

**CEO INCENTIVES AND MERGER ACTIVITY IN THE 1990s:
STOCK OPTIONS AND REAL OPTIONS**

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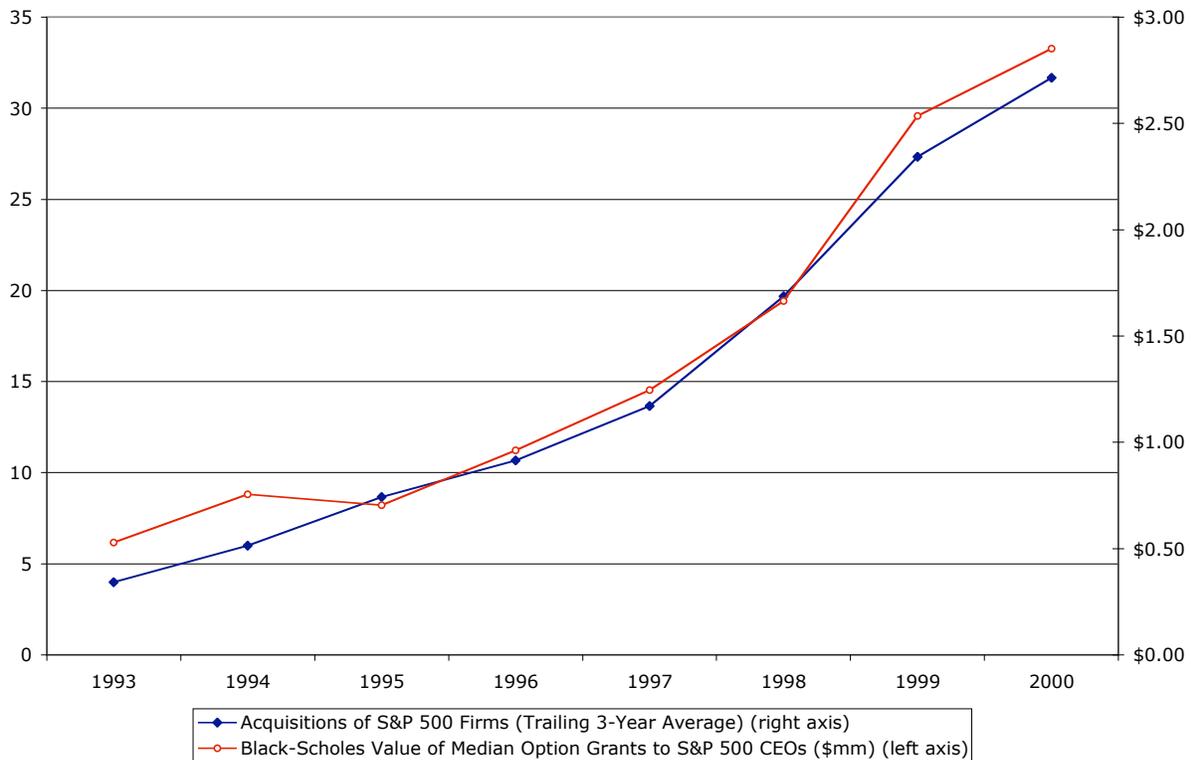
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The motivation for this paper was a common observation: the 1990s were characterized by strong growth in both merger and acquisition (M&A) activity among large US public companies and the use of stock and option compensation for senior executives of those same companies. One percent of companies in the S&P 500 were acquired in 1993; by 1999, more than five percent of the S&P 500 were acquired. In 1993, the median Black-Scholes value of new stock option grants to CEOs in the S&P 500 was \$530,000, and the median value of those CEOs' stock ownership was \$6.1 million; by 2000, CEO option grants and stock holdings had grown to \$2.9 million and \$13.4 million, respectively. A simple story jumps out of **Figure 1**: perhaps the greatest M&A boom in world history was at least partly caused by increased use of stock and option compensation.

Figure 1. CEO Option Grants and Acquisitions of S&P 500 Firms 1993-2000



This conjecture has become common among legal academics. Kahan and Rock (2002), for example, view stock and option compensation as one of the “adaptive devices” by which market forces responded to the demise of hostile takeovers at the end of the 1980s to mitigate the agency costs that might be expected to grow in the absence of takeover bids.¹ In this paper, we formalize the intuition in that story and test it against the evidence.

¹ See also Arlen (2002); Booth (2000); Coates (2000); Gordon (2000); Kraakman (2002); Roe (2002).

