Adverse selection and stock-based grants to non-executive employees

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ABSTRACT

I argue that issuing shares to employees instead of outside investors mitigates the adverse selection problem even if employees do not have any private information. For a firm that repeatedly needs funds for investment, the incentives to grant overvalued equity to employees are reduced because employees can deprive the firm of fairly priced financing in the future. Granting equity to employees allows the firm to signal its value and to issue securities to outside investors at fair prices. Consistent with predictions of the model, I find that the market reacts less negatively to the announcements of seasoned equity offerings when they are coupled with employee stock option grants. Moreover, since raising equity in the external market is cheaper for companies that grant stock options, they tend to do large equity issues. Beyond my empirical results, the model explains why employees often value stock options above Black-Scholes values, why grants are positively related to volatility and past returns, and why operating performance improves after stock option grants.

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Stock-based grants to non-executive employees have been popular in the U.S. and have been criticized on a number of grounds (see, e.g., Hall and Murphy (2003)). Indeed, the evidence from Fama and French (2005) that companies issue more equity through their employees than through seasoned equity offerings (SEOs), warrants, rights, and conversion of bonds seems puzzling given that employees are undiversified and should require a risk premium for holding their firm's equity. In this paper, I propose a novel explanation for why employees may be efficient providers of capital and why they often value stock options above their Black-Scholes values.[1]

I argue that when managers have superior information about the value of firm's assets (as in Myers and Majluf (1984)), financing investment by issuing stock to employees mitigates the adverse selection problem even if employees have no private information about the firm. Intuitively, if the realized stock returns following the equity-based grants by a firm do not live up to employees' expectations, employees can deprive the firm of fairly priced financing in the future. Whenever the firm's stock performs poorly, rational employees consider it more likely that informed managers granted them overvalued equity and discount future equity-based grants more heavily. I present a dynamic, infinite horizon model of firm's financing decisions under adverse selection and show that, in the separating equilibrium, a manager of a firm that repeatedly needs funds for investment raises capital by issuing shares to the external market whenever she has negative information and to employees whenever she has positive information.

When investment costs cannot be entirely absorbed by employees, a seasoned

[1] Using French data Sautner and Weber (2007) document that employees value stock options at 31 Euros, when their Black-Scholes value is only 26 Euros. Lambert and Larcker (2001) provide similar survey evidence for the U.S.

equity offering coupled with stock-based grants to employees sends a more positive signal to the market than does an offering without such grants. In this respect, my model is related to the model in Leland and Pyle (1977) who show that, by holding a substantial stake in the firm, a risk-averse informed manager can credibly signal firm value. The important difference between my paper and theirs is that I focus on grants to non-executive employees who, unlike top managers, do not have any private information and do not make decisions regarding the timing of equity issuance. The empirical implication of my model is that the price reaction to an SEO announcement is less negative, when the SEO is combined with stock or option grants to employees.

I test the predictions of the model using data on broad-based stock option plans from Risk Metrics Group during the period 2000-2005. Consistent with predictions of the model, I find that SEO announcements are greeted less negatively by the market if the firm has recently awarded many employee stock options. These results cannot be explained by the incentive or retention effects of stock options, since such effects should have been capitalized in the stock price at the time of the grants. The positive relation between stock option grants and the price reaction to the announcement of an SEO is economically meaningful and appears to be stronger for firms with a greater information asymmetry. I also find that, controlling for investment opportunities, companies that heavily grant stock options subsequently do SEOs of a larger size. These results suggest that, since option-granting companies can issue equity in the external market at higher prices, they are willing to raise more funds to finance their investment. This effect is particularly pronounced for companies with greater information asymmetry between the firm's manager and outside investors, such as new economy firms, small

firms, and firms with high stock return volatility.

Consistent with predictions of my model and recent empirical evidence (Bergman and Jenter (2007) and Spalt (2008)), I find that firms award more stock options to employees following high stock returns. Bergman and Jenter (2007) argue that after high stock returns, employees become overoptimistic about future firm performance. While I do not rule out behavioral explanations, I show that this evidence is also consistent with rational employees placing a lower value on equity-based compensation after poor stock performance. If employees fail to discount new grants following poor performance, an informed manager will give them stock options when she has negative information and employees will not receive a proper compensation in the long term. Consistent with the theory, I find that the positive relation between past stock returns and new option grants is present in the data only if the firm made significant option grants in the past. In addition, I find that over 70% of option-granting companies in my sample have traded options on their stocks and that companies with traded options make larger employee stock option grants. These findings are consistent with firms granting stock options to alleviate the adverse selection problem rather than to profit from employee sentiment since firms can only benefit from sentiment if no similar securities can be purchased by employees directly from the market.

Beyond my own empirical results, the model explains several existing empirical regularities. For example, I explain why highly volatile companies tend to grant more stock options (see evidence in Oyer and Schaefer (2005) and Spalt (2008)), a fact that is seemingly at odds with the predictions of agency theory. I argue that companies with highly volatile stock returns tend to have greater information asymmetry than firms with less volatile returns, and thus have larger potential

benefits from minimizing adverse selection costs. Similarly, my model provides for the empirical fact that financially distressed firms have a much smaller tendency to make broad-based stock option grants. Given that firms often lay off workers in bankruptcy, managers of financially distressed firms are less concerned about employees staying with a company in the future if their stock option grants perform poorly. Therefore, managers of financially distressed firms have high incentives to give employees overvalued stock options and the adverse selection problem is severe.

My theory suggests that the grants of employee stock options should be followed by positive news about the firm reflected in higher stock returns and improvements in operating performance. In support of this prediction, Ittner, Lambert, and Larcker (2003) and Hochberg and Lindsey (2008) find that option grants are associated with good subsequent performance, while Beatty (1995), Kato, Lemmon, Luo, and Schallheim (2005), and Kedia and Mozumdar (2002) document positive effects on stock prices. While this empirical evidence is often taken to imply that equity-based compensation provides significant incentives to firm employees or has other benefits, such as employee attraction, retention, or sorting (Oyer (2004) and Oyer and Schaefer (2005)), I argue that it is also consistent with managers making equity-based grants to employees when they have positive private information about the firm. Future empirical work has to be more careful in identifying whether the positive effects of non-executive stock option grants on firm performance is causal.

I also explain why employee stock options and restricted stock typically have vesting schedules and cannot be sold by employees in the secondary market. Since the private information of managers is often over a horizon of several years, employ-

ees are required to hold their stock-based awards until such information becomes public. If employees could sell their options immediately after the grant the firm would be subject to the same degree of adverse selection as when it directly sells equity to the external market.

The remainder of this paper is organized as follows. In the next section, I review the related empirical and theoretical literature on option-based compensation. I present a simple example and develop a dynamic model of information flow, equity grants, and issuance of stock in the external market in Section 2. Section 3 translates the predictions of the model into testable empirical implications. Section 4 describes data sources and variable definitions. Section 5 presents the empirical results. The final section offers concluding remarks.

1 Literature Review

Several explanations have been offered for the puzzling empirical fact that companies grant considerable amounts of equity to non-executive employees. For example, Hall and Murphy (2003) argue that companies perceived the cost of option-based compensation to be low because until recently employee stock options were not expensed in financial statements and created no immediate cash outlays for the firm. In support of this hypothesis, some companies considerably reduced their reliance on option-based compensation following the introduction of new accounting rules in 2004 (FASB 123R).[2] However, Oyer and Schaefer (2006) show that accounting treatment alone cannot justify the pervasive use of employee

[2] FASB 123R requires all companies to expense the fair value of stock-based compensation given to employees in their financial statements, while previously companies that granted at-the-money stock options could disclosed such information in footnotes.

stock options. In addition, accounting treatment fails to explain why many companies grant restricted stock to their non-executive employees or why stock option use is still widespread today.

Several recent papers argue that employees are subject to behavioral biases and often value stock options above their fair values. For example, Bergman and Jenter (2007) suggest that employees become overoptimistic following high stock returns. According to their hypothesis, a company can decrease compensation costs by granting stock options, provided that no similar securities can be purchased by employees directly from the market. Bergman and Jenter (2007) document that granting activity is concentrated among profitable firms with stellar stock price performance, while firms in or close to distress are less likely to make stock option grants. Similarly, Spalt (2008) argues that employees overestimate the probability of large gains, especially when stock prices are highly volatile. However, this behavioral explanation seems to be inconsistent with the fact, that in companies with high volatility, employees tend to exercise their stock options earlier (see Bettis, Bizjak, and Lemmon (2005)). Using survey evidence, Sautner and Weber (2007) and Lambert and Larcker (2001) document that employees often value options above their Black-Scholes values, while Oyer and Schaefer (2005) suggest that employees may value stock options above what they are worth because optimistic employees are attracted to firms that grant stock options. In my model, employees are fully rational, but because they know that managers make equity-based grants when they have positive information about the future it appears as if employees are overoptimistic.

