before	0.0	0.0	14.3	28.6	80.0	16.5	18.5	13.89***	21.88***
	after	0.0	33.3	42.9	57.1	85.7	44.3	16.9	(0.000)	(0.000)

Panel C: Compensation Committee Composition (%)

Insiders	before	0.0	0.0	0.0	100.0	100.0	39.3	46.2	- 10.00***	- 12.71***
	after	0.0	0.0	0.0	0.0	80.0	5.4	14.3	(0.000)	(0.000)
Affiliated	before	0.0	0.0	50.0	100.0	100.0	45.0	41.3	-4.30***	-4.30***
	after	0.0	0.0	33.3	50.0	100.0	35.3	31.7	(0.000)	(0.000)
Venture Capital	before									
	after									
Outsiders	before	0.0	0.0	0.0	33.3	100.0	14.8	25.8	12.61***	19.80***
	after	0.0	41.7	60.0	100.0	100.0	59.3	31.8	(0.000)	(0.000)

Panel D: Ownership Structure (%)

CEO	before	0.0	4.6	14.5	44.2	100.0	28.2	30.1	- 12.00***	- 10.88***
	after	0.0	3.1	6.9	24.7	84.9	16.8	20.1	(0.000)	(0.000)
Directors and Officers	before	0.0	14.8	32.8	54.7	99.2	35.6	26.4	- 12.07***	- 14.52***
	after	0.0	4.3	12.0	27.6	86.0	17.5	16.7	(0.000)	(0.000)
Venture Capitalists	before	0.0	0.0	0.0	27.5	90.9	14.6	19.7	-9.65***	- 11.05***
	after	0.0	0.0	0.0	1.1	47.7	3.7	8.7	(0.000)	(0.000)
Blockholders	before	0.0	0.0	0.0	0.0	77.1	2.4	8.6	-1.00	-0.67
	after	0.0	0.0	0.0	0.0	78.3	2.0	7.6	(0.318)	(0.747)

Panel E: Other Variables (%)

Leverage	before	0.0	0.6	8.0	29.1	229.0	21.1	30.9	-5.27***	-3.79***
	after	0.0	0.0	2.6	20.3	159.6	13.8	22.3	(0.000)	(0.000)
In size (In 1,000,000)	before	0.3	2.4	3.1	3.8	8.1	3.2	1.2	14.22***	22.82***
	after	0.7	3.7	4.4	5.2	8.4	4.4	1.1	(0.000)	(0.000)

*, **, *** denote significance at 10%, 5% or 1%, respectively.

Table 4. IPO firms operating performance before and after the IPO event

Data on accounting data are obtained from the registration statement (S1) forms for the three years before the event, and from Compustat industrial files for the three years after the IPO. The operating income is calculated as Sales less Cost of goods sold less selling, general, and administration expense less depreciation, depletion and amortization divided by the book value of total assets, or (EBIT and extraordinary items). The industry-adjusted change of a firm for a given period is computed as the difference between its change in operating income relative to year (-1) and the median change in operating income of the industry matched firm. Year (+1) is the first full fiscal year of post IPO. Panel A shows results for the medians levels of accounting performance for the full sample. The industry-adjusted operating levels are computed as the difference between the operating income of the sample firm from the median of the control group. The first row shows the unadjusted-operating performance, whereas, the second row shows the industry-adjusted operating performance. Panel B shows results of medians of changes in accounting performance for the full sample.

Panel A: Levels in Accounting Performance

	Year –3	Year –2	Year –1	Year 1	Year 2	Year 3
Unadjusted						
Mean	-17.80	-21.75	-15.98	-2.21	-8.67	-13.56
Median (%)	5.45	4.15	5.34	5.95	4.49	1.83
% of Positives	60.6	57.9	60.1	63.1	60.4	54.3
% of Negatives	39.4	42.1	39.9	36.9	39.6	45.7
Adjusted						
Mean	-15.74	-18.99	-13.16	0.61	-5.85	-10.74

Median (%)	-0.92	-0.65	0.08	2.29	-0.89	-2.63
% of Positives	48.2	48.4	50.2	56.0	48.5	41.0
% of Negatives	51.8	51.6	49.8	44.0	51.5	59.0
No. of observations	249	285	293	293	293	293