Our preliminary findings are three. First, the simple motivating story is simply wrong. At overall and annual cross-sectional means and medians, neither stock nor option grants to CEOs, nor the stock or option holdings of CEOs, correlate positively and significantly with acquisitions of S&P 500 firms. In fact, by some measures, both CEO share holdings (at mean and median, measured in value or in percent) and CEO option holdings (average intrinsic value of options) were actually lower for target firms than for non-target firms. In our regression analysis, the statistically significant estimated effects of stock options “predict” that the average effect of CEO stock option holdings was actually to *reduce* deal activity by about 18%, and that the median change in CEO stock option holdings from 1993 to 2000 was a wash for M&A. Thus, our going-in intuition that the direct incentive effects of stock options help explain the 1990s deal wave is rejected by the data. Only 5 to 10% of the variation in acquisition incidence can be explained by variation in CEO-compensation or related variables, whether in pooled logit, annual logit, and proportional hazard regression models.

Second, the simple motivating story is not just a false aggregate correlation that we ignore, like sunspots corresponding to the business cycle. CEO compensation trends in the 1990s do appear to have had effects on the market for corporate control, but the effects were more complicated and interesting than the aggregate trends suggest. Although the net direct effects of options seems to be negative, stock options did increase the odds that some companies would be acquired, while decreasing the odds (by more) for others; for most, the effects of increased stock options were a wash.

Why didn’t stock options have the more intuitive direct effect on deals? The effects of options turn out to be complicated by at least two sets of factors: “real option” effects, and ownership effects. A CEO has a “real” option of choosing to sell the company at any point in time, and a sale today eliminates his ability to sell in the future. For many firms, this “embedded” option appears to be stronger than the incentive that stock options create to sell today. Consistent with option theory, this real option is strongest when the variance in the benefits a CEO can expect to receive by selling in the future is high, either because of volatility in his company’s stock, or because of variance in his compensation as CEO. We not only find evidence that stock price volatility and compensation variance correlate with deals, but also find that only when such measures are considered do stock options have any robust, positive effect on deal incidence in the data.

Stock options can also increase stock ownership, and ownership can entrench as well as improve incentives. CEOs who own significant amounts of their companies’ stock (CEO-owners) appear to pay themselves differently from CEOs who are not CEO-owners. Ownership also correlates with wealth, and wealth can be expected to change preferences for risk and liquidity, which in turn affect a CEO’s incentives to sell his company. We find evidence consistent with each of these ownership effects.

Third, unlike stock options and stock holdings, golden parachutes have no value unless a deal occurs; and (consistent with evidence from the 1980s), we find that in fact they strictly increase deal odds, even parachutes that have been in place for more than a year, but (somewhat counterintuitively) only for CEOs that own significant (0.8+%) stakes in

their firms. Conversely, high “flows” of compensation typically disappear once a firm is sold, and provide no deal-related benefit (except by increasing the value of golden parachutes). We find that CEOs receiving abnormally high compensation are less likely to sell their companies than other CEOs. Both findings are relatively straightforward implications of traditional agency-cost models of large-firm CEO behavior, and are thus in some sense reassuring. Less straightforwardly, it is here that option grants appear to have made an indirect contribution to the deal wave, by (famously) increasing the amount and variance in annual CEO compensation while (less obviously) cutting the percent of CEOs receiving compensation that was abnormally high relative to other large-firm CEOs, overall or by industry. These trends substantially shrank the percent of large-firm CEOs receiving *atypically* large annual payouts relative to peer CEOs, and thus (we suggest) relative to the expected paychecks at their next-best jobs. The option-driven compensation boom thus had the counterintuitive effect of reducing the *number* of CEOs who would view job loss with special alarm. Finally, we also find some evidence consistent with an “insider trading” story, in which CEOs who intend to sell the company hold onto more shares in the period prior to the sale in order to profit from the deal premium.

As with our findings on the direct effects of stock options, these findings only make marginal contributions to explanations of the 1990s deal wave overall: the increase in golden parachutes in the S&P 500 during the 1990s was minimal, and the net contributions of these incentives was to increase deal odds by 0.9% (compared to an overall average deal rate of 3.4%).

The remainder of this paper is organized as follows. Section 2 reviews prior research on managerial incentives and deal activity. Section 3 contains our theoretical approach to the problem of modeling the relationship between managerial incentives and deal activity, with a focus on modeling difficulties not previously noted in the literature. Section 4 describes our sample, discusses summary statistics and analyzes the data with simple mean and median comparisons. Section 5 uses regression analysis to relate managerial incentives on deal activity, focusing on the effects of stock options. The paper then concludes.

1. Literature Review

a. CEO Incentives – Theory

What has become the “standard model” (Hansmann & Kraakman (2001)) of large public companies analyzes potential conflicts between a corporation’s principals (shareholders) and its agents (managers) (e.g., Jensen & Meckling (1976), Fama (1980), Fama & Jensen (1983)). Jensen and Meckling suggest these conflicts are inherent in modern businesses and are reflected in market valuation of firms. They also claim that manager-shareholder conflicts diminish as managers own a larger fraction of a firm’s stock. As discussed below, subsequent theory has challenged the logic of this claim.