An alternative view that firms grant options to relax their financing constraints is suggested by Yermack (1995), Core and Guay (2001), Kato, Lemmon, Luo, and

Schallheim (2005), and Babenko, Lemmon, and Tserlukevich (2008). In particular, Core and Guay (2001) provide evidence that firms with large interest burden and small cash flows grant more options to their non-executive employees, which is consistent with financially constrained firms trying to save cash. Babenko, Lemmon, and Tserlukevich (2008) argue that in addition to substituting for cash wages required by employees at the grant date, stock options also provide capital to the firm when employees exercise them. However, while these papers highlight the importance of employee stock options in relaxing financing constraints, they do not answer an important question why firms that issue them are constrained in the first place and cannot sell other types of securities, such as warrants or equity, on the open market. In this paper, I fill this gap by showing that financial constraints may arise because of asymmetric information between firm managers and capital providers and that financing investment through employees minimizes the adverse selection problem.

Other explanations for the popularity of broad-based stock option plans relate to labor market frictions, tax issues, and agency problems. For example, Ittner, Lambert, and Larcker (2003) and Oyer and Schaefer (2005) conclude that options may be granted to retain valuable employees, while Oyer (2004) argues that employee stock options minimize contract renegotiation costs if outside opportunities are positively correlated with firm's stock performance. By explicitly calculating the present value of tax payments, Babenko and Tserlukevich (2008) find that, for most firms, stock options provide a tax advantage relative to fixed wages since companies take tax deductions for stock options when their taxable incomes and tax rates tend to be high. Finally, Cai, Sevilir, and Van Wesep (2008) argue that broad-based employee stock option plans may be a manifestation of agency

problem since undiversified managers have incentives to shift risk to employees.

2 Model

2.1 A Single Period Example

To demonstrate the point that equity grants to employees minimize the adverse selection problem, I build a simple single period example, where the firm's manager has perfect information about the value of the firm's assets. Following Myers and Majluf (1984), I assume that the manager is acting in the interest of the firm's original shareholders and needs to raise amount I to finance a positive net present value project.[3] The investment project has a certain payoff F at the next date, and the appropriate discount rate for the firm's cash flows is r. In addition to financing investment, the manager needs to compensate the firm's employees and offers them a linear contract consisting of fixed wages w and n shares of restricted stock that become vested at the next date.[4] Since employees have outside opportunities that guarantee them wages l per period and are assumed to be risk-neutral, they accept a contract only if, given their beliefs, it pays at least l in expectation.

The firm has cash of c dollars today and assets in place that generate uncertain cash flow at the next date. The common prior is that the cash flow from assets in place can be high, c_H, or low, c_L, with equal probabilities. Neither outside investors nor employees have private information about the firm, but the manager

[3] To keep the model parsimonious, I only allow for positive net present value projects. Cooney and Kalay (1993) show that some of Myers and Majluf's results, such as the nonpositive reaction to an equity issue, would not always hold if the firm can invest in negative, as well as positive, net present value projects. Cooney and Kalay's conclusions generalize to my setting.

[4] The intuition of the model is similar if I allow for a convex compensation contract, such as stock options.

has perfect private information about next period's cash flow from the assets in place.[5]

The investment and compensation costs can be financed by issuing equity to outside investors or by cutting employee wages and granting them the firm's stock.[6] Outside investors are competitive and risk-neutral. By buying a newly issued equity, they acquire a share of the firm in exchange for providing capital I. Following Lucas and McDonald (1990), I assume that outside investors have access to other investments with an expected rate of return r. To make the financing problem relevant, I assume that

$$c_H - l < I < c_L. \tag{1}$$

This assumption guarantees that regardless of the realization of the current cash flow, the firm can finance investment by cutting fixed wages and issuing shares to employees. However, if the firm gives an all-wage contract to employees it needs to finance at least part of investment externally.

To demonstrate the intuition of the model in the simplest form, I assume that if, after the state of the world is realized, the employees are unsatisfied with their compensation, they can take actions that decrease firm value by amount

[5] My results depend on the assumption that shareholders cannot write a fully optimal contract that would allow the manager to credibly reveal her private information (see Dybvig and Zender (1991)). While this assumption is standard in signaling models, it can also be justified by the ex-post incentives of the shareholders to either replace a firm's manager or to change her compensation contract.

[6] The model is parsimonious and does not consider situations when the firm can also finance investment by issuing debt, warrants, or convertible bonds. Brennan and Kraus (1987) analyze how by choosing an appropriate financing mechanism a firm can costlessly signal its prospects and mitigate underinvestment incentives. Stein (1992) shows that firms issuing risky convertible bonds can credibly signal their quality to the market and, therefore, can issue external equity through a backdoor.

k. There are many ways in which such costs can come about. For example, employees can withdraw their human capital from the firm, advise new people not to take jobs with the firm, go on a strike, or even quit their jobs, generating significant retraining and rehiring costs for the firm. Alternatively, cost k can be interpreted as a disutility to a manager from being disloyal to employees. For example, Cronqvist et al. (2008) document that CEOs with more control pay their workers more, which allows CEOs to improve social relations with employees.

In the next section, I endogenize cost k in a multi-period setting by focusing on a case when employees can deprive the firm of fairly priced financing if the stock price performance following equity grants does not live up to their expectations.

The following proposition establishes my first result that a firm that can grant stock to its employees is able to mitigate the adverse selection problem and issue equity at a fair price.

Proposition 1 *If cost k is sufficiently large,*

$$k > \frac{(l + I - c)(c_H - c_L)}{c + c_H + F - I - l},$$

there exists a separating fully revealing equilibrium, where the privately informed manager finances investment by issuing shares directly to the external market when she has negative information and by issuing shares to employees when she has positive information.

Proof. All proofs are given in the Appendix. ■

Intuitively, a manager with positive private information does not want to issue equity to outside investors because of the adverse selection problem. Since

employees know that they have an implicit threat against the firm in case their equity grants perform poorly, they agree to accept the firm's equity at a higher price. In contrast, a manager with negative private information raises equity in the external market because selling equity to employees is associated with a high probability of poor stock performance and subsequent employee backlash.

2.2 The Dynamic Model of Financing Decisions

2.2.1 Information Structure and Financing Instruments

In this section, I generalize the single period example to a multi-period setting, relax the assumption that the manager's private information is perfect, and endogenize the costs to the firm associated with misleading employees. The benefit of intertemporal setup is that it allows me to make predictions regarding the dynamics of financing and analyze how it relates to past firm performance. In addition, by considering a dynamic information flow, I escape a standard criticism applied to signaling models that a firm should delay a security issue until all private information is revealed.

Each period the firm is endowed with an indivisible project that cannot be deferred to future periods. To make the infinite-period problem tractable, I assume that each period before making its investment decisions the firm returns the proceeds from previous investment F as a dividend to shareholders. In case when the firm plans to forgo investment opportunitity this period it distributes all the surplus cash.[7] Firms are assumed to follow a pure strategy of (a) not issuing any

[7] More realistically, a constrained firm would save the surplus cash for future investment needs. Allowing for savings would not change the main intuition of the model, but it would complicate the analysis since, at each point of time, one would have to track the path-dependent cash reserves of the firm.

equity, (b) issuing equity to outside investors, or (c) issuing equity to employees.[8]

Outside investors and firm employees have no private information about the firm, while the manager receives a private imprecise signal s each period about the next period's cash flow from the firm's assets in place. The common prior is that this cash flow can be c_H or c_L with equal probability. The manager can use her private signal to infer the conditional probabilities of the high and low cash flow states:

$$\Pr(c_H|s = c_H) = \Pr(c_L|s = c_L) = q > \frac{1}{2}, \tag{2}$$

where a higher value of q indicates greater informational advantage of the manager over outside investors and firm employees ($q = 1$ implies perfect private information and $q = \frac{1}{2}$ implies no private information).

At each date after observing a private signal, the manager decides on a compensation contract to be offered to firm employees. Following Oyer (2004), I assume that employees may leave the firm if their outside opportunities are better than the contract in the firm, in which case the firm bears turnover costs.[9] However, I assume that each period the firm can renegotiate the contract with employee at no cost, so that each period the firm offers a contract that is optimal given employees' beliefs.

