How Employee Stock Options and Executive Equity Ownership Enhance Long-term IPO Performance

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Abstract

This paper examines the longer-term performance of IPOs from the expiration of the stabilization period to three years after the IPO. It seeks to determine whether employee stock options (ESOs) affect long-term market-adjusted performance after controlling for other influential factors previously uncovered in the IPO and compensation literature, such as executive cash compensation, profitability, age, size, venture capital backing, underwriter ranking, industry, book-to-market, analyst growth forecasts, and underpricing. We find that new public companies granting extensive ESOs outperform companies granting few ESOs for two years after the IPO. In addition, among IPOs with extensive ESOs, IPOs with high executive equity ownership outperform IPOs with low executive equity ownership. We offer a theoretical explanation for these results based on managerial risk aversion and compensation arrangements.

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Abstract

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1. Introduction

The use of equity-based compensation for employees has been growing rapidly during the last decade, with the most common method being stock option plans. The National Center for Employee Ownership (2001) estimates that between seven and ten million US employees held options in 2000. Snider (2000) reports how in the late 1990s law firms were forced to massively increase the salaries for their associates to prevent them from leaving to internet start-ups offering equity-based compensation. At the same time, newly minted MBAs from top business schools shunned previously coveted jobs in consulting and investment banking, and instead chose jobs with "new economy" firms offering option compensation. New economy firms were the most aggressive users of stock option plans during the dot-com bubble in the late 1990s (see Anderson, Banker and Ravindran, 2000; Ittner, Lambert and Larcker, 2003; Meulbroek, 2001 and 2002; and Murphy, 2003).[1] The popularity of equity-based compensation is a puzzle for standard economic theory: the positive incentive effects could be diminished or even eliminated by free rider problems and by the cost of imposing risk on employees.

Why are we interested in studying stock option usage by new public companies? After an IPO, insider holdings are diluted and the secondary market makes it easier for insiders to sell their ownership shares; nevertheless, the use of equity-based compensation such as stock options increases significantly (Frye, 2002). Understanding how compensation influences a firm's ability to raise capital represents an important research area.

[1] Empirical studies on the use of stock options come primarily from the US. Heath et al. (1999) find that the mean expected value of stock options constitutes 160 percent of yearly base salary in the US (the median is 35 percent). Conyon and Murphy (1999) compare the composition of chief executive officers' pay in the US with that in the UK and find that stock options constitute one-third of total pay for US CEOs compared to only ten percent for UK CEOs. Moreover, the median stock option compensation for US CEOs is over ten times that of UK CEOs.

Agency theory suggests that firms issue stock options to provide employees with an incentive to exert their efforts.[2] Because the payoff of a call option is positively related to the underlying stock price, employees will only increase the value of their options if they increase the firm's stock price and thus shareholder value at the same time. Moreover, stock-based compensation plans may not only strengthen the link between compensation and performance for existing recipients, but can also assist a firm in bringing talented new staff on board (Oyer, 2004 and Oyer and Schaefer, 2004). Stock options might be particularly effective forms of compensation when cash availability is limited in cash-poor start-up firms (Inderst and Müller (2003). This might be especially important for high-tech firms that have intangible assets but little cash (Yermack, 1995; Dechow et al., 1996; and Core and Guay, 2001).

Yet, stock-based compensation has fueled an avalanche of criticism from different sources. In recent years, stock option plans have drawn the attention of many critics who claim that they have become too costly, that their costs are not properly reported under current GAAP rules, and that they provide employees with an incentive to abuse the system.[3] Despite recent corporate scandals by such high-profile firms as WorldCom, Enron, and Adelphia Communications, the use of stock options to improve employee performance is still widespread, particularly by high-tech firms.

IPOs present an opportune setting for the examination of executive compensation. Although stock options comprise the fastest growing component of top management compensation, there is no consensus

[2] See also Jensen and Meckling (1976), Haugen and Senbet (1981), Smith and Stulz (1985), Lambert (1986), Copeland and Weston (1988), Lambert, Larcker, and Verrecchia (1991), Hirshleifer and Suh (1992), and Hemmer, Kim, and Verrecchia (1999). Other researchers such as Demsetz and Lehn (1985), Himmelberg, Hubbard, and Palia (1999), Core and Guay (1999), Rajgopal and Shevlin (2002), and Hanlon, Rajgopal, and Shevlin (2003) predicate their analyses on the premise that the granting of options is consistent with firm value maximization.

[3] Murphy (2002 and 2003) proposes that compensation policies are based on the "perceived cost" of options rather than their true economic cost. Options bear no accounting charge and incur no outlay of cash; therefore, firms may perceive the cost of option compensation as low and prefer it to cash compensation.

on the relation between employee stock option compensation and future IPO performance. Our study investigates whether the use of stock options leads to better firm performance after the IPO. Our sample includes 897 firm-commitment IPOs filed between January 1997 and December 1999. We estimate whether the use of employee stock options is associated with superior post-IPO performance from the expiration of the stabilization period (20 days after the issue) to the lockup expiration, from the day after the lockup expiration to two years after the issue, and for the third year after the issue. After controlling for firm characteristics such as size, profitability, age and industry, and for corporate governance characteristics such as cash compensation and executive equity ownership, we find that stock option grants enhance future firm performance for the first two years after the issue. We also study whether the relation between stock options and long-term performance depends on top management equity-based compensation. We find that the link between stock option usage and post-IPO performance is stronger when there is greater executive equity ownership.

Our paper differs from previous papers that have investigated the relation between executive pay and future firm performance. Several studies correlate compensation measures with ex-post stock price performance (e.g., Masson, 1971; Abowd, 1990; Defusco et al., 1991; Core, Holthausen and Larcker, 1999; Kedia and Mozumdar, 2002; and Ittner, Larcker and Lambert, 2003). A major difficulty with this approach is that stock prices have embedded shareholder expectations. An option grant is intended to affect the distribution of stock returns for the company. In an efficient market, the forward-looking nature of stock prices likely incorporates this shift in the distribution of returns prior to the executive taking any action induced by the option grant. For example, a stock price revision might occur well before the option grant is even announced. Our research design of studying IPOs and using the relative number of stock options granted per share is better suited to compute the post-IPO performance associated with granting options because using the number of stock options per shares offered avoids the circular dependence of stock option values on current stock prices.

2. The Interaction between Stock Options and Executive Equity Ownership

If investors believe that stock options provide effort-enhancing incentives they should respond more favorably to IPOs when stock options are an important part of employee compensation. Interestingly, previous research has generally treated stock options and equity ownership as equivalent incentive structures (Beatty and Zajac, 1994; Yermack, 1995; Shleifer and Vishny, 1997), but equity ownership and stock options have different risk properties. Returns on options are more volatile than returns on the underlying equity, so holding an undiversified position in options is more risky than holding an equal dollar amount of equity. On the other hand, adopting more risky investment projects increases the value of option grants, though it will not increase the value of equity grants and could even decrease their value. This suggests that investors might favor a combination of options and equity grants to different levels of employees. All employees are motivated to exert extra effort by options, but top decision makers must be restrained from taking on too many risky projects; such a restraint is effectuated when top executives hold significant undiversified equity positions.

2.1 Equity Ownership

Like the literature on stock options, research on executive equity ownership has relied predominantly on agency theory. When managers own significant amounts of a firm's equity, their decisions are more likely to be aligned with the interests of shareholders; when executives hold lower levels of firm equity, their decisions are more likely to deviate from value-maximizing objectives. Complementing the agency perspective, Leland and Pyle (1977) apply signaling theory to the IPO context and suggest that the equity retained by executives conveys a positive signal to potential investors. Taken together, agency and signaling theories have served as the framework for a vast body of empirical research on IPOs and ownership structure. Empirical evidence does not, however, uniformly support a positive, linear association between executive equity ownership and firm performance.

Researchers have also considered the potential problems resulting from executive ownership of relatively large amounts of firm equity (Morck, Shleifer, and Vishny, 1988; McConnell and Servaes, 1990). Executives with substantial ownership positions in the firms they serve may use their power to gain private

benefits from firm assets (Shleifer and Vishny, 1997). The entrenchment of executives with large equity stakes exacerbates such self-serving behavior, making it difficult for external markets to effectively discipline them (Shleifer and Vishny, 1986).

Relatively high levels of executives' equity may also influence their risk-taking behavior. As the ownership of equity in a firm increases, the wealth of the firm's executives becomes more dependent on the firm's stock performance, and the executives may try to minimize firm risk and, thus, the risk of their personal portfolios (Amihud and Lev, 1981). Mehran, Taggart, and Yermack (1999) find that executives with high levels of equity ownership use financial contracting to reduce their personal exposure to obsolescence or other asset-specific risks. A statement by Wright et al. (2002) is consistent with associating these risk properties with equity ownership: "CEOs' personal wealth concentration will induce them to undertake risk-reducing firm strategies." May (1995) mirrors this observation, arguing that "the accumulation of equity wealth while aligning effort incentives may make the manager more risk averse and thus misalign risk-taking incentives." However, granting options to top executives may counteract this risk-reducing behavior because options increase in value with volatility.

Empirical research supports some of the complexity in the relation between executives' equity and risk tolerance. Some researchers, for example, have reported a nonlinear relation between executive equity and firm performance (see Morck et al., 1988; and McConnell and Servaes, 1990). There is no consensus, however, regarding the point at which the negative effects of equity ownership outweigh the positive effects. Besides, other studies have demonstrated no support for a nonlinear relation (Cho, 1998; Himmelberg, Hubbard and Palia, 1999).

2.2 Stock Options and Executive Equity Ownership, A Theoretical Perspective

As discussed previously, the positive influence of executives' equity at increasing levels of equity ownership is empirically indeterminate. The potential problems associated with high concentrations of executives' equity may be particularly prominent in the IPO context, where executives tend to hold substantially higher percentages of a firm's equity than executives in large, publicly traded seasoned firms.

Certo et al. (2001) report that CEOs of IPO firms retained approximately 13% of firm equity, on average. In contrast, the equity held by CEOs of large firms averaged less than 1%.

We propose that stock option compensation could be particularly effective when executives also own high levels of firm equity. When executives have much personal wealth in the form of both money and human capital invested in their firms, the resulting risk exposure may make them reluctant to favor good risky projects. Options could help ensure that executives with large amounts of equity continue to take measured risks.

To formalize this intuition, consider a compensation arrangement for the top-ranking manager/decision making agent of the firm. For simplicity of illustration, we assume that his future wealth derives entirely from a position in the firm's equity plus a grant of options on the same equity. This manager/agent is risk averse. Because of well-known difficulties in monitoring and supervising his investment decisions, the shareholders realize that their manager/agent will essentially be able to select the overall risk of the firm's equity. Because systematic risk alone matters for well-diversified shareholders, again for illustration we presume that the manager can affect market-related risk by choosing a leverage ratio for the firm, thereby fixing the firm's "beta" at a level optimal for himself. The agency problem for the shareholders is to select a compensation arrangement, a mix of options and equity that will motivate the manager to select a compensation arrangement, a mix of options and equity that will motivate the manager to select an optimal leverage ratio from their perspective. We now show that this is indeed feasible provided that the shareholders understand the risk tolerances of the manager.