Manager-shareholder conflicts are acute in the context of a potential sale of the company. If measured against pre-deal market prices, target shareholders on average benefit enormously from a sale, realizing abnormal returns consistently in excess of 30% over the past twenty years (e.g., Coates (2000), Jarrell, Brickley & Netter (1988), Jensen & Ruback (1983)). Target managers, by contrast, lose expected future compensation, firm-specific human capital, and private benefits of control (psychic and pecuniary). On the other hand, target managers may benefit from golden parachutes or other payments from the target or the acquiror, and – the focus of this paper – target managers gain along with other shareholders to the extent of their stock and options.

Prior theoretical literature regarding the relationship between manager-shareholder conflicts and the sale of the company has focused on hostile takeovers and golden parachutes. Jensen (1988) and Harris (1990) argue that parachutes mitigate potential salary losses in the event of a hostile takeover, and thus should increase deal incidence, and Knoeber (1986) and Berkovitch and Khanna (1991) argue that parachutes assure managers that deferred compensation (or firm-specific capital) will not be captured by opportunistic hostile bidders, and thus should decrease resistance to hostile bids. Choi (2001) argues that parachutes can shift some of the cost of compensating an executive to a bidder, allowing targets to pay executives less in non-sale states of the world.²

To the extent managers control the incidence of negotiated (“friendly”) deals, the foregoing theory implies that deal incidence will relate positively to manager stock ownership and the presence of golden parachutes, and negatively to the level of manager compensation. However, because the incidence of apparently “friendly” deals is in part a function of unobservable “hostile” pressure, see Schwert (1999), or shareholder activism, manager ownership may also reduce the incidence of such deals. One line of theoretical literature relates manager ownership to the effect of hostile takeovers on firm value. In Stulz (1988), firm value depends on takeover odds and takeover premia: if manager control of voting rights is low, odds of a takeover are high, but the premium offered will be low; if managers control more voting rights, takeover odds fall, but expected premia increase. Ownership structure would thus affect firm value in a non-linear fashion.³

b. CEO Incentives – Empirical

Prior empirical research relating M&A to manager incentives dates from (or studies samples drawn from) the 1980s, and thus focuses on factors salient in that period: manager ownership of stock (as opposed to stock options), and golden parachutes, particularly in the context of hostile bids. Mikkelsen and Partch (1989) find that low manager ownership is associated with a higher probability of receiving a hostile takeover bid, and Song and Walkling (1993) find that targets of hostile takeover bids have lower ownership than industry averages, or matched non-targets, and that manager ownership is positively related to target stock returns around bid announcements. Cotter and Zenner

² On the other hand, Gompers et al. (2002) note that golden parachutes increase the cost to bidders of changes of control and argue that the primary effect of golden parachutes is to reduce the ability of shareholders to impose a penalty on underperforming managers by firing them in a takeover.

³ Cf. Demsetz (1983) (predicting no relation between ownership structure and value).

(1994) find that (conditional on a tender offer) manager ownership is positively related to tender offer completion rates. Hadlock, Houston and Ryngaert (1999) find that for a sample of bank acquisitions, banks with higher manager ownership are less likely to be acquired.

Machlin, Choe and Miles (1993) find that parachutes increase the odds of an acquisition, and Lambert and Larcker (1985) find a positive stock price reaction to the adoption of parachutes. Narayanan and Sundaram (1998) find that managers of firms that adopt parachutes do not thereafter reduce firm value in the hope of attracting an acquisition, and Knoeber (1986) finds that the presence of a parachute is inversely related to manager ownership, whereas Daley and Subramaniam (1995) present evidence that entrenched managers get parachutes to shield themselves from market discipline. Lefanowicz, Robinson and Smith (2000) study a sample of deals from 1980-1995, and find that (conditional on a deal), deal-induced changes in manager wealth overall (including those relating to salary, stock holdings, and parachutes) increase target stock returns, that the presence of parachutes reduces this effect for a given level of manager incentives, and that the level of parachute payments has no effect on target stock returns. Cotter and Zenner (1994) study a sample of tender offers in the period 1989-1990, and find that (conditional on such an offer) bid-induced changes in manager wealth overall decrease the odds of manager resistance, but increase the odds of bid completion, and that manager resistance increases manager gains, but not target stock returns.