[8] The strategy space of the informed manager is restricted to avoid the difficulty in analyzing out-of-equilibrium moves by the manager in an infinite horizon setting. As is standard in signaling models (see, for example, Myers and Majluf (1984) and Lucas and McDonald (1990)), both the ability to issue risk-free debt and the existence of financial slack lessen the importance of adverse selection. Lucas and McDonald (1990) discuss some of the costs associated with these alternative financing methods.

[9] This assumption is only needed to rule out the existence of unrealistic equilibria, in which, in order to avoid the financing squeeze, the manager fires all employees after a poor performance and immediately makes new hires.

2.2.2 A Separating Perfect Bayesian Equilibrium with Employee Financing

I conjecture a separating fully revealing perfect Bayesian equilibrium (PBE) consisting of the firm's strategies and the beliefs of employees and outside investors, such that the firm may be in two states: the normal state (where the firm can receive financing from employees at attractive terms) and the reversionary state (where such financing is impossible). If the firm is in the normal state and the manager receives a positive signal, she finances investment by issuing restricted stock to employees, while if the manager receives a negative signal she issues equity to outside investors and offers employees an all-wage contract. The firm continues to operate in the normal state unless it issues stock to employees and firm performance turns out to be poor. The equilibrium beliefs of employees and outside investors are consistent with the manager's strategy, so that whenever the manager grants stock to employees, they accept it at a fair price.

Finally, to complete the description of the equilibrium, I need to specify the contingencies if the firm enters the reversionary state. In the reversionary state, which lasts for N periods, only firms with a negative signal invest and they do so by floating shares in the public market. The firms that receive a positive signal choose to forfeit investment. Since the current cash flow of the firm and past employee stock grants are observable, it is common knowledge whether the firm currently operates in the normal or the reversionary state. Whenever a firm that is in the reversionary state attempts to issue stock to employees, their off-equlibrium belief is that the manager has received a negative signal. In my model, a reversionary episode occurs in equilibrium despite the fact that a firm manager never defects.

This feature of the model is present because the manager does not have perfect private information and is often found in similar information models (see, e.g., Green and Porter (1984) for a model of collusion under uncertainty).

The existence of the equilibrium requires that the net present value of new investment satisfies two conditions (see Apendix for details):

$$\frac{F - I(1+r)}{(c_H - c_L)(2q-1)} < \frac{(I + l - c_H)\frac{2r^2}{1+2r}}{c_H + c_L + 2F - 2I - 2l}, \tag{3}$$

$$\frac{F - I(1+r)}{(c_H - c_L)(2q-1)} > \frac{\frac{2r}{1-\frac{1}{(1+r)^N}} + 1 - q}{\frac{q(C(1+2r)+AB)}{(2r+(1-q)(1-\frac{1}{(1+r)^N}))(l+I-c_L)} - 2q + 1}. \tag{4}$$

where A, B, and C are given in the Appendix. The first condition is needed to rule out the existence of pooling equilibria, since otherwise firms with good signal would find it optimal to invest when their shares are undervalued instead of passing up the valuable investment opportunity. The second condition rules out situations, in which the firms may find it optimal to grant overvalued equity to employees and then forfeit investment should the reversionary state occur. I now prove that the conjectured strategies of the manager and the beliefs of employees and outside investors indeed constitute a PBE.

Proposition 2 *Suppose condition (1) holds and the investment payoff function satisfies conditions (3) and (4). Then there exists a separating fully revealing PBE, in which a manager with negative information finances investment through an SEO. A manager with positive information finances investment through employees whenever the firm is in the normal state and forfeits investment if the firm is in the reversionary state.*

The proof proceeds as follows. First, I show that whenever the firm is in the normal state and the manager gets negative private information, the firm does not have an incentive to grant stock to employees. Second, I specify the necessary and sufficient conditions to rule out the possibility of the pooling equilibria. Third, I establish that the manager with favorable inside information (when the firm is eiher in the normal or reversionary state) does not have incentives to float stock in the public market. Finally, I show that the threat by employees to deprive the firm of fairly priced financing in the future is credible. In other words, it is optimal for rational employees to place low value on future stock awards whenever the performance of previous grants does not live up to their expectations.

The intuition of the proposition is straightforward. A manager with positive private information cannot issue equity to outside investors at an attractive price since outside investors believe that equity is issued to the external market only when the manager has negative information. In contrast, a manager with negative information would issue equity to outside investors at a fair price. Intuitively, while such a manager can issue equity to employees at a higher price, doing so would result in the firm being deprived of valuable financing in the future (with a significant probability) and forgoing some investment projects. Finally, one might speculate why employees that held the firm's stock in the past, place a low value on new equity grants following poor firm performance. I argue that if employees accept stock at a high price (e.g., as if the manager has a positive signal) then the manager would consistently deceive employees by giving them stock regardless of the signal. Hence employees would be better off by quitting their jobs and working elsewhere. Similarly, if employees accept stock by valuing it as if positive and negative signals are equally likely, then the manager would grant stock to

employees when the signal is negative and would forfeit the project when the signal is positive. In this case, employees would also be earning less than outside salary, so it is a credible threat for them to leave.[10]

I now discuss the case when the investment costs are too large to absorbed by cutting employees' wages and replacing it with stock. Thus I modify assumption (**??**) to $I > c_H$. In this case, I conjecture a separating fully revealing PBE, in which whenever the manager has positive information she pays zero fixed wages to employees and finances the rest of investment through an SEO, and whenever the manager has negative information she raises the total amount needed for investment from the external market. If the firm is in the reversionary state, the manager forgoes investment opportunity if she believes that the firm's shares are currently undervalued.

Proposition 3 *Suppose $I > c_H$ and the investment payoff function satisfies conditions (3) and (4). Then there exists a separating fully revealing PBE, in which a manager with negative information finances investment through a seasoned equity offering. A manager with positive information finances investment through a combination of stock grants to employees and SEO whenever the firm is in the normal state and forfeits investment if the firm is in the reversionary state.*

The proof of Proposition 3 follows essentially the same steps as Proposition 2 and is omitted for brevity. Please note that there is no claim made in the paper

[10] It is worth noting that, in my theory, the major difference between shareholders and employees is that employees have long-term relationships with a firm and continuously provide financing. Therefore, the conclusion that the adverse selection problem is mitigated could be extended to groups of shareholders with similar characteristics. Consistent with this observation, Hertzel and Smith (1993) find that price reactions to privately placed equity issues are positive, while Gao and Mahmudi (2008) document that firms with large institutional ownership have better SEO outcomes.

with respect to the uniquness of the proposed equilibria.[11]

3 Empirical Implications

The model yields a number of testable empirical predictions related to the granting decisions by a firm and firm performance following such grants. For example, one of the implications is that firms where managers have more asymmetric information (e.g., high-tech firms, young firms, small firms, and highly volatile firms) would grant more stock options since these firms face deeper discounts if they issue equity to outside markets. Similarly, since grants to employees signal confidence by the firm in its prospects, the implication of the model is that larger than expected grants should be associated with superior accounting and stock price performance. However, while data lends support to these empirical predictions,[12] it could also be consistent with the incentive effects or other benefits of non-executive stock options.

To isolate the signaling effect of stock options, I focus in the empirical tests on the returns at the time of the announcements of seasoned equity offerings. First, it is perceived that most of the reaction to SEOs is because of information issues, and hence signaling with stock options should have a stronger effect at this time. Second, I do not expect the incentive effect of non-executive stock options to show up strongly at the time of an SEO announcement because it must have been

[11] Standard refinements applied to signaling games, such as Cho-Kreps (1987) intuitive criterion can rule out pooling equilibria, in which both type of managers invest by issuing equity to outside market.

[12] See, for example, Oyer and Schaefer (2005) and Spalt (2008) on the effect of volatility, Ittner, Lambert, and Larcker (2003) on the effect of industry, Bergman and Jenter (2007) on the effect of size, Hochberg and Lindsey (2008) on accounting performance following grants, and Kedia and Mozumdar (2002) on stock return performance.

capitalized in stock prices at the time when the firm first released information on stock option grants. Thus, the empirical prediction is that the price reaction at the time of an SEO announcement should be less negative if the company has recently made large stock option grants to non-executive employees.