Notationally, let S_t denote the firm's stock price at time t and let the current time, t=0, be the date when the compensation arrangement is put into effect. Options are granted at-the-money to the manager, so the strike price, K, is S_0. An amount Q is granted in shares of equity while an amount αQ is granted in European call options on the stock. At time t=T, the manager sells his stock at S_T, exercises the options if $S_T > S_0$, and then retires from the job. At that point, his wealth is

$$W = Q[S_T + \alpha \max(0, S_T - S_0)]$$

and his expected utility is

$$E[U(W)] = \int_0^{S_0} U(QS_T)df(S_T) + \int_{S_0}^{\infty} U[QS_T + \alpha Q(S_T - S_0)]df(S_T),$$

where $df(S_T)$ is the probability density function of the stock price at T, which is determined partly by the manager's choice of risk level (leverage) for the firm. Shareholders determine α, the relative managerial compensation in the form of options.

In the numerical illustration solution to follow, we further assume that the stock price at T is distributed lognormally,

$$\tilde{S}_T = S_0 \exp[R_F + \beta\lambda(\tilde{R}_M - R_F)]$$

where β would be the firm's beta if it had no debt (the unlevered beta), $\lambda \equiv 1+D/E$ is the leverage ratio, unity plus the market debt/equity ratio (the decision choice variable of the manager), R_F is the risk-free interest rate and $\tilde{R}_M$ is Gaussian. Further, we assume that the manager has a CRRA (constant relative risk aversion) utility function of the form

$$U(\text{Wealth}) = U(W) = \frac{W^{1-g}}{1-g}$$

where g is the risk aversion parameter. Consequently, the manager's problem is

$$\max_{\lambda} E[U(W \mid \alpha)]$$

Even for such a simple utility function, a closed-form analytic solution is problematic because of the partial integral involving the option. Moreover, it is not immediately obvious that there exists an internal maximum for λ, the manager's optimal leverage/risk level. For high levels of risk aversion, he might pick minimal risk, $\lambda=0$, while for very high levels of risk tolerance, improving the value of the option grant might completely override any risk felt from the stock grant and he would select such high leverage that the firm would be unlikely to escape bankruptcy before his tenure expires.

Nonetheless, it is also clear the internal solutions do exist for moderate levels of manager risk aversion and that the manager's problem can easily be solved by numerical integration. Figure 1 depicts a series of solutions, each for a different level of manager risk aversion, g. The horizontal axis in Figure 1 gives α, the options granted to the manager as a fraction of the shares granted. The Figure assumes an annual market mean return of 7%, a risk-free rate of 5%, market volatility (return standard deviation) of 25% and an unlevered beta of 1.0. Without loss of generality we fix Q=1 and set the option's term to one year.[4]

Each curve plots the manager's choice of risk (debt/equity ratio) given his option/stock compensation contract. Higher leverage makes the stock more risky, of course, by altering the firm's beta. Manager risk aversion increases from the top to the bottom curve, so understandably the chosen leverage ratio also falls from top to bottom whatever the compensation arrangement.

The horizontal line is for a debt/equity ratio of 1:1. If stockholders held this to be an optimal risk level from their perspective, they would grant options to managers with different levels of risk aversion ranging from 20% for managers with g=1.2 to about 220% for managers with g=1.35. A 20% grant means, for instance, that for every $1 million in stock granted, the options granted would be worth about $25,000 on the grant date.[5] At the higher end, (g=1.35) the options would be worth about $270,000 for every $1 million in stock.

The basic insight of this theoretical illustration concerns the offsetting roles of options and stock in top management executive compensation. By using both options and stock in the appropriate proportions,

[4] In this illustration, idiosyncratic risk is assumed to be zero. Intuitively, allowing for idiosyncratic risk (without any higher return), should induce managers to select lower leverage levels.

[5] This is based on a rough Black/Scholes calculation, given the option's term and strike, the interest rate, and the stock's volatility. An ESO might be worth less because of vesting and other considerations; of course, if the options were longer term, as they often are in ESO grants, they would be worth correspondingly more.

shareholders can induce their agent to take on the level of risk they desire; this exact same level of risk is optimal from the manager's perspective, given his compensation contract.

3. Data Description

Our sample has 897 IPOs that were filed between January 1997 and December 1999. Of these 897 firms, 257 firms went public in 1997, 210 firms in 1998, and 430 firms in 1999. REITs, closed-end funds, financial firms, unit offerings, ADRs, and issues priced at less than five dollars are excluded from the data set. Although many previous studies also exclude financial institutions, they are not dropped here, since there is no theoretical reason to do so. All IPOs are US firms and started trading on the NYSE, AMEX or NASDAQ. Foreign companies are excluded since tax laws may differ. These sample selection criteria are consistent with previous studies by Ritter (1991), and Krigman, Shaw, and Womack (1999). Aftermarket price information is collected from the CRSP database but, for some firms that are not covered in CRSP, we use the prices reported in the SDC (Securities Data Corporation) new issues database and verify them against news sources and the share price database on bigcharts.com. All IPO information including shares offered, offer price, and the initial offering range are collected from SEC filings made available through the EDGAR database and from the SDC. Since, Ljungqvist and Wilhelm (2003) document that there are significant errors in SDC's variables for venture-backing and shares outstanding pre- and post-IPO, we hand-collect these variables as well.

We also hand-collect the number of stock options and warrants outstanding as of the issue date, the number of new options issued concurrently with the IPO, and executive cash compensation (salaries and bonuses) from prospectuses. There are 309 firms in the sample that offer new options at the IPO. Managers, employees and directors of the firm hold the majority of these options. The ratio of options outstanding to the issue size, exclusive of overallotment shares, is calculated and used in the analysis, as is the ratio of options issued concurrently with the IPO to the number of shares offered. In the sample, 365 firms are backed by venture capital. We collect the number of shares held by venture capitalists and financial institutions from the prospectuses. We hand-fill gaps in compensation data from the ExecuComp

database providing additional information on the number of shares and options owned, the number of shares sold, options granted, and options exercised, the CEO's holdings, the number of restricted shares held at the time of the IPO, and executives' cash compensation.

Accounting information, such as book value, total assets, EBITDA, and sales is obtained from Compustat and further data not available on Compustat is compiled from the financial reports on EDGAR. Some SDC accounting data (the book values of assets and equity, sales, and EBITDA) are used purely for illustrative purposes or to check for outliers.

The ratio of accruals to total assets reported in the first annual statement after the firm goes public is considered a measure of earning quality. Using the cash flow statement, we construct accruals as income before extraordinary items (Compustat item 123) minus cash flow from operations (item 308 minus item 124). Forecast earnings data are obtained from the I/B/E/S database. Lastly, underwriter quality is based on modifications of the Carter and Manaster (1990) and Carter, Dark, and Singh (1998) rankings as developed by Loughran and Ritter (2004); the rankings are between 0 (low) and 9.1 (high).

Finally, we hand-fill gaps in the SDC's coverage of company founding dates and manually check all firms that according to SDC were zero to three years old at the IPO; this is motivated by Loughran and Ritter (2004), who note that the SDC frequently reports the most recent incorporation date rather than the founding date. As in Loughran and Ritter, the founding date is defined here as the date when operations commenced. In IPOs previous corporate divisions, we attempted to determine the date when the division commenced operations. This date normally precedes the date of the division's incorporation. In roll-ups and similar acquisition-based IPOs, the founding date of the IPO is taken as the earliest founding date of any of its constituent firms.

Matching firms are selected from currently listed firms that have been public for at least three years. Industry classifications are taken from Kenneth French's website;[6] they are groupings of various 4-digit

[6] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/changes_ind.html

SIC codes. SIC codes are obtained from the SDC for both IPOs and matching firms.[7] In contrast to many other studies, we do not exclude IPOs that have negative earnings, book values or EBITDA during the last reporting year before the issue; they actually represent a large part of the sample. Most such companies are high-growth, high value, and technology firms that dominated the 1997-1999 IPO market.

4. Methods and Empirical Results

Table 1 provides information on the underpricing and option usage of 365 venture capital-backed deals and 532 non venture capital-backed deals. Since Ljungqvist and Wilhelm (2003) find that venture-backed firms experience higher underpricing during the late 1990s, we report data for venture capital-backed firms and those not backed by venture capital separately. Moreover, we break down the data into 470 firms with founder CEOs and 427 firms without founder CEOs.

The difference between the venture-backed firms and other firms is surprising. Underpricing, the percentage of the difference between offer price and first-day closing price, is almost double the sample average at 73.1%. The existing options ratio, existing options outstanding at the IPO relative to the number of shares offered in the IPO, is much higher on average and the concurrent option ratio, options offered concurrently with the offering relative to the number of shares offered in the IPO, is lower on average (68% and 5.3%, respectively). The underpricing of firms not backed by venture capital is only 27.6%. These firms have an existing options ratio of 33.7% and a concurrent option ratio of 8.5% implying that they rely much less on options than venture-backed firms. The warrant ratio is 18.6% versus 10.3%, respectively.

*** Insert Table 1 about here ***

The information on CEO founder IPOs versus non-CEO founder IPOs is also insightful. The underpricing averages of the two groups are close to the sample mean and are not statistically different

[7] The source of SIC codes is crucial since the SIC codes reported by SDC, CRSP, and Compustat for the same firm have surprisingly little correlation. We do not use SIC codes from CRSP because CRSP reports the SIC codes today, not the SIC code that was present when a firm went public.

from one another. Their option use is also similar, although firms with non-founder CEOs are more likely to have fewer existing options, which they offset with more options offered concurrently with the IPO.

Price revisions are measured as the percentage difference between the offer price and the mean of the indicative price range. Price revisions are assumed to reflect information acquired from informed investors. Benveniste and Spindt (1989) argue that truthful revelation of positive information requires favoring cooperative investors with preferential allocations of underpriced shares. Thus, underwriters only "partially adjust" the offer price to the information they acquire. Other things equal, revelation of more favorable information requires a greater inducement, implying a positive relation between price revisions and initial returns observed by Hanley (1993). According to SEC regulations, IPO prices cannot exceed the highest filing price by more than 20%. Despite this constraint, a firm that wishes to price in a higher range can do so by refiling the offering with the SEC. Refiling with the SEC sends a signal that there is increased demand. On the other hand, setting the offer price below the filing price range indicates a demand lower than what the investment bank initially expected. To study how offer price revisions are related to stock options, we divide our data into three subsamples; the first consists of firms with offer prices below the low end of the filing price range; the second contains firms with offer prices between the low filing price range and 20% above the upper end of the filing price range; and the third contains firms with offer prices more than 20% above the upper end of the filing price.