More recent work has shifted to the study of managerial incentives in the context of the negotiated deals. Hartzell, Ofek and Yermack (2000) examine a sample of M&A transactions from the 1990s and find that CEOs receive large “gratuitous” payments by targets at the time of a sale. They find that in 27% of their sample deals, target CEOs receive a special cash payment at the time the target board approves the deal, and that 12% of CEOs with a pre-existing parachute also get an increased payout at the time the target board approves the deal. They also find that deals in which target CEOs get such payments include lower deal premia, suggesting that target CEOs trade-off private benefits for deal price in negotiations.

On the question of whether manager ownership affects firm value, the evidence is mixed. Demsetz and Lehn (1985) found no relationship between ownership structure and accounting profit rates, but the Stulz model of entrenchment discussed above was supported in Morck, Shleifer and Vishny (1988),⁴ who found in the Fortune 500 a curvilinear relationship between manager ownership and firm value, with Tobin’s Q rising as board ownership increases from 0 to 5%, falling from 5 to 25%, and then rising slightly thereafter, a pattern corroborated for a cross-section of U.S. firms from 1935 by Holderness, Kroszner, and Sheehan (1999).⁵

⁴ See also Wruck (1989) (finding the Morck et al. inflection points affect stock market reactions to announcements of private placements of equity by public companies) and Barclay & Holderness (1989) (finding the Morck et al. inflection points affect the premiums over small block market prices at which 5+% blocks trade).

⁵ McConnell and Servaes (1990) use a larger sample than Morck et al. and find an inverted U-shaped relation between Q and manager ownership, with an inflection point between 40% and 50%. Hermalin and

More recently, Himmelberg, Hubbard and Palia (1999) study firms randomly selected from Compustat and show that a large portion of the cross-sectional variation in managerial ownership from 1985 to 1992 can be explained by unobserved firm heterogeneity. They demonstrate that after controlling for observed firm characteristics and firm fixed effects (which proxy for unobserved firm characteristics that are invariant over time), differences in managerial ownership cannot be said to affect firm performance. Instead, they conclude (*a la* Demsetz), manager ownership is endogenous to a firm's contracting environment. Himmelberg et al.'s sample consists, however, predominantly of firms that are much smaller than the firms studied by Morck et al. It is plausible that the problem of endogeneity is less serious in samples of larger firms. In very large firms, shareholders face greater coordination costs and thus have less ability to directly influence manager ownership or other agency-cost constraints in very large firms, and such firms are less likely to have faced capital market constraints in the recent past. For such firms, adjustment of ownership levels to maximize firm value may be less likely than in smaller firms, and deviations in the value/ownership relationship could arise and persist. Cf. Bebchuk, Fried & Walker (2002).

c. Deal Activity – Empirical

Models of deal activity remain primitive. Mitchell and Mulherin (1996) write of the “relatively meager understanding of the dynamics of takeover activity,” and no model has yet to explain more than a modest part of the variation in deal incidence. Palepu (1985) critiques work prior to that date and concludes by noting that the explanatory power of his empirical model in explaining deals in the 1970s, like prior models, was “quite small.” Work since then has only complicated things further: Ambrose and Megginson (1992) are unable to replicate several of Palepu's findings on a different sample of firms from the 1980s, and few firm-specific variables have been found to consistently predict deals over time.

The few target-specific variables found to have statistically significant (if weak and inconsistent) relationships with acquisitions in the 1980s were variables measuring (1) performance (negatively related), such as Tobin's Q, market/book ratios, stock market returns, and return on assets, whether raw or industry-adjusted; (2) size (negatively related), such as logged book value of assets, logged sales, and logged market capitalization; (3) growth (negatively related), such as percent change in sales; and (4) leverage (negatively related), such as debt/equity ratios. Other studies have focused on more unusual firm-specific factors, such as the deal-inducing role of prior acquisitions badly received by the stock market (Mitchell and Lehn, 1990) or prior conglomerate acquisitions (Bhagat, Shleifer and Vishny, 1990).

Weisbach (1991) analyze 142 NYSE firms and find that Q rises with ownership up to a stake of 1%; the relation is negative in the ownership range of 1-5%, is positive in the range of 5-20%, and negative over 20%. Kole (1995) examines differences in data sources used and concludes that differences in firm size can account for reported differences between those studies.

In addition, industry variables have been found to have effects separate from or in addition to firm-specific variables, e.g., Morck, Shleifer and Vishny (1989), Powell (1997), and Mitchell and Mulherin (1996) found that economic, technological and legal “shocks” caused M&A to cluster by industry in relatively short one- to three-year windows of activity during the 1980s. Golbe and White (1988) document and Brealey & Myers (1996) note the “puzzling” fact of “merger waves” – that deals cluster in time and that aggregate deal activity has a positive relationship with stock market performance. Daines (2001) finds that firms incorporated in Delaware experience more bids than firms incorporated in other states, up through 1995. Few other published articles have modeled deal incidence in the 1990s.