The second set of predictions concerns the size of the seasoned equity offering. Provided that granting stock options to employees helps the company to mitigate the adverse selection problem, I expect the companies with larger stock option grants to make SEOs of larger size. There are two channels through which larger stock option grants should lead to larger SEO proceeds, conditional on a firm making a seasoned equity offering. The first channel is that companies that granted more stock options face a smaller discount in external markets when they announce an SEO and thus can afford to raise more equity in these markets. The second channel is that firms with larger investment projects make larger grants and larger seasoned equity offerings to finance projects of bigger size.

I expect that the effect of option grants on SEO size should be especially pronounced in companies with large information asymmetries since, for these companies, the adverse selection problem is most severe. In empirical tests, I focus on several proxies for information asymmetry that are recognized in the literature, such as firm size, stock return volatility, and the indicator for new economy firms, as defined in Ittner, Lambert, and Larcker (2003).

Additionally, since granting stock or options to employees mitigates the adverse selection problem to a much smaller extent if the company is on the brink of financial distress, I expect that the effect of non-executive stock options on the size of seasoned equity offerings is smaller in financially distressed firms. I proxy for financial distress using Altman's Z-score, past stock returns, firm's market-to-

book ratio, and financial leverage.

Finally, the model predicts that stock option grants and seasoned equity offerings should be substitutes in terms of financing the firm's investment expenditures. The substitution effect should be more pronounced for firms with small investment since such firms do not need to resort to issuing equity in the external market simply because the entire cost of investment cannot be absorbed by employees.

4 Data and Summary Statistics

To test the empirical predictions of the model, I obtain data on broad-based employee stock option programs during the period of 2000 to 2005 from Risk Metrics Group (RMG).[13] The RMG database covers large profitable firms (S&P 1500 firms) and provides information on the number of options granted during a fiscal year, their weighted average strike prices, and expected maturities, as well as information on outstanding, cancelled, and exercised stock options.[14] To get some coverage on smaller high-growth firms, I augment this data set with hand-collected stock option data on the NASDAQ 100 firms (composition as of December 8, 2006). Some firms in my sample have only three years of coverage (either 2000-2002 or 2003-2005) because of changes in the composition of the indices and because of firm

[13] The predictions of the model concern any type of the stock-based grants to employees (e.g., restricted stock, restricted stock units, SARs, stock options, etc.). Due to data availability issues, I test the predictions of the model using only the stock option data.

[14] While it is also possible to use the Execucomp database to infer the value of stock options granted to non-executive employees, the use of such data may be problematic. First, it is not possible to obtain the expected term of granted stock options and their strike prices from Execucomp. Instead, it is commonly assumed that all stock options have the same term and are granted at-the-money. Second, if, in any given year, the firm makes no grants to executives, it is automatically assumed that the firm makes zero grants to non-executives, resulting in a negatively biased value of non-executive grants Finally, it is often the case that the use of data on different executives in any given year provides significantly different estimates of the value of non-executive grants.

entry or exit. The data on stock options is then merged with financial data from Compustat and executive compensation data from Execucomp. To obtain data on traded stock options for firms in my sample, I use the Option Metrics database. The final sample used in my analysis consists of $7,116$ firm-year observations from $1,416$ unique firms.

In addition to stock option data, I obtain a sample of seasoned equity offerings (SEOs) during the same period from the Securities Data Company New Issue Database. I exclude limited partnerships, unit issues, American depositary receipts, rights issues, shares of beneficial interest, and SEOs lacking information about the filing date or stock price data on the Center for Research on Security Prices (CRSP). Following Jegadeesh, Weinstein, and Welch (1993) and Datta, Iskandar-Datta, and Raman (2005), I construct the announcement return using the three-day cumulative abnormal return centered on the filing date of the offering. The abnormal returns are obtained using a market model with either a value-weighted or an equally-weighted CRSP index. To minimize the effect of price runup prior to the announcement, I estimate the parameters of the market model from the trading day -250 to -50 prior to an SEO announcement. To the extent that some of the actual announcements happen prior to the filing dates, my tests are inherently biased against finding significant negative announcement returns.

I calculate the value of stock option grants using the Black-Scholes formula as modified by Merton (1973) to include dividend payout. Since employee stock options are typically exercised long before their expiration dates, I use the expected option term as disclosed in the firm's 10-K form instead of option maturity.[15] The

[15] Bettis, Bizjak, and Lemmon (2005) study how the choice of a model to compute incentives

stock return volatility is estimated using daily returns from CRSP over the fiscal year prior to the year of the grant. The risk-free rate is assumed to be 5.0% over the whole period, and the dividend payout is estimated from Compustat data prior to the year of the grant.[16]

Summary statistics for the full sample are reported in Table I, Panel A. The average value of stock option grants is 3.7% of book assets in the full sample and exceeds the average dollar amount raised through a seasoned equity offering of 1.5% of book assets.[17] This evidence is consistent with Fama and French (2005) who document that companies issue more equity through employees than through SEOs. The average value of stock option grants per employee is also large at $\$17,648$, although the median value is considerably smaller. Most of the granted stock options are awarded to non-executive employees, with the value granted to non-executive employees exceeding 80% of all grants in more than three quarters of the sample. Notably, approximately 71.7% of companies that grant employee stock options also tend to have traded stock options, with 54.4% of all firms having traded stock options with maturities of six months or longer.

Panel B of Table I reports the summary statistics for the subsample of firms that do seasoned equity offerings. Consistent with many previous empirical studies (see, e.g., Mikkelson and Partch (1986), Barclay and Litzenberger (1988), and Jung, Kim, and Stulz (1996)), I find that the market reacts negatively to an

from stock options influences the statistical inference and conclude that while it is important to incorporate early exercise in the valuation, the choice of the model is unlikely to be important in cross-sectional studies.

[16] I do not use the value estimates of stock option grants as provided in 10-K statements since different firms use different methods to obtain this value. For example, it is typical for firms in the same fiscal year to use different values of the risk-free rate in the estimation of the value of grants.

[17] If the firm conducts more than one SEO in a given fiscal year, I sum the proceeds from all equity offerings during the year.

announcement of an SEO. The average three-day abnormal return at the announcement of an SEO is -1.5% (-1.2%), which is consistent with the more recent empirical studies (e.g., Datta, Iskandar-Datta, and Raman (2005)). For firms announcing SEOs, the average Black-Scholes value of the options portfolio per employee is $\$18,460$. Overall, the characteristics of firms in SEO sample look similar to those in the full sample. However, firms in the SEO sample tend to have higher leverage, larger value of stock option grants per employee, and lower probability of having traded stock options.

5 Empirical Results

Table II presents the regression results for the returns around SEO announcements. All explanatory variables are winsorized at 1% and 99% tails to avoid the influence of outliers. Since the distribution of stock option grants to employees is highly skewed, I follow Bergman and Jenter (2007) and define the main variable of interest as the natural logarithm of one plus the value of stock option grants divided by the number of employees.[18] The regression specifications include nine industry fixed-effects (defined by the one-digit SIC code) to account for any unmodeled heterogeneity across industries and five year fixed-effects to account for any unmodeled macroeconomic effects. Including year fixed-effects may be important since Bayless and Chaplinsky (1996) find that there is a considerable variation in SEO announcement returns across years because equity issue markets may be hot or cold. In all tables, I report the t-statistics with heteroskedasticity-consistent standard errors clustered at the firm level (see Petersen (2008)).

[18] Since approximately 6% of firm-year observations have zero stock option grants in my sample, I check that my results are robust to the exclusion of such observations from the sample.

The regression results in Table II provide support for the adverse selection story. I find that larger firms (where managers are likely to have smaller informational advantage over outside investors) experience smaller negative announcement returns, while firms with larger equity issues have more negative returns, although the coefficient on the issue size is not significant as in Mikkelson and Partch (1986). However, the empirical studies tend to underestimate the effect of the issue size on the announcement effect since firms with an unusually large negative price reaction can cut back on the size of the issue (Ritter (2003)). Importantly, the market reacts more favorably to the announcements of SEOs if the firm made large stock option grants during the previous fiscal year (Column 1).[19] For example, a one standard deviation increase in the value of option grants is associated with a 33.0% increase in the announcement return. Note that since regressions include a measure of the firm's investment opportunities (proxy for Q), it is unlikely that the option grants variable simply proxies for growth options. As argued by Jung, Kim, and Stulz (1996) and Barclay and Litzenberger (1988) firms with better investment opportunities should have a less negative price reaction to the announcement of equity issues because it is unlikely that SEO proceeds will be invested in negative NPV projects.[20] When I include the growth in net sales and stock returns prior to the announcement as additional proxies for investment opportunities, my empirical results are virtually unchanged (untabulated).[21] The

[19] Since 10-K forms that report information on stock option grants are typically released with a three-month lag, I use the prior year data whenever the firm announces an SEO during the three months following the fiscal year end.