Table 2 reports that 17.9% (161/897) of the deals were priced below the filing price range. At the same time, 15.2% of the issues were priced more than 20% above the high filing price. We can see that there are more ventured-backed IPOs than non-venture-backed IPOs that have offer prices higher than the filing range. Moreover, the results indicate that IPOs with an offer price below the filing price range have lower average underpricing, existing option ratios, and warrants than the sample average. The use of options and warrants in venture capital backed firms is higher than in the other subgroups. Venture-capital backed firms that have offer prices more than 20% above the high filing price are underpriced by 165.1% on average. This differs significantly from the average underpricing of 120.8% for non-venture capital

backed firms in the same pricing range (p-value < 0.05). Although venture capital backed firms display higher underpricing, their ownership dilution is lower because they are selling a smaller percentage of their firms. Option usage for the firms in this group is also considerably higher than for firms that have offer prices below 120% of the high filing price. Over 25% of the venture capital backed IPOs are in this high filing price range group, whereas only 8.3% of the non-venture capital backed firms are included. Founder firms and non-founder firms have about the same level of underpricing, and options and warrants usage as all firms.

*** Insert Table 2 about here ***

5. Stock Options and Long-Term IPO Performance

How does the long-term performance of IPOs with more stock option usage compare to that of IPOs with less stock options usage? To answer that question we examine the returns of IPOs following the offer date for IPOs with large and small stock option grants. For robustness, we estimate long-term returns using three different approaches, a buy-and-hold abnormal returns method, a Fama-French three-factor regression, and a cross-sectional regression method.

5.1 Calculating Buy-and-Hold Abnormal Returns

Long-run buy-and-hold abnormal returns (BHAR) are measured as follows:

$$R_{nT} = \prod_{t=offerdate+2}^{\min[T,DL]} (1 + R_{nt}) - 1 \quad (1)$$

$$R_{bT} = \prod_{t=offerdate+2}^{\min[T,DL]} (1 + R_{bt}) - 1 \quad (2)$$

where R_{nt} and R_{bt} are the daily returns of an IPO firm n and benchmark b on date t, respectively. R_{nt} and R_{bt} are the long-run returns of issue n and the long-run return of benchmark b, respectively; which we compute beginning on day +2 to avoid any endogeneity problems. T is the ending date while DL is a delisting date, if it happens prior to T. We now define a firm's BHAR as follows:

$$BHAR_{nT} = R_{nT} - R_{bT} \tag{3}$$

As we can see, an issuing firm's BHAR is the difference between its buy-and-hold return and the benchmark return. Under the assumption of independence of returns, the mean BHAR and t-statistic are computed as follows:

$$\overline{BHAR_T} = \left(\frac{1}{I}\right) * \left(\sum_{n=1}^{I} BHAR_{nT}\right) \tag{4}$$

$$t(BHAR_T) = \left(\sqrt{I}\right) * \left(\frac{\overline{BHAR_T}}{\sigma\left(BHAR_T\right)}\right) \tag{5}$$

The symbol "I" denotes the total number of IPOs in the sample; $\sigma\left(BHAR_T\right)$ is the sample standard deviation of the BHAR of IPO firms at the end date T.

Based on Barber and Lyon (1997), BHARs are superior to the cumulative abnormal return (CAR) approach. First, BHARs represent returns earned over the long-term by the mean or median of the sample. For our purposes, BHARs represent an appropriate measure of long-term IPO performance because most IPOs perform better in earlier years of their publicly traded life than in later years. CARs treat a 50 percent gain the same way as a 50 percent loss, thus the result will be biased against long-run underperformance.[8]

[8] Previous studies, such as Loughran and Ritter (1995), Brav and Gompers (1997), Krigman, Shaw, and Womack (1999), Michaely and Womack (1999), and Purnanandam and Swaminathan (2004) also use BHARs to compute long-run returns. However, see Gompers and Lerner (2003) for a comparison of differences in long-term IPO performance, when the latter is measured with BHARs versus CARs.

Second, the CAR gives positively biased results. If a firm is delisted during the period, the mean return reflects fewer firms in subsequent periods. An analysis of the delisted firms shows that their returns at the time of delisting are not significant outliers and thus do not bias our results.[9]

Although BHARs may be superior to CARs as a performance metric, Purnanandum and Swaminathan (2004) caution that there is significant misspecification in the small sample distribution of long-run returns in event studies (especially using BHARs over 3-5 years). To address this concern, we compute t-stats from randomization, which are the percentiles for an upper tail test computed from a bootstrap procedure. The one-to-one correspondence between stock option ratios, which is the number of employee stock options (number of existing options plus number of concurrent options) divided by the number of shares offered and BHARs is randomly shuffled within each annual IPO cohort by using a randomization procedure (sampling without replacement). This generates sample pseudo stock option ratios and returns. High, medium, and low stock option ratios are formed from this pseudo sample and the difference in returns between high and low stock option IPOs and the corresponding t-statistic under the independence assumptions are computed. We repeat this procedure 4000 times and generate the empirical t-distribution. The 90^{th}, 95^{th}, and 99^{th} percentiles from this distribution for an upper tail test are used in our statistical inferences that involve the use of BHARs. The advantage of this procedure is that it limits clustering of the original sample.

5.2 Choosing Matching Firms

To compute risk-adjusted long-term abnormal returns for IPOs, besides using market returns as our benchmark, we use the long-run returns of matching firms by subtracting them from long-run returns of

[9] We also adjust for survivorship bias as follows. Assume that we want to calculate two-year buy-and-hold returns and r_{11} is the return of IPO firm 1 for the first year. Also, assume that IPO firm 1 is delisted one year after the issue. We invest its first-year return into a Treasury Bill. Hence, the two-year return of IPO firm 1 is $(1+r_{11})$ $(1+r_f)$ where r_f is the return on Treasury Bills and our results are unchanged. Krigman, Shaw and Womack (1999), and Purnanandam and Swaminathan (2004) also use the delisting date as the cutoff time when they compute BHAR as we do in this study.

IPOs. For each IPO firm in the sample, we select a matching firm that did not go public within three years prior to the IPO date and is in the same industry as the IPO firm with the closest sales, and sales divided by gross costs in the most recent fiscal year. To include observations with negative EBITDA, we matched the comparables based on sales divided by gross costs, which equals sales minus EBITDA. Firms in the same industry are more likely to have similar operating risks, profitability, and growth prospects. In general, matching firms by industry should control for growth since firms in the same industry should have similar growth opportunities. Sales is a proxy for size. Matching on sales divided by gross costs can control for differences in profitability across firms. Since sales divided by gross costs measures operating profitability, it is a more stable measure of profitability than sales divided by net costs, which equals sales minus earnings and is thus affected by interest expenses. We do not match firms based on past sales growth because only about 6% of the firms in our sample had sales data available for two prior fiscal years in Compustat. We try to make sure that each IPO gets a unique matching firm in a given cohort year. Sometimes the matching firms are repeated in subsequent years. Dropping these cases does not appreciably affect our finding.

Our matching method is similar to that of Kim and Ritter (1999) who propose controlling for differences in both growth and profitability. Our method is a balance between matching only on industry and sales, and trying to match on too many financial variables. To choose an appropriate matching firm, we first consider all firms in Compustat that are active for the fiscal year before the IPO year. From these firms, we delete firms that went public during the past three years, REITs, closed-end funds, ADRs, and firms with share prices less than five dollars.

To obtain a matching firm, we first classify all remaining firms into industries based on their SIC codes obtained from CRSP as of the end of the prior calendar year. We group these firms into 48 industries using the updated industry specifications from Kenneth French's web site, which are groupings of various 4-digit SIC codes and then the IPO firm is assigned into its industry group. Potential matching firms in the same industry group as the IPO firm are expunged unless their revenue is between 70% and 130% of the

IPO firm's revenue. From this final set, we select a match whose sales divided by gross cost is closest to that of the IPO firm.[10]

5.3 Stock Options and IPO Returns

In Table 3, we compute the median and mean of long-run buy-and-hold abnormal returns (BHAR) based on two benchmarks for each stock option level. These returns are computed for four windows: the first twenty days after the issue or up to the stabilization period expiration, from the twenty-first day after the issue or the date right after the expiration of the stabilization period until the IPO lockup expiration date,[11] from the date right after the lockup expiration date until two years after the issue, and during the third year after the issue. Most IPOs have a 180-day lockup period; however there are some IPOs with 90, 270, and 360-day lockups. Assuming that all IPOs use 180 days may add noise to the results. Hence, we use the actual lockup date and stabilization window for each firm in our return estimation.

*** Insert Table 3 about here ***

[10] We also choose matching firms based on two other criteria. The first one is based on size. We choose firms whose market capitalization as of the prior June or December is closest to the market capitalization of the IPO firm at the close of the offering date. The second is based on the market capitalization and book-to-market ratios where book value of equity is for the fiscal years following the IPO date. Our results are not sensitive to the choice of matching criteria.

[11] Stock price performance and insider selling around lock-up expiration are shown in Aggarwal, Krigman, and Womack (2002) and Brav and Gompers (2003). The lock-up period is the period of time that certain stockholders have agreed to waive their right to sell their shares of a public company. Investment banks that underwrite initial public offerings generally insist upon lockups of at least 180 days from large shareholders (1% ownership or more) in order to allow an orderly market to develop in the shares. The shareholders that are subject to lockup usually include the management and directors of the company, strategic partners and such large investors. These shareholders have typically invested prior to the IPO at a significantly lower price to that offered to the public and therefore stand to make substantial profits on sales of their pre-IPO shares. If a shareholder attempts to sell shares that are subject to lockup during the lockup period, the transfer agent will not permit the sales to be completed.

The justification for commencing the buy-and-hold return calculations 20 days after the IPO relies on the evidence provided in the IPO stabilization literature. Numerous studies document underwriter price stabilization within the first 20 trading days after the offering.[12] Therefore, calculating from 20 days onward avoids potential biases in our return estimation caused by the post-offering price stabilization activities of the underwriting syndicate.

The null hypothesis is that BHARs for low and high stock option IPOs are the same. To construct the test, we assume that the observations are independent; this allows the computation of t-statistics for both the mean and median BHARs. If a matching firm is delisted before the IPO delisting date or the end date, it is replaced with another firm having similar characteristics. If this firm is also delisted, a third firm is substituted, and so on.

The results are that BHARs for high option-usage IPOs significantly exceed BHARs for low option-usage IPOs (for both benchmarks) during the first two years after the issue. The difference is more significant during the period before lockup expiration. In the third year, although the BHAR difference retains the same sign, it is insignificant.