Panel B: Changes in Accounting Performance

	Years				
	(-3 to1)	(-2 to-1)	(-1 to1)	(-1 to 2)	(-1 to 3)
Unadjusted					
Mean	7.59**	7.25*	13.77***	7.31*	2.42
Median (%)	2.83***	1.68***	0.89**	-0.29	-3.56
% of positives	60.6	59.6	54.3	48.5	42.3
% of negatives	39.4	40.4	45.7	51.5	57.7
Adjusted					
Mean	7.88**	7.13*	13.59***	7.13*	2.24
Median (%)	5.45***	3.19***	2.42***	-0.20	-2.10
% of positives	61.4	61.1	55.3	49.5	46.1
% of negatives	38.6	38.9	44.7	50.5	53.9
No. of observations	249	285	293	293	293

*, ** and *** denote significance at 10%, 5% or 1% levels, respectively.

Table 5. Determinants of equity-based compensation

In model 1, the percentage of outsiders is the percentage of independent directors on the board. In model 2 the percentage of outsiders refers to the percentage of independent directors and venture capital directors in the board. In model 3 the percentage of outsiders refers to the percentage of independent directors in the compensation committee. The dependent variable is the percentage of equity-based compensation of total compensation for the CEO. Stock options are valued using the Black-Scholes formula. Stock options include stock option grants, stock appreciation rights (SAR), and restricted shares. The independent variables are CEO stock ownership, non-CEO officers and director's stock ownership, firm size, a venture capital backed binary variable taking the value 1 when there is venture capital backing, and the percentage of independent directors in the board. CEO stock ownership is the percentage of stock ownership held by the CEO and his immediate family members. The ownership of directors and officers excludes the ownership of the CEO. The VC-Backed variable is a binary variable that is set equal to one when the IPO firm has venture capital financing, and zero otherwise. For firm size we use the log transformation of the book value of total assets.

Dependent variable	% of Equity-Based Compensation of			% of Equity-Based Compensation of		
	CEO Pay (before IPO)			CEO Pay (after IPO)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Intercept	39.12***	39.75***	44.76***	56.25***	53.89***	56.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CEO ownership	-0.48***	-0.47***	-0.51***	-1.03***	-1.03***	-1.03***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
D&O ownership	-0.022	-0.05	-0.028	-0.35***	-0.33***	-0.35***
	(0.817)	(0.622)	(0.76)	(0.005)	(0.006)	(0.004)
Log (firm size)	-0.22	-0.16	-0.65	3.06*	3.14*	3.06*
	(0.901)	(0.930)	(0.72)	(0.071)	(0.063)	(0.071)
VC-Backed	15.81***	5.08	14.54***	11.89***	10.98**	12.02***
	(0.000)	(0.410)	(0.001)	(0.006)	(0.012)	(0.006)
% of outsiders	0.34***	0.30**	0.19**	0.004	0.043	0.007
	(0.000)	(0.011)	(0.021)	(0.973)	(0.729)	(0.915)
R-square	0.262	0.255	0.253	0.317	0.319	0.317
F-statistic	20.27***	19.47***	19.07***	26.24***	26.442***	26.244***
p-value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

*, **, and *** denote significance at the 10%, 5%, or 1% levels, respectively.

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Table 6. Determinants of Pay-Performance Sensitivity

In model 1, the percentage of outsiders is the percentage of independent directors on the board. In model 2 the percentage of outsiders refers to the percentage of independent directors and venture capital directors in the board. In model 3 the percentage of outsiders refers to the percentage of independent directors in the compensation committee. The dependent variable is the measure of pay-performance-sensitivity variable modified from Yermack (1995). It is estimated from the product of two terms: the Black-Scholes formula's partial derivative with respect to stock price times the fraction of equity. Stock options are valued by the Black-Scholes formula. Stock options include stock option grants, stock appreciation rights (SAR), and restricted shares. The independent variables are CEO ownership, non-CEO officers and director's ownership, firm size, VC binary variable, and the percentage of independent directors in the board. CEO stock ownership is the ownership is the percentage of stock ownership held by the CEO and his immediate family members. The ownership of directors and officers excludes the ownership of the CEO. The VC-Backed variable is a binary variable that is set equal to one when the IPO firm has venture capital financing, and zero otherwise. For firm size we use the log transformation of the book value of total assets.