[20] Denis (1994) documents that the positive relation between investment opportunities and stock price reaction to an SEO is limited to a subset of very small and young firms. He concludes that investment opportunities play, at best, a minor role in explaining cross-sectional distribution of equity offering announcement returns.

[21] My empirical results are very similar if I include managerial ownership in the regressions, with the ownership variable being insignificant. I do not report these results here since the sample

results are also robust to the omission of announcements made by utility firms (SIC 4900-4999) and/or banks and financial firms (SIC 6000-6999).

When I interact the option grants variable with the measures of information asymmetry, I find that the positive effect of option grants on announcement returns is larger when the information asymmetry is large. In particular, the coefficients on the interaction variables (new economy*option grants and volatility*option grants) are positive and significant (Columns 2 and 3). Notably, the information asymmetry variables themselves are also significant, with new economy firms and firms with high stock return volatility experiencing a larger price decline at the announcement of the SEO.[22]

The results are very similar when the cumulative abnormal returns are calculated with the market model using value-weighted and equally-weighted returns (Column 4). Overall, I confirm that, by granting employee stock options, a firm minimizes the adverse selection problem and has a better SEO outcome.

Next, I investigate the hypothesis that conditional on doing an SEO, firms that make considerable option grants to their employees can afford to make larger equity issues since they can get a more favorable price. The dependent variable in Table III is SEO proceeds normalized by the book assets. The coefficients on control variables are sensible. Firms with more growth opportunities, as measured by their market-to-book ratios, do larger SEOs, which can indicate that these firms issue equity to finance investment. I also find that highly levered firms have smaller equity issues. This result can be attributed to highly levered firms

size is smaller due to reliance on Execucomp for managerial data.

[22] These last results may also be consistent with the intuition provided by Fisher, Carlson, and Giammarino (2006) that riskier firms experience greater negative price reaction when their growth options are converted into assets in place.

being disadvantaged in terms of pricing of the issue and using an equity issue as a last resort. Alternatively, firms with high leverage may issue less equity because equity issuance makes the existing debt safer and thus transfers value from existing shareholders to bondholders.

Column 1 of Table III reports that, controlling for other determinants of SEO size, companies that make larger option grants make larger equity issues. For example, a one standard deviation in the value of stock option grants is associated with a 3.0% larger SEO, when the average SEO size is 24.6%. Although I control for the firm's investment opportunities and growth options by including research and development expenses, cash flow, and a proxy for Q, it still could be argued that firms with larger stock option grants are inherently different. To address this concern, I repeat the analysis in Table III with firm-fixed effects (untabulated) and find that results are very similar.

Since the adverse selection problem should be more severe, all else being equal, in firms where managers have a higher informational advantage over outside investors, I next analyze whether stock option grants affect the size of equity issue differentially in firms with high and low information asymmetry. I use several measures of information asymmetry: firm size, the volatility of stock returns, and a dummy variable indicating whether a firm is a new economy firm (see Ittner, Lambert, and Larcker (2003)). The results in Columns 2 through 4 confirm that for firms with larger information asymmetry, the size of the equity issue is particularly sensitive to employee stock option grants.

The theory also suggests that firms in or near financial distress may not greatly benefit from minimizing the adverse selection problem by granting stock options to their employees. Financially distressed firms tend to care less about their em-

ployees and even may engage in layoffs, so that they are less concerned about a potential employee backlash if stock returns do not live up to employees' expectations. I explore the empirical implications for financially distressed firms in Table IV. I proxy for financial distress by low past stock returns, low Q, high leverage, and low Altman's Z-score. The results in Table IV provide empirical support for my conjecture. In particular, I find that companies do not do larger SEOs following stock option grants if they are financially distressed.

Finally, I examine firms' option-granting behavior. The theory predicts that stock option grants should be larger in firms with high information asymmetry and that are not in financial distress; option grants should also follow high stock returns. The data lend strong empirical support to these predictions (see, e.g., Bergman and Jenter (2007) and Spalt (2008), among others). The empirical difficulty, however, is that similar empirical predictions may emerge from behavioral explanations. The fact that stock option grants increase following high stock returns may reflect that companies are trying to benefit from employee sentiment. For example, Bergman and Jenter (2007) argue that employee sentiment increases following high stock returns, and that firms can decrease compensation costs if employees cannot purchase similar securities in the open market. The results in Column 1 of Table V indicate that firms that have traded stock options also make considerably larger grants to their employees. The conclusions do not change if I only look at whether firms have traded stock options with a relatively long maturity (six months or longer) (see Column 2). In addition I document, that stock option grants only follow high stock returns if the company made significant option grants in the previous fiscal year (Columns 3 and 4). These empirical results are more consistent with the predictions of the theory than with behavioral

explanations since it is unclear why employee sentiment should depend on past grants.

The last set of results examines whether stock option grants and seasoned equity offerings are substitutes (Table VI).[23] Proposition 2 establishes that there exists a separating equilibrium where managers with positive information grant stock to their employees and managers with negative information conduct SEOs. However, for firms with large investment projects, it is also possible to have SEOs combined with equity-based grants to employees. Since the empirical tests for firms with large investment may be confounded, I first report the results for the full sample and then separately for a subset of firms with relatively small investment projects. Specifically, I define the moderate investment and small investment firms as firms where investment in capital expenditures in the fiscal year prior to an SEO did not exceed the value of the stock option grants and one half of the value of stock option grants, respectively. While I do not find a statistically significant negative relation between option grants and the probability of doing an SEO in the full sample (Column 1), the results from the firms with moderate and small investment provide support for my theory (Columns 2 and 3).

6 Conclusion

In this paper, I propose a new explanation for why employees may be efficient providers of capital to the firm. I argue that when managers have superior information about the firm, financing investment by issuing stock to employees can

[23] Unlike all other tables, where I include both year and industry-fixed effects, the estimation procedure in Table VI does not have industry-fixed effects since otherwise the generalized Hessian matrix is not positive definite.

mitigate the adverse selection problem even if employees are uninformed. I show that, in the separating equilibrium, a manager raises capital by issuing shares to public markets whenever she has negative information and to employees whenever she has positive information. When investment costs cannot be entirely financed by employees, a seasoned equity offering coupled with stock-based employee grants sends a more positive signal to the market than an offering without such grants.

Using data on broad-based stock option plans from Risk Metrics Group over the period 2000-2005, I find support for the theory. I document that the market reacts more positively to the announcements of SEOs if the firm has recently granted many employee stock options. Since option-granting companies can issue equity in the external market at higher prices, companies that grant a lot of stock options tend to do SEOs of larger size. This effect is particularly strong for firms with high information asymmetry that are not financially distressed. I also find the positive relation between past stock returns and new option grants (Bergman and Jenter (2007)) is present in the data only if the firm has recently made significant option grants. This evidence is consistent with rational employees discounting option grants more heavily if the privately informed manager granted them options previously and they performed worse than expected.

Appendix

Proof of Proposition 1:

The conjectured equilibrium strategy is to finance investment internally when the manager has positive private information, and through outside investors when she has negative private information. The proof proceeds as follows. First, I derive stock prices under different financing strategies. Second, I derive the equilibrium value to orginial shareholders when the manger has positive information and show that it is higher than the value under the deviation strategy. Third, I derive the equlibrium value to orignal shareholders when the manager has negative private information and show that it is higher than the value under the deviation strategy.

The stock prices in the high and low cash flow states conditional on stock grants to employees are

$$S_H^{int} = \frac{c + c_H + F - I - w}{N + n}, \quad S_L^{int} = \frac{c + c_L + F - I - w - k}{N + n}, \tag{5}$$

where N is the number shares of stock that are outstanding initially, n is the number of shares granted to employees, and w is the fixed wages of employees.

If the manager covers the financing gap $I + l - c$ by issuing m shares to outside investors, the stock prices in the high and low cash flow states are

$$S_L^{ext} = \frac{c_L + F}{N + m}, \quad S_H^{ext} = \frac{c_H + F}{N + m}. \tag{6}$$

Suppose that the manager has positive information. Since in equilibrium employees believe that the manager grants them stock when she has good information,

their participation constraint is

$$l \leq w + nS_H^{int}. \tag{7}$$

The expected equlibrium value of the firm conditional on positive information is

$$V^{int}(c_H) = NS_H^{int} = c + F - I - l + c_H. \tag{8}$$

If the manager deviates and finances investment by issuing shares to outside investors, investors believe that the information is negative and demand m shares of stock such that

$$I + l - c = mS_L^{ext}, \tag{9}$$

Solving for the number of shares that needs to be sold to outside investors yields

$$m = \frac{I + l - c}{c + c_L + F - I - l} N. \tag{10}$$

The expected value of the firm conditional on positive information and external financing is then

$$V^{ext}(c_H) = NS_H^{ext} = c + F - I - l + c_H - \frac{(I + l - c)(c_H - c_L)}{F + c_L}, \tag{11}$$

In order for the manager not to deviate, it must be that $V^{ext}(c_H) < V^{int}(c_H)$, which is always satisfied since $c_H > c_L$.