5.4 The Interaction of Employee Stock Options and Executive Equity Ownership

5.4.1 From the Expiration of the Stabilization Period or 20 Days after the Issue until Lockup Expiration

To examine if the relation between stock options and post-IPO performance is affected when executives own higher levels of equity, we divide the sample into two groups based on low and high executive equity ownership, which is calculated as the number of shares held by executives divided by the number of shares offered at the time of the IPO. In each group, we perform the same analysis as in the previous section from 20 days after the IPO until the lockup expiration. The results in Table 4, Panel A,

[12] See Hanley, Kumar, and Seguin (1993), Schultz and Zaman (1994), Asquith, Jones, and Kieschnick (1998), and Aggarwal (2000).

show that IPOs with high stock option usage outperform IPOs with low stock option usage in both groups of executive equity ownership. Nevertheless, the difference between high and low stock option usage of the high executive equity ownership group is larger than that of the low executive equity ownership group, implying that the relation between stock option usage and post-IPO performance is more positive when executives have high equity ownership. The results are consistent for the first twenty days after the issue or up to the stabilization period expiration (unreported).

5.4.2 After Lockup Expiration

Table 4, Panel B, reports the same analysis for the period after the lockup expiration until two years after the IPO. The results suggest the relation between employee stock options and post-IPO performance is still positively significant and the difference between high and low stock option usage of the high executive equity ownership group is larger than that of the low executive equity ownership group, implying that the relation between stock option usage and post-IPO performance is more positive when executives have high equity ownership.

Table 4, Panel C, shows the same analysis during the third year after the issue. Although the differences of BHARs between high and low stock option usage of the high executive equity ownership group is larger than that of the low executive equity ownership group, such differences are not significant. Therefore, we conclude that, during the third year after the issue, the relation between employee stock options and post-IPO performance is not significantly enhanced by executives' equity ownership.

*** Insert Table 4 about here ***

To check the robustness of the above results, we also calculate the means and medians of the buy-and-hold abnormal return differential (for the same three windows as in Table 4) between IPOs with low and high stock option usage for each year from 1997 to 1999 and for IPOs with high and low executive equity ownership. The results are quantitatively and qualitatively similar in each subperiod. We use Hansen-Hodrick-Newey-West corrected t-statistics for time-series means with an autocorrelation

adjustment to correct for the cross-correlation among returns of IPOs in the same year and to correct for autocorrelation in long-run buy-and-hold returns. The results show that the buy-and-hold abnormal return differential between IPOs with low and high stock option usage in the high executive equity ownership group is significantly higher than that in the low executive equity ownership group. The differences in means and medians are significant for both benchmarks (the NYSE/AMEX/NASDAQ value-weighted index and the matched firm benchmark based on industry, sales, and sales divided by gross cost.) These results confirm that firms with high stock option usage do significantly better than IPOs with low stock option usage during two years after the IPO issue. Furthermore, they suggest that the relation between stock option usage and post-IPO performance is more positive when executive equity ownership is high.

5.5 Cross-Sectional Regression Tests

We further test the relation between stock option grants and firm performance by following a standard procedure followed in the compensation literature using firm performance as the dependent variable and manager compensation as the independent variable (Murphy, 1999). The following cross-sectional regression model formally measures the relation between stock option usage and long-run risk-adjusted returns:

$$\begin{aligned} Long\text{-}Run\ Risk\text{-}Adjusted\ \ Return_n &= \beta_1 + \beta_2(Employee\ Stock\ Options)_n + \beta_3(Executive\ Equity\ Ownership)_n + \\ &\beta_4(Salaries\ \&\ Bonuses)_n + \beta_5(Employess\ Stock\ Options * Executive\ Equity\ Ownership)_n + \beta_6(Initial\ Return)_n + \\ &\beta_7 \ln(Book\text{-}to\text{-}Market\ Ratio)_n + \beta_8 \ln(1 + Analyst\ Consensus\ Growth)_n + \beta_9(Accruals / Total\ Assets)_n + \\ &\beta_{10} \ln(Proceeds)_n + \beta_{11}(Venture\ Capital\ \ Dummy)_n + \beta_{12}(Sales / Gross\ Costs)_n + \\ &\beta_{13}(High\text{-}Tech\ Industry\ Dummy)_n + \beta_{14}(Firm\ Age) + \beta_{15}(Underwriter\ Ranking) + \mu_n \end{aligned} \quad (6)$$

where n is an index denoting each IPO firm in our sample. Long-run risk-adjusted returns are estimated by subtracting the long-run returns of firms matched by industry, sales, and sales divided by gross cost from the long-run returns of IPOs. Standard errors are adjusted for time clustering by assuming that observations are independent for companies at different points in time, but not necessarily for companies that go public in the same month. They are more conservative than White (1980) standard errors. Returns are reported for four windows: the first twenty days after the issue or up to the stabilization period expiration, from the

twenty-first day after the issue or the date right after the expiration of the stabilization period until the IPO lockup expiration date, from the date right after the lockup expiration date until two years after the issue, and during the third year after the issue. Employee stock options are computed as the number of stock options per number of shares offered.

Controls include executive cash compensation (salaries & bonuses), defined as executives' cash compensation divided by the number of shares offered, and executive equity, calculated as the number of shares held by executives including restricted stocks divided by the number of shares offered, as other forms of compensations besides stock options. We also include an interaction term between employee stock option and executive equity ownership to study how the relation between long-run risk-adjusted returns and employee stock option is affected by executive equity ownership. The initial return follows Krigman, Shaw, and Womack, (1999) and a venture-capital backed dummy follows Brav and Gompers (1997).

Book-to-market ratios are related to the cross-section of stock returns even though there is no evidence that they are related to the cross-section of IPO returns. However, it is important to control for book-to-market effects in the rest of long-run returns. We include analyst growth forecasts because Rajan and Servaes (1997) find that IPOs with high analyst growth expectations subsequently underperform IPOs with low growth expectations. We further include an accruals variable (accruals relative to total assets) from the first annual statement after the IPO date as a control since Teoh, Welch, and Wong (1998) find that IPOs with high accruals underperform. We include prior fiscal year IPO proceeds as a proxy of ex-ante size and prior fiscal year sales divided by gross costs as a control for profitability. While Carter, Dark, and Singh (1998) find that long-term IPO performance is affected by underwriter reputation, Louge, Rogalski, Seward, and Foster-Johnson (2002) find no evidence of the relation between underwriter reputation and investor returns over different holding-periods. Moreover, Doukas, and Gonenc (2001) show that underwriter reputation is not linked to post-issue IPO performance when they control for venture

capital backing. Since the relation between initial returns and underwriter ranking is still inconclusive, we include underwriter ranking and venture capital backing as control variables.

Firm age is measured as the natural log of one plus the difference between the date of a firm's IPO and its founding date (Carter, Dark, and Singh, 1998). Finally, we control for industry effects by assigning firms with high-tech SIC codes a dummy variable of 1 and zero otherwise.[13]

*** Insert Table 5 about here ***

The results in Table 5 show that stock option usage is significantly positively related to the risk-adjusted returns and the interaction between stock option usage and executive equity ownership is significantly positive only for the first two years after the issue. Salaries and bonuses are positively related to post-IPO performance at the 5% significance level before lockup expiration and at the 10% significance level after this period. Executives' equity increases with post-IPO long-term performance only before the lockup period. In contrast to the negative relation between long-run risk-adjusted returns and initial returns as reported by Krigman, Shaw, and Womack (1999), we do not find any evidence of such a relation for either the period before or after the lockup expiration date. Venture capital backing is significantly positively related to returns. Analyst growth forecasts and accruals are both negatively related to long-run returns but only analyst growth forecasts are statistically significant. Small IPOs that are in the high-tech industry have better performance prior to the lockup period whereas large IPOs have better performance after the lockup period. There is no book-to-market, underwriter ranking, profitability, and firm age effect in our sample.

These results clearly show that the relation between stock options and long-run abnormal returns is not driven by salary and bonuses, initial returns, book-to-market ratios, analyst consensus growth rates, accruals, offering size, venture capital backing, underwriter reputation, profitability, industry, and firm age.

[13] We follow Loughran and Ritter (2004) and Cliff and Denis (2004) who categorize firms with the following SIC codes as tech firms: 2833, 2834, 2835, 2836, 3571, 3572, 3575, 3577, 3578, 3661, 3663, 3669, 3674, 3812, 3823, 3825, 3826, 3827, 3829, 3841, 3845, 4812, 4813, 4899, 7370, 7371, 7372, 7373, 7374, 7375, 7377, 7378, 7379.

IPOs with high executive equity ownership display a stronger positive relation between stock option usage and post-IPO performance during the first two years after the issue. Next, we study the relation between stock options and long-run returns using a portfolio test.

5.6 Long-Term Performance Based on the Fama-French Three-Factor Model

The BHAR metric of long-term performance used in previous section is based on market-adjusted abnormal returns but does not fully control for systematic risks other than the market index. To address this issue, we use the three-factor Fama and French regression model and compute monthly risk-adjusted abnormal returns (as measured by the intercept term in the Fama-French regression equation) for portfolios of IPOs with low, high, and (high-low) stock option usage. We allot each IPO to one of three stock option portfolios, which are assumed to be held from the first twenty days after the IPO date until two years after the issue or from the day after the first two years until three years after the issue. After all IPOs are allocated in this fashion, we calculate both value-weighted and equally-weighted average returns across all stocks for each calendar month. Fama (1998) demonstrates that much of the apparent overreaction and under reaction to information disappears when portfolios are value-weighted and after controlling for common factors such as size and book-to-market effects. Nevertheless, as noted by Loughran and Ritter (2000), when applied to event studies, value-weighted portfolios are likely to be dominated by a few large firms. An equally weighted portfolio is also likely to be more consistent with the way an investor would implement a trading strategy based on the results presented in this study.