Dependent Variable	Pay-Performance Sensitivity (PPS)			Pay-Performance Sensitivity (PPS)		
	(before)			(after)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Intercept	0.39	0.49*	0.55**	2.54***	2.78***	3.18***
	(0.133)	(0.065)	(0.029)	(0.001)	(0.000)	(0.000)
CEO ownership	-0.00	-0.00	-0.00	-0.03***	-0.03***	-0.03***
	(0.261)	(0.208)	(0.127)	(0.000)	(0.000)	(0.000)
D&O ownership	0.01	0.00	0.00	-0.01	-0.01	-0.02*
	(0.141)	(0.240)	(0.183)	(0.105)	(0.106)	(0.085)
Log (firm size)	-0.04	-0.04	-0.04	-0.25**	-0.25**	3.06**
	(0.485)	(0.449)	(0.395)	(0.044)	(0.043)	(0.035)
VC-Backed	0.02	-0.19	0.00	-0.01	-0.26	-0.12
	(0.863)	(0.278)	(0.978)	(0.983)	(0.409)	(0.692)
% of outsiders	0.01***	0.01*	0.01**	0.01	0.01	0.00
	(0.005)	(0.084)	(0.043)	(0.135)	(0.371)	(0.813)
R-square	0.067	0.050	0.056	0.0811	0.076	0.074
F-statistic	4.08***	2.96**	3.33***	4.785***	4.465***	4.312***
p-value	(0.001)	(0.012)	(0.006)	(0.000)	(0.000)	(0.000)

*, **, and *** denote significance at the 10%, 5%, or 1% levels, respectively.

Table 7. Results of ANOVA and Kruskal-Wallis tests considering the effect of the existence of stock option plans for CEOs on the change in the IAOI

In this table, the industry-adjusted operating income change of a firm for a given period is computed as the difference between its change in operating income relative to year -1 and the median change in operating income of the industry matched firm. Group 1 identifies the number of firms with no stock option plan for the CEO before and after the IPO event (mostly this group reflects firms with a CEO who is a founder or has high stock ownership). Group 2 identifies the number of firms that converted from no stock option plan for the CEO before the IPO event to stock option plan for the CEO after the IPO. Group 3 identifies the number of firms that have a stock option plan for the CEO before the before the offering and do not have a plan after the offering. The last group 4 identifies the number of firms that have stock option plans before and after the IPO. The test variable is the change in the industry-adjusted return on assets for each year relative to year (-1) around the IPO. Stock option plans were available for other executives in most firms after the IPO, however, the case is different for the CEO.

Changes in IAOI in years		Status of stock option grants before and after IPO					
		Group 1 (0,0)	Group 2 (0,1)	Group 3 (1,0)	Group 4 (1,1)	Z-stat F-stat	p-value
	Mean	3.9	4.2	-11.2	12.8	0.64	0.587
-3 to -1	Median	2.7	5.7	3.9	4.6	2.02	0.568
	Mean rank	116.1	127.7	103.6	128.6		

	Mean	-0.8	10.7	-2.2	9.1	0.44	0.701
-2 to -1	Median	1.7	4.3	-0.5	4.4	3.98	0.264
	Mean rank	128.7	146.7	114.4	1148.9		
	Mean	-1.8	0.5	9.7	29.8	4.48***	0.004
(-1 to1)	Median	-0.5	0.7	4.3	6.6	15.06***	0.002
	Mean rank	123.1	131.9	160.2	166.2		
	Mean	-6.0	-2.5	-4.5	20.7	3.41**	0.018
(-1 to 2)	Median	-3.1	-1.8	-4.6	4.1	11.49***	0.009
	Mean rank	124.9	138.4	124.1	164.0		
	Mean	-6.2	-5.0	-14.3	12.6	1.32	0.270
(-1 to 3)	Median	-3.8	-4.2	-16.0	1.6	10.37**	0.016
	Mean rank	131.1	140.1	98.0	161.8		

*, ** and *** denote significance at 10%, 5% or 1% levels, respectively

Table 8. Results of Mann-Whitney tests

In this table, we performed a nonparametric test to determine which of the four groups in Table 7 have the significant levels of IAOI in years before the IPO. The industry-adjusted operating income (IAOI) is computed as the difference between the operating income of the sample firm from the median of the control group. Group 1 identifies the number of firms with no stock option plan for the CEO before and after the IPO event (mostly this group reflects firms with a CEO who is a founder or has high stock ownership). Group 2 is the firms that converted from no stock option plan for the CEO before the IPO event to stock option plan for the CEO before the offering and do not have a plan after the offering. Group 3 is the group with stock option plans before the IPO but not afterwards. Group 4 identifies the number of firms that have stock option plans before and after the IPO event. Values in the table represent *p*-values.