Now consider a situation when the manager has negative information. If the manager raises money for investment from outside investors, they demand the

number of shares given by (10).The expected value of the firm is then

$$V^{ext}(c_L) = NS_L^{ext} = c + c_L + F - I - l. \tag{12}$$

If the manager deviates and finances investment by issuing shares to employees, the expected value of the firm is

$$V^{int}(c_L) = NS_L^{int} = c + c_L + F - I - l - \frac{kN}{n+N} + \frac{n(c_H - c_L)}{n+N}, \tag{13}$$

In order for the manager not to deviate to financing investment through granting stock to employees when her private signal is negative, it must be that $V^{ext}(c_L) > V^{int}(c_L)$, or

$$k > \frac{n}{N}(c_H - c_L). \tag{14}$$

Since it is easier to satisfy condition (14) when n is small, I focus on the equilibrium when the firm issues the minimum number of shares n sufficient to finance the financing gap, i.e., such n that $c - I = w$. In this case,

$$k > \frac{(l + I - c)(c_H - c_L)}{c + c_H + F - I - l}. \tag{15}$$

Q.E.D.

Proof of Proposition 2:

Conditional on the stock issuance to the external market, investors believe that the manager has negative private information. In order to finance the investment cost I and the current period's compensation cost l when the current cash flow is

low, the firm has to sell a stake f to investors such that

$$fV_L = I + l - c_L, \tag{16}$$

where V_L is the expected value of the firm in the normal state conditional on negative inside information. The value of the firm to original shareholders is then

$$(1-f)\,V_L = V_L - I - l + c_L. \tag{17}$$

If the manager deviates and awards stock to employees in lieu of fixed wages, she can receive a higher price since employees wrongly infer that the manager has favorable information. Since the gain from misleading employees is bigger when the financing gap is large, I only need to establish that the manager does not deviate when the current cash flow is low. The largest cash wage a company can pay and still finance its investment is $w = c_L - I$.[24] The employees' participation constraint is then

$$\theta V_H + c_L - I = l, \tag{18}$$

where θ - is the fraction of the firm's stock granted to employees, and V_H is the expected value of the firm in the normal state conditional on positive inside

[24] In principle, any contract with a smaller fixed wage is feasible. I look at the contract with the largest possible wage, because in practice there may be additional disadvantage of equity-based compensation, such as employee risk aversion. In addition, a larger equity-based part requires a longer reversionary stage, so that the equilibrium is less efficient.

information. The value of the firm to original shareholders is then

$$(1-\theta)\left((1-q)\frac{c_H+F-I-l+\frac{V_L+V_H}{2}}{1+r}+q\frac{c_L+F-\frac{I}{2}-l}{1+r}\right) \tag{19}$$
$$+(1-\theta)\,q\left(\frac{\frac{c_L+c_H+F-I-2l}{2}}{(1+r)^2}+\frac{\frac{c_L+c_H+F-I-2l}{2}}{(1+r)^3}+...+\frac{\frac{c_L+c_H+F-I-2l}{2}}{(1+r)^N}\right)$$
$$+(1-\theta)\,q\left(\frac{\frac{c_H+c_L+F-2I-2l}{2}+\frac{V_L+V_H}{2}}{(1+r)^{N+1}}\right)$$

Given a negative signal, the probability of a high cash flow in the next period is $1-q$. In this case, the firm receives proceeds F from the previous investment, pays l in expected labor costs, and, since it continues to operate in the normal state, it makes investment I and has the remaining value of $\frac{V_L+V_H}{2}$. With a complementary probability q, the next period's cash flow turns out to be low, and the firm enters the reversionary state lasting for N periods. In the reversionary state, only managers with negative inside information invest, so that the expected investment cost is $\frac{I}{2}$, and the expected payoff from the previous investment is $\frac{F}{2}$ starting from the second period. After the firm emerges from the reversionary state in period $N+1$, it has the remaining expected value of $\frac{V_L+V_H}{2}$.

The manager with a negative signal does not deviate from the equilibrium strategy if (19)<(17). Intuitively, the benefit of deviating is the lower expected compensation cost for one period. The disadvantage of deviating is the increase in the probability that the firm would not be able to receive financing from employees at attractive terms in the future.

To find V_H and V_L explicitly, I need to write the recursive relation going forward:

$$V_L=\frac{qc_L+(1-q)\,c_H+F-I-l+\frac{V_L+V_H}{2}}{1+r}. \tag{20}$$

Expression (20) says that in the normal state the expected value of the firm conditional on a negative signal is equal to the discounted value of the next period's expected cash flow from assets in place $qc_L + (1-q)\,c_H$, less expected labor and investment costs $I + l$, plus the payoff from investment F and the remaining value $\frac{V_L+V_H}{2}$.

Similarly, I can write a recursive relation for V_H. The major difference is that if the manager's signal is c_H, the firm makes a grant of stock to employees and in the event of poor performance switches into the reversionary state.

$$\begin{aligned} V_H &= q\frac{c_H + F - I - l + \frac{V_L+V_H}{2}}{1+r} + (1-q)\,\frac{c_L + F - \frac{I}{2} - l}{1+r} \\ &+ (1-q)\left(\frac{\frac{c_L+c_H+F-I}{2} - l}{(1+r)^2} + \frac{\frac{c_L+c_H+F-I}{2} - l}{(1+r)^3} + ... + \frac{\frac{c_L+c_H+F-I}{2} - l}{(1+r)^N}\right) \\ &+ (1-q)\,\frac{\frac{c_H+c_L+F}{2} - I - l + \frac{V_L+V_H}{2}}{(1+r)^{N+1}}. \end{aligned} \tag{21}$$

Solving equations (20)-(21), I get the closed-form expressions for V_L and V_H:

$$V_L = \frac{C - AB + 2A\,(1+r)}{1 + 2r - B} \tag{22}$$

$$V_H = \frac{C + AB + 2Cr}{1 + 2r - B}, \tag{23}$$

where

$$A = \frac{qc_L + (1-q)\,c_H - l + F - I}{1+r},\ B = q + \frac{1-q}{(1+r)^N} \tag{24}$$

$$\begin{aligned} C &= \frac{qc_H + (1-q)\,c_L + F - I - l}{1+r} \\ &+ \frac{1-q}{1+r}\left(1 - \frac{1}{(1+r)^N}\right)\left(\frac{c_L + c_H + F - I - 2l}{2r} + \frac{I}{2}\right). \end{aligned} \tag{25}$$

Substituting (22) and (23) allows us to write explicitly the first necessary condition for the existence of the separating PBE:

$$\frac{F}{1+r} - I > \frac{\frac{c_H - c_L}{1+r}\left(1 - q + \frac{2r}{1-\frac{1}{(1+r)^N}}\right)}{\frac{q(C(1+2r)+AB)}{((1-q)\left(1-\frac{1}{(1+r)^N}\right)+2r)(l+I-c_L)(2q-1)}} - 1. \tag{26}$$

Condition (26) is automatically satisfied when the discounting rate r is small and when the reversionary state lasts for a long time. I next develop the specific conditions needed to rule out the possibility of pooling equilibria, in which both firms with negative and positive signals make investment by raising funds at the same price from outside investors. I conjecture that if instead of issuing stock to outside market, the manager attempts to grant stock to employees, their off-equlibrium beliefs are that the manager had a negative signal. The pooling equilibrium is not sustained whenever the firms with a positive signal are better off by forfeiting investment rather then selling part of the firm to new investors at discounted prices. Since a pooling equilibrium is more likely when the financing gap is small, I only need to consider the case when the current cash flow is high.