Abnormal returns are reported for time-series regressions of monthly IPO returns with low, high, and (high-low) stock option portfolios based on the security market factors used by Fama and French (1993). There are a number of reasons why this method is preferable to using the long-run buy-and-hold returns (BHAR) method. First, it diminishes the autocorrelation problems that are present when using overlapping long-run buy-and-hold returns, and controls for the cross-correlation among returns across events. Second, the three-factor regression model has the same qualities as the average abnormal returns (AAR) approach, thus it has fewer misspecification problems than the long-run buy-and-hold abnormal returns (BHAR)

method. Third, according to Lyon, Barber and Tsai (1997), by using calendar time portfolios to estimate long-run abnormal performance the Fama-French three-factor model controls for the non-independence of returns over time, size and book-to-market (B/M) effects, and avoids the problem of drawing inferences on skewed, long-horizon returns. Lastly, it can control for B/M effects better than the comparable firm approach. Book value during the IPO period varies, so its effect may be difficult to capture. Nevertheless, Barber and Lyon (1997), and Loughran and Ritter (2000 and 2004) argue that this approach has a lower power to reject the null hypothesis of no abnormal returns when they are in fact present, especially when the samples consist of small stocks, as is typical for IPOs. We estimate the following Fama-French three-factor model:

$$R_{pt} - R_{ft} = C_p + B_p(R_{mt} - R_{ft}) + S_p(SMB_t) + H_p(HML_t) + \varepsilon_t \quad (7)$$

where R_{pt} is the monthly return on a portfolio of IPOs; R_{ft} is the monthly return on the one-month T-bill; $R_{mt} - R_{ft}$ is the excess return on the NYSE/AMEX/NASDAQ value (equally)-weighted index; SMB is the difference in the returns of a value (equally)-weighted portfolio of small stocks and big stocks; HML is the difference in the returns of a value (equally)-weighted portfolio of high book-to-market stocks and low book-to-market stocks; and C_p is the monthly risk-adjusted abnormal return in percent. The results of value (equally) weighted returns are presented in Panel A (B) of Table 6. The estimate of C_p provides a test of the null hypothesis that the mean monthly abnormal return on the calendar portfolio is zero. B_p, S_p and H_p are factor-loadings returns, which are obtained from Kenneth French's website.[14]

*** Insert Table 6 about here ***

Table 6 presents results for the periods from the twenty-first day after the issue to the first two years after the issue, and from the day following the first two years to three years after the issue. The key observation is the risk-adjusted abnormal returns differential between the high and low stock-option

[14] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

portfolios. During the first two years after the issue, IPOs with high stock option usage earn a negative 3.972% return (0.331% times 12) for the value-weighted portfolio and a negative 2.556% (0.213% times 12) for the equally-weighted portfolio on an annualized basis, whereas IPOs with little or no stock options earn a significant negative 7.848% per annum (0.654% times 12) for the value-weighted portfolio and a negative 8.604% (0.717% times 12) for the equally-weighted portfolio. Thus, firms that make active use of stock options at the time of their IPO outperform firms with few or no stock options by about 3.876% (0.323% times 12) for a value-weighted portfolio and 6.048% (0.504% times 12) for an equally-weighted portfolio on an annualized basis.

During the third year after the issue, the risk-adjusted average abnormal returns of IPOs with high stock option usage is negative 2.244% (0.187% times 12) and 2.076% (0.173% times 12) for the value/equally-weighted portfolio. IPOs with low stock option usage again earn negative abnormal returns. IPOs with high stock option usage outperform IPOs with low stock option usage over this period (0.504% for value-weighted and 2.52% for equally-weighted indexes) but the result is not significant. Both groups of IPOs with high and low stock options load positively on the SMB factor. This might be explained by the fact that most IPOs tend to be smaller and younger firms. In contrast, there is a difference in the coefficients on the HML factor between IPOs with high and low stock option usage. IPOs with high stock option usage load negatively on HML while IPOs with low stock option usage load positively.

5.6.1 Long-Term Performance with Executive Equity Ownership based on the Fama-French Three-Factor Model

In this section, we separate our IPO sample into low and high executive ownership and perform the same analysis as in the previous section. We investigate whether the relation between stock option usage and long-term performance is positively related to executive equity ownership.

*** Insert Table 7 about here ***

Table 7 presents value and equally-weighted returns for the period from the twenty-first day after the issue through two years, and during the third year after the issue. During the first two years after issue (see Table 7, Panel A1 and B1), for IPOs with high executive equity ownership, those with high stock option usage outperform those with low stock option usage (the abnormal returns are 4.344% or 0.362% times 12 for the value-weighted portfolio; 2.328% or 0.194% times 12 for the equally-weighted portfolio). For IPOs with low executive equity ownership, those with high stock option usage also outperform those with low stock option usage (the abnormal returns are 2.976% or 0.248% times 12 for the value-weighted portfolio; 2.34% or 0.195% times 12 for the equally-weighted portfolio).

After the first two years (see Table 7, Panel A2 and B2), for IPOs with high and low executive equity ownership, those with high stock option usage outperform those with low stock option usage, but the difference in abnormal returns between the two portfolios is not significant.

In Table 7, Panel C, we test whether the differences in abnormal returns between IPOs with high and low stock option usage and with high and low executive ownership are significantly different from zero. The results show that the differences are significant only before the first two years after the issue (p-value are 0.004 for the value-weighted portfolio and 0.007 for the equally-weighted portfolio; during the third year after the issue, the p-values are 0.142 for the value-weighted portfolio and 0.161 for the equally-weighted portfolio). We conclude that IPOs with high stock option usage outperform IPOs with low stock option usage before the first two years after the issue and that the positive relation between stock option usage and two-year risk-adjusted performance is enhanced by executive equity ownership.

6. Discussion and Conclusions

In our sample of IPOs, the use of employee stock options is positively related to long-run performance in the first two years after the issue. This result is robust after controlling for executives' cash compensation, equity ownership, initial return, book-to-market, analyst consensus growth, accrual, offer size, venture capital backing, underwriter reputation, profitability, age, and industry. Moreover, the

relation between employee stock options and post-IPO performance during the first two year after the issue, is stronger when executive equity ownership is higher.

Equity ownership and stock options have different risk properties. Returns on options are more volatile than returns on the underlying equity; thus, holding an undiversified position in options is more risky than holding an equal dollar amount of the equity. On the other hand, adopting more risky investment projects increases the value of option grants, though it will not increase the value of equity grants and could even decrease their value. This suggests that investors might favor a combination of options and equity grants to different levels of employees. All employees are motivated to exert extra effort by options, but top decision makers must be restrained from taking on too many risky projects; such a restraint is effectuated when top executives hold significant equity positions.

For a given level of managerial compensation in the form of stock ownership, there is an ideal option grant that induces a top manager to choose the firm's overall level of non-diversifiable risk commensurate with the desires of shareholders. Perhaps this translates cross-sectionally into improved long-term performance for firms that have selected appropriate compensation arrangements for senior executives.

Future research is needed to examine whether the relation between stock option usage and post-IPO performance still holds after companies have to report stock options as an expense in their income statements under new FASB rules.

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Table 1: Summary Statistics

Below are summary statistics for our sample of 897 IPOs that appeared between January 1997 and December 1999. Underpricing is the one-day percentage return from the SDC offer price to the CRSP closing price at the end of the first day of trading. All other variables were gathered directly from IPO prospectuses. The 'Existing options ratio' is the number existing options outstanding at the IPO relative to the number of shares offered in the IPO. The 'Concurrent options ratio' is the number of options granted concurrently with the IPO relative to the number of shares offered in the IPO. The 'Warrant ratio' is the number of warrants outstanding relative to the number of shares offered in the IPO. In each cell, the sample mean is reported first followed by the standard deviation in parentheses.

Variable	Full sample	Venture capital backed IPOs	Non-venture capital backed IPOs	IPOs with founder CEO	IPOs with non-founder CEO
Underpricing	46.1%	73.1%	27.6%	46.5%	45.7%
	(78.7%)	(99.0%)	(53.8%)	(82.8%)	(74.0%)
Existing options ratio	47.7%	68.0%	33.7%	49.7%	45.4%
	(54.2%)	(60.8%)	(44.1%)	(56.3%)	(51.8%)
Concurrent options ratio	7.2%	5.3%	8.5%	6.2%	8.3%
	(18.9%)	(14.5%)	(21.3%)	(17.2%)	(20.6%)
Warrant ratio	13.7%	18.5%	10.3%	14.2%	13.1%
	(37.8%)	(33.1%)	(40.4%)	(43.7%)	(30.0%)
Fraction of firm sold at IPO	26.4%	22.7%	29.0%	26.0%	26.9%
	(11.9%)	(9.6%)	(12.7%)	(10.9%)	(12.9%)
Backed by venture capital	40.7%	100.0%	0.0%	42.6%	38.6%
With founder CEOs	52.4%	54.8%	50.8%	100.0%	0.0%
Percent priced below lower limit of offering price range	17.9%	15.3%	19.7%	19.1%	16.6%
Percent priced between lower limit and 120% of upper limit of offering price range	66.9%	59.5%	72.0%	65.5%	68.4%
Percent refiled with price above 120% of upper limit of offer price range	15.2%	25.2%	8.3%	15.3%	15.0%
Percent with existing options	87.7%	98.4%	80.5%	90.9%	84.3%
Percent with concurrent options	34.4%	24.7%	41.2%	33.6%	35.4%
Percent with options	99.3%	100.0%	98.8%	99.6%	99.1%
Percent with warrants	57.2%	79.7%	41.7%	59.8%	54.3%
Percent with concurrent private offerings	3.3%	5.2%	2.1%	3.2%	3.2%
Percent with secondary offerings	28.5%	23.3%	32.1%	28.3%	28.3%
Sample size	897	365	532	470	427

Table 2: Summary Statistics by Filing Price Range, Venture Capital Backing and CEO Status

Below are summary statistics for 897 IPOs that were issued between January 1997 and December 1999. Panel A provides summary statistics for the entire sample by filing price range, which is separated into Low, Medium, and High. Low includes IPOs whose offering price is below the low end of the filing price range, Medium includes IPOs whose offering price is between the lowest filing price and 20% above the highest filing price, and High includes IPOs whose offering price is 20% above the highest filing price. Panel B provides summary statistics by filing price range and venture capital backing. Panel C provides summary statistics by filing price range and CEO status. Underpricing is calculated as the one-day percentage return from the SDC offer price to the CRSP closing price at the end of the first day of trading. The 'Existing options ratio' is the number existing options outstanding at the IPO relative to the number of shares offered in the IPO. The 'Concurrent options ratio' is the number of options granted concurrently with the IPO relative to the number of shares offered in the IPO. The 'Warrant ratio' is the number of warrants outstanding relative to the number of shares offered in the IPO. In each cell, the sample mean is reported first followed by the standard deviation in parentheses.