This paper adds to prior research in three principal ways. First, we focus on the role of option grants and option holdings in determining manager incentives in the sale-of-company context, rather than on golden parachutes, although we examine their role as well. Second, we study the trade-offs that CEOs make over time – the “real option” of retaining control now in order to sell out later – something neither modeled nor empirically studied in prior writing. Third, we update prior work from the 1980s – a period in which hostile takeovers were prominent, and stock options relatively unimportant – to the 1990s – when “friendly” sales displaced hostile bids and stock options rapidly overtook cash as the dominant portion of a CEO’s pay. Unlike Hartzell et al., who study a sample of deals, we study a sample of companies, a strategy that allows for a direct estimation of the effect of manager incentives on deal incidence, and addresses the possibility that manager incentives in companies that are acquired differ from incentives in companies generally. As with Morck et al., we focus on companies in which manager-shareholder conflicts are likely to be greatest (very large companies).

2. Managerial Incentives and Deal Activity

Simply put, our hypothesis is that the financial incentives of the CEO of a potential acquisition target bear importantly on whether a company becomes an actual target of a friendly acquisition.⁶ In particular, we expect that a company’s probability of becoming an acquisition target increases with the difference between the value of a deal’s payouts to the CEO, on the one hand, and the value of the CEO’s future compensation in an independent company on the other. Although this hypothesis is intuitively plausible (at least to us), the right methodology for testing it is less obvious. In this section, we model financial payouts to managers who might influence the sale of a company, in order to frame the relationships we would expect to find between the incidence of deals and the manager compensation variables that we can observe.

To restate our hypothesis symbolically, the sale incentive, “SI,” of a CEO or other manager is the difference in her risk-adjusted returns between selling her company and maintaining its independence; that is,

⁶ We do not model or study the effect of stock or option compensation or holdings on CEO incentives to make acquisitions, and exclude transactions in which there is no clear acquiror (so-called “mergers of equals”) so as to focus just on the effects of CEO incentives on the sale of the CEO’s company.

$$SI = \text{comp}_{\text{acq}} - \text{comp}_{\text{ind}}$$

a. The components of comp_{acq}

Comp_{acq} has four principal components, of which three are observable and relatively easy to estimate.

Stock premiums. The first component of comp_{acq} comes directly out of the agency theory discussed above: CEOs that own stock in their own company can liquidate of at a premium price in a acquisition transaction. Although very large stock holdings can also increase a manager's payouts from retaining her firm's independence (as we discuss below), we expect the first-order effect of stock ownership for most CEOs of very large companies to be the opportunity to capture a deal premium on their shareholdings, because median CEO holdings in our sample (~0.15%) represent too small a fraction of a firm's voting power to provide much of an entrenchment effect. Deal premiums will be most attractive when a company's stock price is highly risky, where a CEO is highly risk-averse, or where a CEO has most of his financial and human capital tied up in her company.⁷

Options and option premiums. The second of these components – a manager's returns from exercising her stock options – is similar. Multiyear option plans generally allow options to vest and become exercisable upon a change of control. Thus, a deal to sell the company permits target managers to collect the difference between the strike prices of their options and the price of company's shares, inflated by the deal premium.⁸

Deal-contingent payments. The third observable component of comp_{acq} includes a range of other contingent payouts to top managers that become more valuable if the company is sold than if it is not (**chute**). Two important examples in our analysis are golden parachute contracts and severance packages that are in place prior to the negotiation of deals. For the vast majority of firms that have golden parachutes, incentives created by the tax law and reinforced by board-level compensation norms result in the value of **chute** being equal to three times a CEO's highest direct compensation over the past 3-5 years (**tdcmax**).⁹

⁷ Deal premiums are also attractive for another reason: some stock owned by CEOs is "restricted," and cannot be sold until set time- or performance-based vesting schedules are satisfied, but these restrictions generally lapse in the event of a change in control. However, we lack data on the amount or nature of restrictions on CEO stockholdings.

⁸ As with stock, a deal is also advantageous in that it reduces the risk associated with the option, by eliminating any vesting period (during which the CEO could lose his job). Again, we lack data on vesting schedules.