If pooling equilibria were possible, the decision to invest and raise funds from outside investors would convey no information to the market. The new investors would cover the financing gap of $I + l - c_H$ and demand a stake f of the firm such that

$$f\frac{\frac{c_H + c_L}{2} + F - I - l}{r} = I + l - c_H. \tag{27}$$

Note that $F - I$ enters because, in the pooling equilibrium, either type of firm invests in the future. The manager with a positive signal c_H is better off by

forfeiting investment rather than giving a stake f to new investors to finance the project if

$$(1-f)\,\frac{qc_H+(1-q)\,c_L+F-I-l+\frac{\frac{c_H+c_L}{2}-l+F-I}{r}}{1+r}< \qquad (28)$$
$$\frac{qc_H+(1-q)\,c_L-l-\frac{I}{2}+\frac{\frac{c_H+c_L}{2}-l+\frac{F-I}{2}}{r}}{1+r}+c_H-l.$$

Note that if the manager passes up the investment opportunity, the outside investors infer that the manager has positive information. Equivalently, condition (28) can be written:

$$\frac{F}{1+r}-I<\frac{(I+l-c_H)\,(2q-1)\,(c_H-c_L)}{(c_H+c_L+2F-2I-2l)\left(1+\frac{1}{2r}\right)\left(1+\frac{1}{r}\right)}. \qquad (29)$$

Next, I establish that if the manager possesses favorable inside information, she does not have incentives to float stock in the public market. I have already established that, given pooling valuation, the firm with positive information is better off by forfeiting investment. Conditional on equity issuance in the external market, outside investors believe that the manager has a negative signal and they value firm even lower than in the pooling equilibrium. Therefore, the firm must be better off by forfeiting investment than by issuing equity to outsiders. When the firm is in the reversionary state, employees have the same valuation for firm's stock as outsiders. In the reversionary state, the firm thus passes up the investment opportunity. However, in the normal state, conditional on stock grants to employees, employees believe that the manager has a positive signal. Since they accept the firm's stock at a fair price and the project has a positive NPV, the manager with favorable information invests by granting stock to the firm's employees.

Finally, since, unlike outside investors, employees cannot choose at which price to buy the firm's stock, one might question what it means that in the reversionary state employees value stock as if the manager has a negative signal. In particular, if the manager grants employees stock assuming a higher value, would it be a credible threat for employees to leave? I argue that if employees do not leave the firm in such a situation and accept stock by valuing it as if the manager has a positive signal, then both types of managers would find it optimal to grant stock to employees, and employees would earn less than l per period in expecattion. Hence, employees would be better off by quitting their jobs and working elsewhere. Similarly, if employees accept stock by valuing it as if positive and negative signals are equally likely, then the manager would grant stock to employees when the signal is negative and would forfeit the project when the signal is positive. In this case, employees would also be earning less than l per period, so it is a credible threat for them to leave.

To summarize, for the existence of a separating PBE, conditions (26) and (29) must be satisfied. *Q.E.D.*

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Table I. Summary Statistics.

Panels A and B report summary statistics for the full sample and the subsample of firms that do an SEO, respectively, during the period 2000-2005. The *Value-Weighted SEO CAR* is the three-day cumulative abnormal return around the filing date of an SEO, calculated using the market model with the value-weighted index. *Value of Grants* is the value of all stock options granted during the prior fiscal year calculated using the expected option life as disclosed in a firm's 10-K, the end-of-year stock price, the risk-free rate of 0.05, the dividend yield calculated from Compustat data, and the stock return volatility estimated on daily data over a previous fiscal year. *Leverage* is equal to short- and long-term debt divided over the book assets; SEO Proceeds/Assets is the dollar amount of proceeds from SEO during the year normalized by the book value of assets; *Fraction of Non-Executive Stock Options* is the fraction of the value of all stock options granted to employees, other than the top five executives; *Traded Options* is equal to one if the firm has stock options traded during the fiscal year of the grant, and zero otherwise.

Panel A: Full Sample (8,441 obs.)

Variable	Mean	St.Dev.	25%	50%	75%
Assets ($M)	13,394	61,550	564	1,662	5,896
Leverage	0.22	0.18	0.06	0.22	0.35
SEO Proceeds/Assets	0.015	0.110	0	0	0
Stock Return in the Past Year (%)	25.57	86.20	-16.25	10.36	42.62
Value of Grants/Assets	0.037	0.069	0.003	0.012	0.037
Value of Grants/Employee ($)	17,648	41,250	1,168	3,650	12,981
Fraction of Non-Executive Stock Options	0.842	0.184	0.802	0.895	0.955
Traded Options	0.717	0.450	0	1	1
Traded Options ($\geq$6 months)	0.544	0.498	0	1	1

Panel B: SEO Sample (550 obs.)

Variable	Mean	St.Dev.	25%	50%	75%
Assets ($M)	11,639	40,634	617	1,733	6,526
Leverage	0.31	0.19	0.18	0.34	0.45
SEO Proceeds/Assets	0.246	0.379	0.042	0.118	0.249
Stock Return in the Past Year (%)	30.28	114.79	-17.53	12.98	42.18
Value-Weighted SEO CAR (%)	-1.45	4.96	-3.96	-1.18	1.12
Value of Grants/Employee ($)	18,460	43,774	939	3,389	11,259
Fraction of Non-Executive Stock Options	0.821	0.218	0.794	0.888	0.954
Traded Options	0.640	0.480	0	1	1
Traded Options ($\geq$6 months)	0.438	0.497	0	0	1

Table II. Announcement Returns at Seasoned Equity Offerings.

The dependent variable is the three-day cumulative abnormal return (CAR) centered on the filing date of a seasoned equity offering. The CARs in columns 1-3 (4) are calculated using the market model with the value-weighted (equally-weighted) returns as a market portfolio, and the beta is estimated over the period of -250 to -60 trading days prior to the announcement. Grants/employee is the value of all stock options granted during the prior fiscal year divided by the number of employees in the firm. The value of stock option grants is calculated using the expected option life as disclosed in a firm's 10-K, the end of year stock price, the risk-free rate of 0.05, the dividend yield calculated from Compustat data, and stock return volatility calculated using daily data over a year preceding stock option grant. *Cash Flow* is equal to the sum of income before extraordinary items and depreciation and amortization expenses, all normalized by the book assets; Q is equal to the market capitalization plus book assets minus book equity and deferred taxes, divided by the book assets. The estimation includes year fixed-effects and industry fixed-effects. T–statistics based on robust standard errors clustered by firm are listed in parentheses.

	(1)	(2)	(3)	(4)
Ln(1+Grant/emp)	0.002**	0.002**	-0.002	0.002**
	(2.50)	(2.21)	(-1.02)	(2.31)
New Econ*Ln(1+Grant/emp)		0.020*		
		(1.83)		
Volatility*Ln(1+Grant/emp)			0.011**	
			(2.33)	
Intercept	-0.072***	-0.066***	-0.030	-0.057**
	(-2.71)	(-2.72)	(-0.97)	(-2.29)
SEO Proceeds/Assets	-0.018	-0.020	-0.022	-0.019
	(-0.92)	(-1.05)	(-1.12)	(-1.00)
Ln(Assets)	0.006***	0.006***	0.007***	0.006**
	(2.72)	(2.77)	(2.76)	(2.47)
Cash Flow/Assets	0.013	0.016	0.028	0.024
	(0.45)	(0.55)	(0.93)	(0.85)
Q	-0.000	-0.001	-0.001	0.000
	(-0.05)	(-0.27)	(-0.36)	(0.00)
New Economy		-0.207*		
		(1.92)		
Volatility			-0.101**	
			(-2.37)	
Adjusted-R^2	0.051	0.081	0.062	0.052
Observations	489	489	487	489

Table III. SEO Size, Option Grants, and Asymmetric Information.

The dependent variable is the proceeds from a seasoned equity offering normalized by the book assets. *Grant/emp* is the value of all stock options granted during the prior fiscal year divided by the number of employees in the firm. *Cash Flow* is equal to the sum of income before extraordinary items and depreciation, normalized by the book assets; *Q* is equal to the market capitalization plus book assets minus book equity and deferred taxes, divided by the book assets; *Leverage* is equal to short- and long-term debt, divided by the book assets; *R&D/Assets* is equal to research and development expenses, divided by the book assets; *Volatility* is the stock return volatility estimated over the previous fiscal year; *New Economy* is defined as in Ittner, Lambert, and Larcker (2003). The estimation includes year fixed-effects and industry fixed-effects. *T*–statistics based on robust standard errors clustered by firm are listed in parentheses.