Panel A: Filing Price Range

Filing price range	Low	Medium	High
Underpricing	9.2%	32.3%	150.8%
	(51.6%)	(48.0%)	(119.3%)
Existing options ratio	36.0%	40.7%	92.3%
	(38.8%)	(46.3%)	(76.3%)
Concurrent options ratio	7.3%	7.4%	6.3%
	(13.4%)	(20.5%)	(16.8%)
Warrant ratio	10.1%	13.0%	20.9%
	(19.4%)	(40.6%)	(40.5%)
Sample size	161	600	136

Panel B: Venture Capital Backing

Filing price range	Low		Medium		High	
	Venture capital backed	No venture capital backing	Venture capital backed	No venture capital backing	Venture capital backed	No venture capital backing
Underpricing	8.3%	9.7%	50.8%	21.8%	165.1%	120.8%
	(25.0%)	(61.4%)	(64.6%)	(30.8%)	(128.9%)	(90.4%)
Existing options ratio	53.4%	26.8%	59.4%	30.1%	97.0%	82.4%
	(43.6%)	(32.6%)	(52.6%)	(38.6%)	(77.0%)	(74.6%)
Concurrent options ratio	3.8%	9.1%	5.1%	8.6%	6.7%	5.5%
	(10.9%)	(14.2%)	(13.9%)	(23.4%)	(17.5%)	(15.3%)
Warrant ratio	14.2%	7.7%	18.7%	13.2%	21.9%	18.7%
	(21.1%)	(16.9%)	(40.9%)	(40.7%)	(42.1%)	(37.1%)
Sample size	56	105	217	383	92	44

Panel C: CEO Status

Filing price range	Low		Medium		High	
	Founder CEO	Non-founder CEO	Founder CEO	Non-founder CEO	Founder CEO	Non-founder CEO
Underpricing ratio	11.6%	6.1%	31.6%	33.0%	153.7%	147.4%
	(66.1%)	(22.5%)	(44.9%)	(51.2%)	(130.2%)	(106.7%)
Existing options ratio	41.3%	29.4%	43.4%	37.9%	87.3%	97.9%
	(42.2%)	(33.1%)	(50.3%)	(41.6%)	(77.6%)	(74.9%)
Concurrent options ratio	5.6%	8.4%	6.0%	8.9%	7.8%	4.6%
	(9.7%)	(16.9%)	(19.1%)	(21.8%)	(15.7%)	(17.9%)
Warrants	10.8%	9.3%	16.4%	14.0%	18.8%	23.2%
	(19.9%)	(18.9%)	(46.3%)	(0.1%)	(31.5%)	(48.8%)
Sample size	90	71	308	292	72	64

Table 3: Buy-and-Hold Abnormal Returns for IPOs with a Low, Medium, and High Number of Employee Stock Options

We present buy-and-hold abnormal returns for IPOs with a low, medium, and high number of employee stock options. 897 IPOs issued between January 1997 and December 1999 are in the sample. Employee stock option usage is measured as the total number of employee stock options outstanding on the IPO date divided by the number of shares offered to the public in the IPO. Firms were sorted into three portfolios ranked by option usage. Buy-and-hold abnormal returns (BHARs) are reported for the first twenty trading days in Panel A, from the 21st trading day to the lockup expiration in Panel B, from the lockup expiration to two years after the issue in Panel C, and from the day after the first two years to the third year after the issue in Panel D. In each panel, we distinguish between portfolios consisting of IPOs with a high, medium, low and (high-low) usage of stock options. The BHAR is computed according to (1) the value-weighted NYSE/AMEX/NASDAQ index, and (2) a sample of matched firms based on industry, sales, and sales divided by gross costs (sales minus EBITDA.) The numbers in below the title (High-low stock options) are Wilcoxon-Mann-Whitney non-parametric t-statistics for testing difference in medians under the assumption of independence of observations and simple t-statistics for differences in mean under the assumption of independence of observations. T-stats from randomization are the percentiles for an upper tail test computed from a Monte Carlo simulation. Issuers are the issuing firms and BM is the benchmark. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively, assuming normality and independence.

Panel A: Median and Mean Abnormal Returns for the First Twenty Trading Days after the Issue

Stock Option Portfolio	Median						Mean					
	NYSE/AMEX/NASDAQ VW Index			Firms Matched by Industry, Sales, and Sales Divided by Gross Costs			NYSE/AMEX/NASDAQ VW Index			Firms Matched by Industry, Sales, and Sales Divided by Gross Costs		
	Issuers	BM	BHAR	Issuers	BM	BHAR	Issuers	BM	BHAR	Issuers	BM	BHAR
High stock options	0.96%	1.12%	-0.16%	0.96%	0.22%	0.75%	1.83%	1.41%	0.42%	1.83%	1.27%	0.56%
Medium stock options	0.26%	0.96%	-0.70%	0.26%	0.12%	0.14%	1.11%	0.92%	0.19%	1.11%	1.04%	0.07%
Low stock options	0.06%	0.72%	-0.66%	0.06%	0.09%	-0.03%	0.79%	0.60%	0.19%	0.79%	0.93%	-0.14%
High-low stock options	0.90%	0.40%	0.51%	0.90%	0.13%	0.77%	1.04%	0.81%	0.24%	1.04%	0.35%	0.69%
t-stat			3.29***			1.78*			2.73**			3.12***
Percentile	90%	95%	99%	90%	95%	99%	90%	95%	99%	90%	95%	99%
t-stat from randomization	1.23	1.65	2.80	1.35	1.58	2.43	1.16	1.32	2.46	1.21	1.47	2.39
All IPOs	0.43%	0.93%	-0.51%	0.43%	0.14%	0.29%	1.24%	0.98%	0.27%	1.24%	1.08%	0.16%

Panel B: Median and Mean Abnormal Returns from the Twenty-First Day after the Issue to the Lockup Expiration

Stock Option Portfolio	Median						Mean					
	NYSE/AMEX/NASDAQ VW Index			Firms Matched by Industry, Sales, and Sales Divided by Gross Costs			NYSE/AMEX/NASDAQ VW Index			Firms Matched by Industry, Sales, and Sales Divided by Gross Costs		
	Issuers	BM	BHAR	Issuers	BM	BHAR	Issuers	BM	BHAR	Issuers	BM	BHAR
High stock options	1.39%	3.36%	-1.98%	1.39%	0.65%	0.75%	7.51%	5.03%	2.48%	7.51%	6.37%	1.14%
Medium stock options	-0.02%	2.87%	-2.89%	-0.02%	0.37%	-0.39%	5.56%	4.59%	0.97%	5.56%	5.22%	0.34%
Low stock options	-0.62%	2.17%	-2.79%	-0.62%	0.26%	-0.88%	3.94%	3.01%	0.93%	3.94%	4.63%	-0.69%
High-low stock options	2.01%	1.19%	0.82%	2.01%	0.39%	1.63%	3.57%	2.03%	1.54%	5.56%	1.74%	1.83%
t-stat			2.83***			3.47****			2.28**			2.86***
Percentile	90%	95%	99%	90%	95%	99%	90%	95%	99%	90%	95%	99%
t-stat from Monte Carlo Simulation	1.39	1.67	2.31	1.00	1.60	2.94	1.00	1.65	2.25	1.18	1.49	2.19
All IPOs	0.06%	4.67%	-4.60%	0.06%	0.71%	-0.64%	5.67%	4.21%	1.46%	5.67%	5.40%	0.27%

Table 3 (cont'd)

Panel C: Median and Mean Abnormal Returns from the Lockup Expiration to Two Years after the Issue

Stock Option Portfolio	Median						Mean					
	NYSE/AMEX/NASDAQ VW Index			Firms Matched by Industry, Sales, and Sales Divided by Gross Costs			NYSE/AMEX/NASDAQ VW Index			Firms Matched by Industry, Sales, and Sales Divided by Gross Costs		
	Issuers	**BM**	**BHAR**	**Issuers**	**BM**	**BHAR**	**Issuers**	**BM**	**BHAR**	**Issuers**	**BM**	**BHAR**
High stock options	5.97%	14.69%	-8.72%	5.97%	2.84%	3.13%	21.16%	24.86%	-3.70%	21.16%	20.32%	0.85%
Medium stock options	1.94%	12.72%	-10.77%	1.94%	1.52%	0.42%	18.27%	30.62%	-12.35%	18.27%	18.97%	-0.70%
Low stock options	1.04%	13.79%	-12.76%	1.04%	0.82%	0.22%	15.86%	24.51%	-8.65%	15.86%	17.78%	-1.92%
High-low stock options	4.94%	0.90%	4.04%	4.94%	2.03%	2.91%	5.30%	0.35%	4.94%	5.30%	2.53%	2.77%
t-stat			1.77*			2.17**			2.04**			1.83*
Percentile	90%	95%	99%	90%	95%	99%	90%	95%	99%	90%	95%	99%
t-stat from randomization	1.16	1.33	2.23	1.12	1.38	2.16	0.99	1.41	2.52	1.25	1.38	2.28
All IPOs	4.56%	23.30%	-18.74%	4.56%	2.82%	1.75%	18.43%	26.66%	-8.23%	18.43%	19.02%	-0.59%

Panel D: Median and Mean Abnormal Returns during the Third Year after the Issue

Stock Option Portfolio	Median						Mean					
	NYSE/AMEX/NASDAQ VW Index			Firms Matched by Industry, Sales, and Sales Divided by Gross Costs			NYSE/AMEX/NASDAQ VW Index			Firms Matched by Industry, Sales, and Sales Divided by Gross Costs		
	Issuers	**BM**	**BHAR**	**Issuers**	**BM**	**BHAR**	**Issuers**	**BM**	**BHAR**	**Issuers**	**BM**	**BHAR**
High stock options	4.06%	9.80%	-5.73%	4.06%	1.89%	2.17%	14.11%	16.58%	-2.47%	14.11%	13.54%	0.56%
Medium stock options	1.30%	8.48%	-7.18%	1.30%	1.01%	0.28%	12.18%	20.41%	-8.23%	12.18%	12.65%	-0.47%
Low stock options	0.69%	8.19%	-7.50%	0.69%	0.54%	0.15%	10.58%	16.34%	-5.76%	10.58%	11.86%	-1.28%
High-low stock options	3.37%	1.60%	1.77%	3.37%	1.35%	2.02%	3.53%	0.24%	3.30%	3.53%	1.69%	1.84%
t-stat			1.60			1.36			1.28			1.05
Percentile	90%	95%	99%	90%	95%	99%	90%	95%	99%	90%	95%	99%
t-stat from randomization	1.16	1.28	1.57	1.04	1.38	1.65	1.08	1.26	1.51	1.02	1.17	1.24
All IPOs	3.04%	15.53%	-12.49%	3.04%	1.88%	1.17%	12.29%	17.78%	-5.49%	12.29%	12.68%	-0.39%

Table 4: Buy-and-Hold Abnormal Returns for IPOs with a Low, Medium, and High Number of Stock Options, and High/Low Executive Equity Ownership

We present buy-and-hold abnormal returns for IPOs with a low, medium, and high number of employee stock options, separated by high and low executive equity ownership. 897 IPOs issued between January 1997 and December 1999 are in the sample. Employee stock option usage is measured as the total number of employee stock options outstanding on the IPO date divided by the number of shares offered to the public in the IPO. Executive equity ownership is the number of shares held by the top five executives divided by the number of shares offered. Firms were sorted into three portfolios ranked by option usage. Buy-and-hold abnormal returns (BHARs) are reported from the 21st trading day to the lockup expiration in Panel A, from the lockup expiration to two years after the issue in Panel B, and from the day after the first two years to the third year after the issue in Panel C. In each panel, we distinguish between portfolios consisting of IPOs with a high, medium, low and (high-low) usage of stock options. The BHAR is computed according to (1) the value-weighted NYSE/AMEX/NASDAQ index, and (2) a sample of matched firms based on industry, sales, and sales divided by gross costs (sales minus EBITDA.) The numbers below the title (High-low stock options) are Wilcoxon-Mann-Whitney non-parametric t-statistics for testing difference in medians under the assumption of independence of observations. T-stats from randomization are the percentiles for an upper tail test computed from a Monte Carlo simulation. Issuers are the issuing firms and BM is the benchmark. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively, assuming normality and independence.