	Δ IAOI (-3, -1)		Δ IAOI (-2, -1)		Δ IAOI (-1, 1)		Δ IAOI (-1, 2)		Δ IAOI (-1, 3)	
	z-stat	*p*-value	*z*-stat	*p*-value	*z*-stat	*p*-value	*z*-stat	*p*-value	*z*-stat	*p*-value
Group 1 (0, 0) vs. Group 2 (0, 1)	1.01	(0.313)	1.39	(0.164)	0.57	(0.572)	0.94	(0.349)	0.61	(0.541)
Group 1 (0, 0) vs. Group 3 (1, 0)	-0.56	(0.574)	-0.55	(0.580)	1.37	(0.171)	0.03	(0.975)	1.52	(0.128)
Group 1 (0, 0) vs. Group 4 (1, 1)	1.05	(0.293)	1.56	(0.119)	3.42***	(0.001)	3.09***	(0.002)	2.51**	(0.012)
Group 2 (0, 1) vs. Group 3 (1, 0)	-1.06	(0.212)	-1.10	(0.270)	1.10	(0.275)	0.53	(0.594)	1.56	(0.118)
Group 2 (0, 1) vs. Group 4 (1, 1)	0.18	(0.860)	0.25	(0.801)	2.85***	(0.004)	2.14**	(0.032)	1.85*	(0.067)
Group 3 (1, 0) vs. Group 4 (1, 1)	0.80	(0.426)	1.21	(0.228)	0.33	(0.746)	1.45	(0.147)	2.06**	(0.040)

Table 9. Levels of IAOI depending on above-median pay-performance sensitivity (PPS)

Wilcoxon signed ranks test on results on the differences between the group with above median levels in PPS and the group with below median levels in PPS. Panel A shows differences in IAOI between the two groups based on PPS grouping before the event, while Panel B shows differences in IAOI between the two groups based on grouping after the event. PPS is the measure of pay-performance sensitivity for each firm modified from Yermack (1995). The PPS measure is the Black-Scholes formula's partial derivative with respect to stock price times the fraction of equity. Industry-adjusted operating income is the difference between the operating income of the sample firm from the median of the control group. Year (+1) is the first full fiscal year post-IPO.

	Less than or Equal to Median				Greater than Median					
Year	Mean	Median	Mean Rank	N	Mean	Median	Mean Rank	N	*t*-test *p*-value	*z*-stat *p*-value
Panel A: Pre-IPO										
-3	-20.3	-4.7	63.3	63	-52.9	-7.8	58.5	58	1.80* (0.075)	0.75 (0.455)
-2	-20.4	-6.3	72.5	70	-49.9	-9.2	68.5	70	1.94* (0.055)	0.59 (0.554)

	Mean	Med.	Mean rank	N	Mean	Med.	Mean rank	N	t-stat p-value	z-stat p-value
-1	-15.3	-6.0	72.0	71	-39.0	-5.7	71.0	71	1.46 (0.149)	0.90 (0.895)
Panel B: Post-IPO										
1	-2.8	0.2	94.9	100	-3.4	3.7	105.2	99	1.62 (0.108)	1.26 (0.207)
2	-8.2	-2.2	95.0	100	-1.6	-0.7	105.1	99	-1.37 (0.174)	1.24 (0.214)
3	-16.6	-3.3	98.6	100	-9.7	-2.9	101.4	99	-0.79 (0.431)	0.73 (0.729)

*, ** and *** denote significance at 10%, 5%   or 1% levels, respectively.

Table 10. Levels of IAOI depending on change in pay-performance sensitivity pre-IPO and post-IPO

Wilcoxon signed ranks test on differences between the group with negative change in PPS and the group with positive change in PPS values. The sub sample is based on the change in the value of the PPS from the period before to the period after the IPO. Firms with negative change in PPS denotes the group with lower levels of link between pay and performance, firms with positive change in PPS denotes the group with higher levels of link between pay and performance. The PPS is the new measure of pay-performance sensitivity for each firm, which is modified from Yermack (1995). The PPS measure is estimated from the product of two terms: the Black-Scholes formula's partial derivative with respect to stock price times the fraction of equity. The industry-adjusted operating levels are computed as the difference between the operating income of the sample firm from the median of the control group. Year (+1) is the first full fiscal year post IPO.