⁹ Another type of deal-contingent incentive are those negotiated at the time of the deal, such as payments on consulting contracts or agreement to assist with the post-deal transaction (sometimes called "deal sweeteners"). To the extent these contemporaneous payouts are anticipated prior to deal negotiations or play a make-or-break role in negotiations themselves, we class them as deal incentives on par with

Alternative direct compensation. In addition to these observable components of comp_{acq} , at least one important component is unobservable. This is “alternative direct compensation,” or the compensation that target managers expect to receive in other employment, after their firm is acquired. A manager’s expectations about her likely level of compensation in her next-best employment opportunity cannot easily be measured. We can, however, make a ballpark guess about its order of magnitude. Thus we can substitute a placeholder for this variable using the thin information that we have. We can safely assume that the vast majority of CEOs are likely to earn less in alternative employment than they currently earn, but that this amount will nonetheless correlate with their current earnings (because they will retain their general expertise and managerial ability) and with other variables that correlate with current earnings for CEOs of similar firms (because other CEOs’ compensation will set the market price for managerial services at other firms). Thus we can estimate alternative direct compensation by first estimating current compensation (using our full data set) ($\text{comp}_{\text{predicted}}$), and then using the difference between $\text{comp}_{\text{predicted}}$ and actual observed compensation (tdc) as a measure of how much of a reduction the CEO will expect in direct compensation following the sale of the company. We also hypothesize that CEOs are more likely to retire as they get older, whether in their current or next best job, which implies that the present value of alternative direct compensation is likely to decline as CEOs get older.

Summing the observable components of comp_{acq} and our crude estimate of alternative future compensation yields the following expression:

$$\text{comp}_{\text{acq}} = \begin{aligned} & n_{\text{opt}}(p_{\text{acq}} - p_{\text{exc}}) + \\ & n_{\text{shr}}(p_{\text{acq}} - \text{risk} * p_{\text{mkt}}) + \\ & \text{chute [i.e., } 3 * \text{tdcmax]} + \\ & \min(\text{comp}_{\text{predicted}}, \text{tdc}) / \Delta \text{age} \end{aligned}$$

where “ $n_{\text{opt}}(p_{\text{acq}} - p_{\text{exc}})$ ” and “ $n_{\text{shr}}(p_{\text{acq}} - p_{\text{mkt}})$ ” are acquisition premia available to the manager on her options and shares respectively, and **risk** is a measure of stock price volatility¹⁰; “**chute**” is the estimated value of the manager’s golden parachute or severance payment; “ $\text{comp}_{\text{predicted}}$ ” is a CEO’s estimated current compensation, derived from a regression of compensation on observable firm characteristics, **tdc** is a

premium effects and golden parachutes. If, however, these payments are merely targets of opportunity for target managers or nonessential matters of convenience for acquiring companies, they are not deal incentives. While we have gathered and plan to report data on deal sweeteners in subsequent drafts, we do not have any reliable way to observe which deal sweeteners were anticipated and necessary for a sale, and which were a surprise or unnecessary.

¹⁰ We cannot observe risk-aversion, but we assume that nearly all CEOs are at least modestly risk-averse, so the relative advantage of selling shares into a premium deal will increase with stock price volatility.

CEO's current total direct compensation, and α age is the CEO's age multiplied by some arbitrary scalar.¹¹

b. The components of $comp_{ind}$

Estimating a manager's expected compensation if her firm remains independent during a year in which it might be acquired is no easier than estimating $comp_{acq}$. As one might expect, $comp_{ind}$, turns in large part on tdc , or the present value of a manager's future compensation in her present job, assuming no deal occurs. But it is greatly complicated by the real options embedded in a CEO's job.

Current compensation. We can observe actual current compensation (tdc) directly, and as with alternative direct compensation, we assume that CEOs are more likely to retire as they get older, which implies that the present value of total expected future direct compensation is likely to decline as CEOs get older.

Option value on stock options. As an important offset to the positive sale incentives stock options provide, stock options also provide an incentive to not sell the company, simply by virtue of being options. Option theory tells us that an option's value can be decomposed into intrinsic value (current value of optioned asset less exercise price) and option value, with the latter a function of (i) the exercise price, (ii) the current value of the optioned asset, (iii) the volatility of the value of the optioned asset, (iv) the duration of the option, and (v) the time value of money.¹² By exercising a stock option today – whether in the conventional sense or through a sale of the company – a CEO gives up not only the strike price but also the option itself. The option has value not only because it entitles the holder to obtain the optioned asset today, but because it has a duration, and allows the holder to capture any upside value in the optioned asset without incurring the full cost of purchasing the asset. The higher the volatility of the value of the optioned asset, and the longer the duration of the option, the greater are the odds that the optioned asset will increase in value during the life of the option. All else equal, an option holder does better by waiting until near the end of the option's term before exercising an option,

¹¹ Selecting an appropriate scalar for a CEO's age is not simple: while retirement at 65 is a general norm in our society, over 5% of firms in our sample have CEOs over 65, and many CEOs retire (or are forced to retire) before age 65. Thus, we experiment with different scalars, and allow them to vary with observable firm characteristics, such as ownership structure, industry, or firm size. Likewise, selecting discount rates for the future components of tdc and $comp_{alt}$ is not simple. A CEO's future compensation is risky even apart from the volatility of her firm's business. She might lose her job in a medical crisis or an intra-corporate palace coup. Even greater risks will attend to her current job, since is more likely to have most of her financial and human capital tied-up in her own company, which will lead her to sharply discount new grants of unexercisable options or restricted stock – the largest portion of a modern CEO's paycheck. For those reasons, we do not attempt more formally here to model the discount placed on direct compensation, whether at the current company or in the next best job, and (except insofar as we experiment with different scalars on our age deflators), we ignore these issues in our empirical investigation on the ground that there is no reason to believe that discount factors or expected years to retirement are correlated with other variables in our sample.