Panel A: Median of the Abnormal Returns from the Twenty-First Day after the Issue to Lockup Expiration, by High and Low Executive Equity Ownership

Stock Option Portfolio	High Executive Equity Ownership						Low Executive Equity Ownership					
	NYSE/AMEX/NASDAQ VW Index			Firms Matched by Industry, Sales, and Sales Divided by Gross Costs			NYSE/AMEX/NASDAQ VW Index			Firms Matched by Industry, Sales, and Sales Divided by Gross Costs		
	Issuers	BM	BHAR	Issuers	BM	BHAR	Issuers	BM	BHAR	Issuers	BM	BHAR
High stock options	1.82%	3.55%	-1.73%	1.46%	0.61%	0.85%	0.95%	3.17%	-2.22%	1.32%	0.68%	0.64%
Medium stock options	-0.03%	2.86%	-2.89%	-0.03%	0.40%	-0.43%	-0.02%	2.88%	-2.90%	-0.02%	0.34%	-0.36%
Low stock options	-0.78%	2.15%	-2.93%	-0.84%	0.28%	-1.12%	-0.47%	2.19%	-2.66%	-0.41%	0.24%	-0.65%
High-low stock options	4.41%	1.40%	1.20%	2.30%	0.33%	1.97%	1.42%	0.98%	0.44%	5.56%	0.44%	0.68%
t-stat			2.13**			3.47***			2.78***			2.86***
Percentile	90%	95%	99%	90%	95%	99%	90%	95%	99%	90%	95%	99%
t-stat from randomization	1.39	1.74	2.31	1.00	1.60	2.94	1.00	1.65	2.25	1.18	1.37	2.19
All IPOs	0.34%	2.85%	-2.52%	0.20%	0.43%	-0.23%	0.15%	2.75%	-2.59%	0.09%	0.42%	-0.33%

Panel B: Median of the Abnormal Returns after Lockup Expiration to Two Years after the Issue, by High and Low Executive Equity Ownership

Stock Option Portfolio	High Executive Equity Ownership						Low Executive Equity Ownership					
	NYSE/AMEX/NASDAQ VW Index			Firms Matched by Industry, Sales, and Sales Divided by Gross Costs			NYSE/AMEX/NASDAQ VW Index			Firms Matched by Industry, Sales, and Sales Divided by Gross Costs		
	Issuers	BM	BHAR	Issuers	BM	BHAR	Issuers	BM	BHAR	Issuers	BM	BHAR
High stock options	6.55%	14.11%	-7.55%	6.55%	2.07%	4.48%	5.39%	15.28%	-9.89%	5.39%	3.61%	1.78%
Medium stock options	2.62%	12.66%	-10.4%	2.62%	1.49%	1.13%	1.27%	12.77%	-11.5%	1.27%	1.55%	-0.29%
Low stock options	1.44%	15.94%	-14.5%	1.44%	0.83%	0.61%	0.63%	11.65%	-11.2%	0.63%	0.80%	-0.17%
High-low stock options	5.11%	-1.83%	6.95%	5.11%	1.24%	3.88%	4.76%	3.64%	1.12%	4.76%	2.81%	1.95%
t-stat			2.00***			3.45***			2.69**			1.62
Percentile	90%	95%	99%	90%	95%	99%	90%	95%	99%	90%	95%	99%
t-stat from randomization	1.37	1.68	2.22	1.06	1.50	2.16	0.90	1.68	2.11	1.22	1.43	2.73
All IPOs	3.54%	14.24%	-10.7%	3.54%	1.46%	2.07%	2.43%	13.23%	-10.8%	2.43%	1.99%	0.44%

Panel C: Median of the Abnormal Returns during the Third Year after the Issue, by High and Low Executive Equity Ownership

Stock Option Portfolio	High Executive Equity Ownership						Low Executive Equity Ownership					
	NYSE/AMEX/NASDAQ VW Index			Firms Matched by Industry, Sales, and Sales Divided by Gross Costs			NYSE/AMEX/NASDAQ VW Index			Firms Matched by Industry, Sales, and Sales Divided by Gross Costs		
	Issuers	**BM**	**BHAR**	**Issuers**	**BM**	**BHAR**	**Issuers**	**BM**	**BHAR**	**Issuers**	**BM**	**BHAR**
High stock options	4.37%	9.40%	-5.04%	4.37%	1.38%	2.99%	3.76%	10.19%	-6.43%	3.76%	2.41%	1.35%
Medium stock options	1.75%	8.44%	-6.69%	1.75%	0.99%	0.76%	0.84%	8.52%	-7.67%	0.84%	1.04%	-0.19%
Low stock options	0.96%	8.62%	-7.66%	0.96%	0.56%	0.40%	0.42%	7.76%	-7.34%	0.42%	0.53%	-0.11%
High-low stock options	3.41%	0.78%	2.63%	3.41%	0.82%	2.58%	3.34%	2.42%	0.92%	3.34%	1.88%	1.46%
t-stat			1.66			1.43			1.52			1.01
Percentile	90%	95%	99%	90%	95%	99%	90%	95%	99%	90%	95%	99%
t-stat from randomization	1.19	1.32	1.48	1.05	1.39	1.61	1.01	1.27	1.49	1.08	1.25	1.36
All IPOs	2.36%	8.82%	-6.46%	2.36%	0.98%	1.38%	1.67%	8.82%	-7.15%	1.67%	1.33%	0.35%

Table 5: Cross-Sectional Long-Run Risk-Adjusted Return Regressions

We provide results for four cross-sectional long-run risk-adjusted return regressions. The dependent variables are long-run risk-adjusted returns estimated as the intercept from a Fama and French (1993) three factor regression involving individual IPO monthly excess returns calculated (1) from the third to the twentieth day after the IPO, (2) from the twenty-first day to the end of the lockup expiration, (3) from the lock-up expiration to two years after the issue, and (4) from the day after the first two years to the third year after the issue. Employee stock options are defined as the ratio of the number of employee stock options per number of shares offered. Executive equity ownership is the number of shares held by the top five executives divided by the number of shares offered and salaries and bonuses is the amount of executives' salaries and bonuses divided by the number of shares offered. The book value of equity is for the fiscal year after the IPO date. Analyst consensus growth is measured as the forecasted annual growth over the next five years or one year, whichever is available. Analyst growth rates are available only after the firm goes public. Accruals/total assets is the ratio of accruals to total assets based on the first annual statement after the firm goes public. Proceeds are the number of shares offered multiplied by the offer price. Venture capital is a dummy variable equal to one if the IPO is venture backed and zero otherwise. Underwriter ranking is based on modifications of the Carter and Manaster (1990) and Carter, Dark and Singh (1998) rankings as developed by Loughran and Ritter (2004); the rankings are between 0 (low) and 9.1 (high). Sales/Gross costs is the ratio of sales to gross costs where gross costs are sales minus EBITDA. Firm age is IPO year minus founding date. Unless otherwise noted, accounting variables are based on fiscal year data prior to the IPO from Compustat and growth rates are from I/B/E/S. Standard errors are adjusted for time clustering by assuming that observations are independent for companies at different points in time, but not necessarily for companies that go public in the same month. They are more conservative than White (1980) standard errors. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively, assuming normality and independence.

Independent Variables	From the 3rd day after the issue until the end of the stabilization period (20 days)	After the end of the stabilization period (20 days) until lockup expiration	After lockup expiration until two years after the issue	From the day after the first two years to the third year after the issue
	Coefficients	Coefficients	Coefficients	Coefficients
Employee stock options	0.216 (3.208***)	0.252 (3.536***)	0.165 (2.181**)	0.117 (1.314)
Executive equity ownership	0.167 (2.187**)	0.311 (2.888***)	0.233 (1.603)	0.193 (1.486)
Salaries and bonuses	0.377 (2.164**)	0.780 (2.016**)	0.522 (1.762*)	0.456 (1.892*)
Employee stock options * Executive equity ownership	0.238 (2.996***)	0.156 (2.630**)	0.144 (2.008**)	0.078 (1.196)
Initial return	0.314 (1.409)	0.264 (1.192)	-0.383 (-1.741)	-0.420 (-1.543)
ln(Book-to-market)	-0.215 (-1.851*)	-0.186 (-1.609)	-0.186 (-1.242)	-0.177 (-1.163)
ln(1+Analyst consensus growth)	0.180 (1.515)	0.238 (1.011)	-0.232 (-2.017**)	-0.296 (-2.302**)
Accruals/Total assets	-0.444 (-1.463)	-0.319 (-1.600)	-0.462 (-1.542)	-0.499 (-1.396)
ln(Proceeds)	-0.353 (-2.587**)	-0.761 (-1.563)	1.029 (1.796*)	1.011 (1.984*)
Venture capital dummy	1.402 (2.282**)	1.768 (2.594**)	1.909 (2.323**)	1.632 (2.437**)
Underwriter ranking	0.116 (1.429)	0.152 (1.563)	0.125 (1.641)	0.131 (1.375)
Sales/Gross costs	-0.172 (-0.335)	-0.337 (-0.539)	0.211 (0.369)	0.211 (0.375)
High-tech industry dummy	0.182 (1.911*)	-0.149 (-1.196)	-0.268 (-1.624)	-0.278 (-1.608)
Firm age	0.268 (1.239)	0.348 (1.485)	0.383 (1.447)	0.383 (1.269)
Adjusted R-squared	35.63%	31.41%	28.27%	22.53%
Number of observations	656	651	645	638

Table 6: Fama and French Three Factor Time-Series Regressions

We provide results for Fama and French three-factor time-series regressions. Stock options are defined as the number of employee stock options divided by the number of shares offered. Three regressions are performed: (1) for the high stock option portfolio, (2) for the low stock option portfolio, and (3) for the difference between the high and low stock option portfolios. Following Fama and French (1993), the three factor model is:

$$R_{pt} - R_{ft} = C_p + B_p(R_{mt} - R_{ft}) + S_p(SMB_t) + H_p(HML_t) + \varepsilon_t$$

where p is an index for the portfolio; t is month t; R_{pt} is the monthly return on the portfolio of IPOs. R_{ft} is the monthly return on the one-month T-bill. $R_{mt} - R_{ft}$ is the excess return on the NYSE/AMEX/NASDAQ value (equally)-weighted index presented in Panel A (B). SMB is the difference in the returns of a value (equally)-weighted portfolio of small stocks and big stocks. HML is the difference in the returns of a value (equally)-weighted portfolio of high book-to-market stocks and low book-to-market stocks. C_p is the monthly risk-adjusted abnormal return in percent. The estimate of C_p provides a test of the null hypothesis that the mean monthly abnormal return is zero. B_p, S_p, and H_p are factor-loadings. To construct the portfolios in Panel A (B), we allocate IPOs to low, medium, and high stock-option portfolios and hold them either from the twenty-first trading day until two years after the issue or during the third year after the issue. When all IPOs are allocated in this manner, we compute value (equally)-weighted average returns across all stocks for each calendar month. Standard errors are adjusted for time clustering by assuming that observations are independent for companies at different points in time, but not necessarily for companies that go public in the same month. They are more conservative than White (1980) standard errors. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively, assuming normality and independence.