	(1)	(2)	(3)	(4)
Intercept	0.418***	0.593***	0.416***	-0.125
	(4.44)	(4.73)	(4.71)	(-0.72)
R&D/Assets	-0.278	-0.502	-0.324	-0.469
	(-0.60)	(-1.03)	(-0.67)	(-0.99)
Ln(Assets)	-0.056***	-0.051***	-0.056***	0.013
	(-7.42)	(-6.77)	(-7.62)	(0.67)
Cash Flow/Assets	-0.058	0.040	-0.055	-0.030
	(-0.34)	(0.23)	(-0.32)	(-0.17)
Q	0.084***	0.078***	0.081***	0.080***
	(6.23)	(5.98)	(6.34)	(5.95)
Leverage	-0.280***	-0.278***	-0.245***	-0.292***
	(-3.92)	(-3.44)	(-3.42)	(-3.53)
Volatility		-0.466**		
		(-2.50)		
New Economy			-0.755***	
			(-2.64)	
Ln(1+Grant/emp)	0.011***	-0.018**	0.008**	0.077***
	(2.73)	(-2.19)	(2.28)	(3.41)
Volatility*Ln(1+Grant/emp)		0.068***		
		(2.92)		
New Econ*Ln(1+Grant/emp)			0.077***	
			(2.55)	
Ln(Assets)*Ln(1+Grant/emp)				-0.008***
				(-3.21)
Adjusted-R^2	0.595	0.619	0.608	0.606
Observations	495	495	495	495

Table IV. SEO Size, Option Grants, and Financial Distress.

The dependent variable is the proceeds from a seasoned equity offering normalized by the book assets. *Grant/emp* is the value of all stock options granted during the prior fiscal year divided by the number of employees in the firm. *Cash Flow* is equal to the sum of income before extraordinary items and depreciation, normalized by the book assets; *Leverage* is equal to short- and long-term debt, divided by the book assets; *Distress* is equal to one if Altman's Z-score is below 1.8, and zero otherwise; *Past Return* is the stock return over the previous fiscal year. The estimation includes year fixed-effects and industry fixed-effects. T–statistics based on robust standard errors clustered by firm are listed in parentheses.

	(1)	(2)	(3)	(4)
Intercept	0.269**	0.467***	0.507***	0.693***
	(2.50)	(3.72)	(5.21)	(7.68)
R&D/Assets	-0.334	-1.003**	-0.272	-0.347
	(-0.71)	(-2.09)	(-0.58)	(-0.76)
Ln(Assets)	-0.056***	-0.076***	-0.058***	-0.059***
	(-7.60)	(-6.63)	(-7.63)	(-8.63)
Cash Flow/Assets	-0.078	0.017	-0.014	0.144
	(-0.46)	(0.09)	(-0.08)	(0.76)
Q	0.081***	0.099***	0.080***	-0.108***
	(6.16)	(7.96)	(6.10)	(-2.91)
Leverage	0.346**	-0.270***	-0.273***	-0.247***
	(1.99)	(-3.61)	(-3.99)	(-4.07)
Ln(1+Grant/emp)	0.030***	0.018***	0.006*	-0.017***
	(3.84)	(2.87)	(1.64)	(-3.47)
Distress		0.212***		
		(3.71)		
Past Return			-0.175***	
			(-3.85)	
Leverage*Ln(1+Grant/emp)	-0.072***			
	(-3.53)			
Distress*Ln(1+Grant/emp)		-0.021***		
		(-3.01)		
Past Ret*Ln(1+Grant/emp)			0.017***	
			(3.76)	
Q*Ln(1+Grant/emp)				0.018***
				(5.17)
Adjusted-R^2	0.606	0.643	0.609	0.626
Observations	495	306	495	495

Table V. Stock Option Grants and Employee Sentiment.

The dependent variable is the natural logarithm of one plus the value of all employee stock options granted during a fiscal year divided by the number of employees in the firm. *Traded Options* is equal to one if the firm has stock options traded during the grant year, and zero otherwise; *Traded Options ($\geq$6 months)* is equal to one if the firm has stock options with maturities of six months or longer traded during the grant year, and zero otherwise; Q is equal to the market capitalization plus book assets minus book equity and deferred taxes, divided by the book assets; *R&D/Assets* is equal to research and development expenses, divided by the book assets; *Long-term Debt Dummy* is equal to one if the firm has long-term debt, and zero otherwise; *Past Grants<50% (Past Grants<25%)*is equal to one if the stock option grants in the previous fiscal year were below the sample median (the 25th percentile), and zero otherwise; *Volatility* is the stock return volatility estimated over the previous fiscal year; *New Economy* is defined as in Ittner, Lambert, and Larcker (2003); *Past (Contemporaneous) Return* is the stock return over the previous (current) fiscal year. The estimation includes year fixed-effects and industry fixed-effects. T–statistics based on robust standard errors clustered by firm are listed in parentheses.

	(1)	(2)	(3)	(4)
Traded Options	0.504***			
	(5.84)			
Traded Options (≥6 months)		0.310***	0.183***	0.232***
		(4.10)	(2.72)	(3.53)
Past Return	0.091***	0.082***	0.030	0.051**
	(3.89)	(3.45)	(1.15)	(1.99)
Contemporaneous Return	0.222***	0.208***	0.352***	0.339***
	(7.32)	(6.84)	(8.07)	(7.76)
Past Grants<50%			-1.701***	
			(-22.75)	
Past Grants<25%				-1.744***
				(-17.86)
Past Grants<50%*Past Return			-0.163**	
			(-2.03)	
Past Grants<25%*Past Return				-0.371***
				(-2.95)
R&D/Assets	6.997***	6.932***	4.477***	6.413***
	(9.20)	(9.05)	(6.47)	(8.72)
Ln(Assets)	0.034	0.048*	0.037	0.030
	(1.31)	(1.80)	(1.57)	(1.30)
Q	0.330***	0.334***	0.258***	0.280***
	(16.45)	(16.49)	(12.72)	(12.96)
New Economy	0.976***	0.992***	0.574***	0.770***
	(6.77)	(6.81)	(4.74)	(5.86)
Volatility	1.227***	1.286***	0.829***	1.005***
	(6.57)	(6.87)	(4.63)	(5.55)
Long-term Debt Dummy	-0.163	-0.163	-0.031	-0.099
	(-1.44)	(-1.43)	(-0.30)	(-0.98)
Constant	5.541***	5.615***	7.323***	6.800***
	(17.07)	(17.22)	(23.52)	(22.91)
Adjusted-R^2	0.380	0.643	0.609	0.609
Observations	7,481	7,481	5,984	5,984

Table VI. Logistic Model of SEO Announcements.

The dependent variable takes the value of one if the firm announces an SEO during a fiscal year, and is equal to zero otherwise. *Grant/emp* is the value of all stock options granted during the prior fiscal year divided by the number of employees in the firm. *Cash Flow* is equal to the sum of income before extraordinary items and depreciation, normalized by the book assets; *Q* is equal to the market capitalization plus book assets minus book equity and deferred taxes, divided by the book assets; *Leverage* is equal to long-term debt divided by the book assets; *Past Return* -1 to 0 (-2 to -1) is the stock return over the fiscal year directly preceding SEO announcement (the fiscal year before); *Sales Growth* is the percentage growth in net sales, estimated over the previous fiscal year. *Moderate Investment* refers to all firm-years where the capital expenditures in the previous fiscal year were smaller than the value of employee stock option grants. *Small Investment* refers to all firm-years where the capital expenditures in the previous fiscal year were smaller than one half of the value of employee stock option grants. The estimation includes year fixed-effects. *T*–statistics based on robust standard errors clustered by firm are listed in parentheses.

	Full Sample	Moderate Investment	Small Investment
Ln(1+Grant/emp)	-0.059	-0.143**	-0.191**
	(-1.63)	(-2.15)	(-2.42)
Ln(Assets)	0.076*	-0.007	-0.080
	(1.67)	(-0.10)	(-0.93)
Past Return Year -2 to -1	0.146***	0.035	0.017
	(3.27)	(0.51)	(0.20)
Past Return Year -1 to 0	0.356***	0.395***	0.372***
	(6.14)	(5.59)	(4.64)
Cash Flow/ Assets	-1.979***	-2.044***	-1.363*
	(-3.42)	(-2.72)	(-1.64)
Leverage	1.740***	0.356	-0.067
	(4.87)	(0.67)	(-0.10)
Sales Growth	1.228***	1.378***	1.484***
	(7.72)	(5.59)	(4.68)
Q	-0.081	-0.095	-0.096
	(-1.61)	(-1.53)	(-1.30)
Constant	-5.092***	-3.867***	-3.731***
	(-10.79)	(-3.72)	(-2.79)
Observations	7,626	2,351	1,488