¹² See generally Rudd (1997); Brealey & Myers (1996). For a stock option, the issuer's dividend policy also affects option value.

even one that has been “in the money” (positive intrinsic value) for some time.¹³ For the same reason, and because of risk-aversion, we also expect that, all else equal, CEOs of firms with volatile stocks will on average be granted and retain more stock options than other CEOs.

The same general point applies to any “exercise” of stock options through a sale of the company: if the CEO can count on being able to sell the company a year later at an equivalent deal premium, then the option value of stock options will create an incentive to wait. This will be most true if the firm’s stock is volatile, or if the expected deal premia for that firm vary substantially over time. Of course, a deal may not be forthcoming next year, the CEO may have less discretion to sell at that time, or the premium may be lower than the premium available today. Further, most acquisitions of large companies in the 1990s were for stock, and in stock mergers most (but not all) stock options are not cashed out but “rolled over” into new stock options of the acquiring company, with terms and conditions that are equivalent to the options given up, so a CEO will lose no option value by selling the company today. Despite these caveats, the general point remains that for CEOs with options on highly volatile stock, or in industries where deal premiums are highly volatile, may give up substantial value if their options are “cashed out” in a sale of the company, value they would retain if the company remains independent.

Embedded put option more generally. The same point just made about stock options can be generalized over all the elements of the CEO’s deal-related compensation. In the extreme case, in which a CEO can sell her company at a premium whenever she chooses, this CEO holds in-the-money option to put the company (and her own stock, as well as the rest of the components of her comp_{acq}) at any point during her job tenure. Preserving this embedded put option has an opportunity cost whenever $\text{comp}_{\text{acq}} - \text{tdc} > 0$, but if the CEO owns stock as well as stock options, it also has an option value that increases with the volatility of the company’s share price¹⁴ and the expected deal premium. The option value of the embedded put option will also increase with the volatility of the CEO’s comp_{acq} , and thus, with the volatility of the value of chute , and thus with the volatility of tdc . The option value will also increase with the remaining years a CEO’s expected tenure and thus, on average, decrease with CEO age.

¹³ If the optioned asset is risky and can be sold for cash or less risky assets, and if the option holder is risk-averse, then the holder also has an incentive to exercise and “lock in” the intrinsic value of in-the-money options prior to expiration, an incentive that will increase with the risk-aversion of the holder, the intrinsic value of the option, and the passage of time. See Hall & Murphy (2002) for an illustration of the point. Also, for stock options, dividends expected to be paid by the issuer will reduce option value, and increase the incentive to exercise prior to expiration. For both of these reasons, CEOs often do in fact exercise stock options early. Huddart & Lane (1996). As we cannot observe actual CEO risk-aversion, we do not include its effect in our empirical model.

¹⁴ Volatile stock prices can also be expected to increase the odds of a sale of the company for other reasons: it makes it more likely that a synergistic bidder could afford to buy the company during downturns, or that a bidder will have private information and be able to buy a company undervalued by the market, and it straightforwardly decreases the value of stock in the hands of a risk-averse or under-diversified CEOs, as discussed above. But controlling for whatever direct effect volatile stock prices have on deals, the interaction of a volatile stock price and a high level of other elements of comp_{ind} should cut the other way.

Private benefits of control. A last component of $comp_{ind}$ includes the private benefits of control that may be available to managers with very large shareholdings. CEOs with real voting power in their companies are more entrenched, and thus have more secure future compensation, than CEOs with smaller holdings. In addition, CEOs with large shareholdings may also be able to extract private benefits in the form of self-dealing transactions or other covert practices that dominant shareholders generally find easier to pursue than most managers. While these payouts are not “compensation” strictly speaking, they may nonetheless be important financial incentives weighing on the side of maintaining a company’s independence for a significant minority of CEOs. While private benefits are difficult if not impossible to estimate or observe, we can at least control for the ownership-based aspect of these private benefits of control by controlling for a CEO’s voting power, and our panel data set allows us to use industry- or firm-fixed effects to proxy for private benefits that are stable over time. As with direct compensation, a CEO’s age should reduce the present value of future benefits.