Panel A: Value-Weighted Index

Independent Variables	From the twenty-first trading day through two years after the issue			During the third year after the issue		
	Stock Options			Stock Options		
	High	Low	High-Low	High	Low	High-Low
Intercept	-0.331 (-1.115)	-0.654 (-1.832*)	0.323 (2.239**)	-0.187 (-1.390)	-0.229 (-1.781*)	0.042 (1.028)
Rm-Rf	1.167 (16.253***)	1.035 (12.283***)	0.132 (0.118)	1.041 (13.448***)	0.982 (12.296***)	0.059 (1.104)
SMB	0.869 (10.925***)	0.825 (9.788***)	0.044 (0.806)	0.993 (11.085***)	0.842 (9.721***)	0.151 (0.638)
HML	-0.146 (-1.457)	0.158 (1.084)	-0.304 (-1.727)	-0.170 (-1.324)	0.094 (1.352)	-0.264 (-1.151)
Adjusted R-squared	73.76%	68.61%	14.45%	61.42%	58.33%	13.81%

Panel B: Equally-Weighted Index

Independent Variables	From the twenty-first trading day through two years after the issue			During the third year after the issue		
	Stock Options			Stock Options		
	High	Low	High-Low	High	Low	High-Low
Intercept	-0.213 (-1.037)	-0.717 (-2.083**)	0.504 (2.123***)	-0.173 (-1.053)	-0.383 (-1.994*)	0.210 (1.313)
Rm-Rf	1.592 (13.880***)	1.279 (11.766***)	0.313 (0.467)	1.164 (14.723***)	1.039 (10.492***)	0.125 (0.225)
SMB	1.097 (11.413***)	0.955 (9.079***)	0.142 (0.513)	0.943 (16.909***)	0.860 (8.981***)	0.083 (0.082)
HML	-0.154 (-1.466)	0.106 (1.219)	-0.260 (-1.367)	-0.191 (-1.719)	0.130 (1.028)	-0.321 (-0.793)
Adjusted R-squared	61.77%	63.07%	20.85%	55.61%	58.24%	17.77%

Table 7: Fama and French Three Factor Time-Series Regressions by Executive Equity Ownership

We provide results for Fama and French three-factor time-series regressions by different levels of executive equity ownership. Stock options are defined as the number of employee stock options divided by the number of shares offered. Six regressions are performed: for the high stock option portfolio, for the low stock option portfolio, and for the difference between the low and high stock option portfolios, each for IPOs with high and low executive equity ownership calculated as the number of shares held by the top five executives divided by the number of shares offered. Following Fama and French (1993), the three factor model is:

$$R_{pt} - R_{ft} = C_p + B_p(R_{mt} - R_{ft}) + S_p(SMB_t) + H_p(HML_t) + \varepsilon_t$$

where p is an index for the portfolio; t is month t; R_{pt} is the monthly return on the portfolio of IPOs. R_{ft} is the monthly return on the one-month T-bill. $R_{mt} - R_{ft}$ is the excess returns on the NYSE/AMEX/NASDAQ value (equally)-weighted index presented in Panel A (B). SMB is the difference in the returns of a value (equally)-weighted portfolio of small stocks and big stocks. HML is the difference in the returns of a value (equally)-weighted portfolio of high book-to-market stocks and low book-to-market stocks. C_p is the monthly risk-adjusted abnormal return in percent. The estimate of C_p provides a test of the null hypothesis that the mean monthly abnormal return is zero. B_p, S_p, and H_p are factor-loadings. The regression equation uses value- (equally-) weighted monthly calendar time returns for low, high, and low minus high stock-option portfolios in Panel A (B). Panel C reports a test for differences in intercepts C_p of high minus low stock option usage between the high and low executive ownership regressions. To construct the portfolios in Panel A (B), we allocate IPOs to low, medium, and high stock-option portfolios and hold them either from the twenty-first trading day after the IPO until two years after the IPO or during the third year after the issue. When all IPOs are allocated in this manner, we compute value (equally)-weighted average returns across all stocks for each calendar month. Standard errors are adjusted for time clustering by assuming that observations are independent for companies at different points in time, but not necessarily for companies that go public in the same month. They are more conservative than White (1980) standard errors.*, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively, assuming normality and independence.

Panel A: Value-Weighted Index

Panel A1: From the twenty-first trading day through two years after the issue

Independent Variables	High Executive Equity Ownership			Low Executive Equity Ownership		
	Stock Options			Stock Options		
	High	Low	High-Low	High	Low	High-Low
Intercept	-0.272	-0.634	0.362	-0.328	-0.576	0.248
	(-0.766)	(-1.823*)	(2.576**)	(-0.826)	(-1.479)	(1.994*)
Rm-Rf	1.298	1.111	0.187	1.275	1.117	0.158
	(12.873***)	(10.031***)	(0.225)	(11.352***)	(10.236***)	(0.280)
SMB	0.969	0.853	0.116	0.912	0.884	0.028
	(10.733***)	(8.105***)	(0.890)	(10.198***)	(7.980***)	(0.387)
HML	-0.160	0.138	-0.298	-0.163	0.157	-0.320
	(-1.543)	(1.281)	(-1.363)	(-1.431**)	(1.359)	(-1.624)
Adjusted R-squared	73.79%	73.25%	15.96%	64.17%	69.43%	14.87%

Panel A2: During the third year after the issue

Independent Variables	High Executive Equity Ownership			Low Executive Equity Ownership		
	Stock Options			Stock Options		
	High	Low	High-Low	High	Low	High-Low
Intercept	-0.317	-0.511	0.194	-0.342	-0.537	0.195
	(-0.607)	(-0.816)	(1.582)	(-0.574)	(-0.757)	(1.476)
Rm-Rf	1.138	1.003	0.135	1.242	1.102	0.140
	(12.460***)	(9.601***)	(0.218)	(12.797***)	(10.367***)	(1.070)
SMB	0.950	0.821	0.129	0.931	0.885	0.046
	(11.279***)	(8.841***)	(0.726)	(11.936***)	(9.691***)	(0.630)
HML	-0.191	0.142	-0.333	-0.169	0.151	-0.320
	(-1.520)	(1.439)	(-1.696)	(-1.205)	(1.023)	(-1.545)
Adjusted R-squared	95.12%	77.92%	12.09%	81.78%	74.04%	10.43%

Panel B: Equally-Weighted Index

Panel B1: From the twenty-first trading day through two years after the issue

Independent Variables	High Executive Equity Ownership			Low Executive Equity Ownership		
	Stock Options			Stock Options		
	High	Low	High-Low	High	Low	High-Low
Intercept	-0.240	-0.421	0.181	-0.289	-0.394	0.105
	(-0.633)	(-0.908)	(2.098**)	(-0.734)	(-0.836)	(1.777*)
Rm-Rf	1.248	1.197	0.051	1.255	1.134	0.121
	(11.244***)	(8.041***)	(0.378)	(11.798***)	(10.641***)	(1.153)
SMB	0.960	0.844	0.116	0.911	0.881	0.030
	(15.492***)	(13.709***)	(0.752)	(10.897***)	(9.201***)	(0.809)
HML	-0.180	0.138	-0.318	-0.171	0.184	-0.355
	(-1.124)	(1.045)	(-1.692)	(-1.209)	(1.300)	(-1.734)
Adjusted R-squared	81.80%	51.83%	18.81%	62.11%	75.54%	15.51%

Panel B2: During the third year after the issue

Independent Variables	High Executive Equity Ownership			Low Executive Equity Ownership		
	Stock Options			Stock Options		
	High	Low	High-Low	High	Low	High-Low
Intercept	-0.344	-0.580	0.236	-0.483	-0.515	0.032
	(-0.418)	(-0.562)	(0.346)	(-0.435)	(-0.505)	(0.108)
Rm-Rf	1.197	1.041	0.156	1.153	1.128	0.025
	(10.241***)	(9.211***)	(1.072)	(10.046***)	(9.110***)	(0.399)
SMB	0.871	0.818	0.053	0.918	0.804	0.114
	(11.541***)	(9.478***)	(0.893)	(10.102***)	(8.711***)	(1.157)
HML	-0.133	0.172	-0.305	-0.124	0.128	-0.252
	(-1.110)	(1.278)	(-1.071)	(-1.470)	(1.352)	(-1.548)
Adjusted R-squared	73.44%	85.47%	10.81%	42.59%	75.15%	9.25%

Panel C: Tests for a Positive Relation between Stock Option Usage and Long-Run Risk-Adjusted Performance Enhanced by Executive Equity Ownership

If executive equity ownership enhances the positive relation between stock option usage and performance, the intercept from regressions of high minus low stock option portfolios for IPOs with high executive equity ownership will be significantly greater than the intercept from regressions of high–low stock option portfolios for IPOs with low executive equity ownership; i.e., the null hypothesis is

Ho: [C_p from high-low stock option regressions for high executive equity ownership] > [C_p from high-low stock option regressions for low executive equity ownership]

From the twenty-first trading day through two years after the issue	
Equally-Weighted p-value	Value-Weighted p-value
0.007	0.004
During the third year after the issue	
Equally-Weighted p-value	Value-Weighted p-value
0.161	0.142

Figure 1: Combinations of Option and Stock Grants to Induce Appropriate Risk-Taking by Managers

The figure illustrates how a top-manager's selection of a firm's risk level depends on his compensation arrangement, which is assumed to consist of both option and stock grants. The depicted manager has a CRRA (constant relative risk aversion) utility function with risk aversion g. For simplicity of illustration, options are granted at-the-money with one year to expiration; the market-wide mean return is 7%, the risk-free rate is 5%, and the market's volatility is 25%. To fix the firm's risk, the manager is assumed to select a particular leverage ratio, thereby altering the risk relevant for diversified shareholders. The firm's unlevered beta is assumed to be 1.0. If shareholders have a preferred risk level, they can induce the manager to select it for them by altering the proportions of options and stock in his compensation contract. For example, if stockholders desired a debt/equity ratio of 1:1, they would grant 20 options for every 100 shares of stock to a manager with modest risk aversion (g=1.2) and 220 options for every 100 shares of stock to a more risk averse manager (g=1.35.) A 20% (220%) options grant would be worth roughly $25,000 ($270,000) per $1 million worth of stock granted.