| | Negative change | | | | Positive change | | | | | |
| | | | Mean | | | | Mean | | t-stat | z-stat |
Year	Mean	Med.	rank	N	Mean	Med.	rank	N	p-value	p-value
-3	-24.3	2.4	89.2	27	-22.8	-3.6	83.0	140	0.09 (0.933)	-0.60 (0.546)
-2	-23.1	-5.9	105.0	33	-32.0	-5.9	99.6	167	-0.56 (0.576)	-0.49 (0.625)
-1	-22.2	-1.9	102.5	33	-19.7	-1.6	102.5	171	0.15 (0.878)	0.00 (0.999)
1	-6.8	0.3	112.7	33	-0.8	2.2	100.5	171	1.48 (0.140)	-1.08 (0.280)
2	-10.3	0.6	101.6	33	-4.2	-1.8	102.7	171	0.93 (0.352)	0.10 (0.919)
3	-13.0	-6.7	95.0	33	-13.6	-3.1	103.9	171	-0.05 (0.961)	0.79 (0.427)

*, ** and *** denote significance at 10%, 5% or 1% levels, respectively.

Appendix A
ESTIMATION OF CEO PPS MEASURE

We compute the pay-performance sensitivity measure (*PPS*) using the following:

$$PPS \approx \Delta \cdot \left(\frac{\text{shares represented by option award}}{\text{shares outstanding at start of year}} \right)$$

where:

$$\Delta = \frac{\partial(\text{Black - Scholes Value})}{\partial P} \qquad (A.1)$$

The Black-Scholes value is evaluated by

$$C = P e^{-dT} \Phi(Z) - X e^{-rT} \Phi\left(Z - \sigma\sqrt{T}\right) \tag{A.2}$$

where:

$$Z = \frac{\ln(P/X) + T\left(r - d + \sigma^2/2\right)}{\sigma\sqrt{T}} \tag{A.3}$$

To evaluate Δ, we calculate values for two cases: 1) pre-IPO and 2) post-IPO.

A.1 Pre-IPO

With no public market for the IPO firm stock before the event, to proxy for the stock price, we use the closing first-day price. We also set the exercise price equal to the stock price on the first trading day, as is common practice in US corporations. Thus, (A.2) and (A.3) will be

$$C = P e^{-dT} \Phi(Z) - P e^{-rT} \Phi\left(Z - \sigma\sqrt{T}\right) \tag{A.4}$$

where:

$$Z = \frac{\sqrt{T\left(r - d + \sigma^2/2\right)}}{\sigma}. \tag{A.5}$$

Notice that Z is independent of P. Thus, using (A.1) and (A.4)

$$\Delta = \frac{\partial C}{\partial P} = e^{-dT} \Phi(Z) - e^{-rT} \Phi\left(Z - \sigma\sqrt{T}\right), \tag{A.6}$$

where Z is defined as (A.5)

A.2 POST-IPO EVENT

We have both the stock price and the exercise price post-IPO, so we estimate the pay-performance sensitivity measure as follows: Using (A.1) – (A.3)

$$\Delta = \frac{\partial C}{\partial P} = e^{-dT} \Phi(Z) + P e^{-dT} \frac{\partial \Phi(Z)}{\partial P} - X e^{-rT} \frac{\partial \Phi\left(Z - \sigma\sqrt{T}\right)}{\partial P} \tag{A.7}$$

Thus, by the chain rule,

$$\frac{\partial \Phi(Z)}{\partial P} = \frac{\partial \Phi(Z)}{\partial Z} \cdot \frac{Z}{\partial P}$$

$$= \frac{\phi(Z)}{P\sigma\sqrt{T}} \tag{A.8}$$

and similarly

$$\frac{\partial \Phi\left(Z - \sigma\sqrt{T}\right)}{\partial P} = \frac{\phi\left(Z - \sigma\sqrt{T}\right)}{P\sigma\sqrt{T}} \tag{A.9}$$

where $\phi(\cdot)$ is the probability density function of the standard normal distribution. Substituting (A.8) and (A.9) in (A.7) yields

$$\Delta = e^{-dT} \Phi(Z) + \frac{e^{-dT}\phi(Z)}{\sigma\sqrt{T}} - \frac{X e^{-rT}\phi\left(Z - \sigma\sqrt{T}\right)}{P\sigma\sqrt{T}} \tag{A.10}$$

where Z is as defined by (A.3)

Thus, equations (A.6) and (A.10) denote the Black-Scholes values for the pre-IPO and post-IPO measure