In sum, we can represent the observable components of $comp_{ind}$ as:

$$comp_{ind} = \quad tdc / \square age + \\ f(optval, risk, sdprehat, sdt dc, age) + \\ f(sharpct, lnass, ln sales, sic1, firm, age)$$

where tdc is current observed compensation,¹⁵ age is CEO age, \square is an arbitrary scalar; option value is represented by a function of the size of a CEO’s option holdings ($optval$), the volatility of a CEO’s stock holdings ($risk$), the volatility of compensation ($sdt dc$, the standard deviation of total direct compensation), and age , the CEO’s age; and private benefits of control are represented by a function of CEO ownership ($sharpct$, a CEO’s percentage ownership of the company), firm size ($lnass$, log of assets, or $ln sales$, log of sales), $sic1$ (a company’s industry), $firm$ (a fixed firm variable), and age .

Putting the foregoing together, we can represent a CEO’s sale incentive as follows:

$$SI = n_{opt}(p_{acq} - p_{exc}) + \\ n_{shr}(p_{acq} - risk * p_{mkt}) + \\ chute [i.e., 3 * tdcmax] - \\ min(tdc - comp_{predicted}, 0) / \square age - \\ f(optval, risk, sdt dc, age) - \\ f(sharpct, lnass, ln sales, sic1, firm, age)$$

¹⁵ TDC is a single year measure, but we can convert this to a growing annuity through the scalar \square .

c. Implications for testing the incentive hypothesis

Our model has a number of testable implications.

- Controlling for risk, stock options favor sales of companies.
- Controlling for stock options, risk favors sales.
- Controlling for stock options and risk, the interaction of risk and stock options disfavors sales.
- Higher than expected compensation disfavors sales.
- Controlling for risk, volatile direct compensation disfavors sales.
- Larger deal premia favor sales.
- Age of CEOs favors sales.
- Deal-contingent payments such as golden parachutes favor sales.

CEO share holdings have an ambiguous expected effect on deals. Deals increase the value of managers' stock (via the premia), but large shareholdings lead to a measure of control, and may thus be a proxy for entrenchment and private benefits of control, which favor maintaining company independence.

3. Sample and Summary Data

a. Sample

We start with executive compensation data for the companies in Standard & Poor's (S&P) indices from Compustat's Execucomp database, which is derived from annual proxy statement filings with the SEC. For each year from 1993 to the present, Execucomp maintains data on all firms in the S&P 500 for that year (which exceeds 500 because S&P removes a small number of firms each year, primarily due to acquisitions), as well as firms in S&P's Midcap and Smallcap indices.¹⁶ We collect data on chief executive officers (meaning the single highest paid officer¹⁷) for any given firm for all firms in the S&P 500 at any time from 1993 to 2000.

For each annual observation, we gather data on that year's total direct compensation (TDC), as well as the discrete components of TDC, including SALARY, BONUS, LTIP (long-term incentive payments), RSTKGRNT (restricted stock grants), and BLKSHVAL (the Black-Scholes value of new option grants). We also report the top officer's end-of-year total holdings of shares of stock, vested options, and unvested options. We calculate the value of stock holdings (SHARVAL) by multiplying them by

¹⁶ Execucomp has some data for 1992, but the 1992 data is substantially incomplete. Our access to Execucomp was through Wharton's on-line collection of databases. In the Wharton collection, Execucomp does not make publicly available its electronic codes for S&P 500 membership for firms that are no longer included in the S&P 500 (i.e., historic S&P 500 membership) and commingles those observations with firms that were but no longer in the Midcap and Smallcap indices, so we hand-code historic S&P membership by reference to S&P annual publications.

¹⁷ Although not all top executive officers have the title "Chief Executive Officer," for brevity we refer herein to top executive officers as CEOs.

the company's end-of-year stock price. Execucomp maintains data on the intrinsic value of options (i.e., the difference between strike prices and the company's end-of-year stock price). The sum of the intrinsic value of vested and unvested options is reported as OPTVAL; the sum of the number of all vested and unvested options is reported as OPTNUM. Summary statistics are shown in **Table 1**.

Execucomp also maintains data on the age of the CEOs included in its database.¹⁸ Data for this variable is spotty, however, so we spot-check the data and supplement the database by direct reference to proxy statements for approximately half the sample, and report the corrected data as AGEYEAR. We also supplement Execucomp with data on golden parachutes (CHUTE) and executive severance agreements (SEV) from Investor Responsibility Research Center (IRRC), which has periodically published such information for the S&P 500 during the 1990s.¹⁹ We lack complete data for each of these items on a small number of firms in the Execucomp database, so our total number of observations falls slightly when these controls are included in the regressions discussed below.

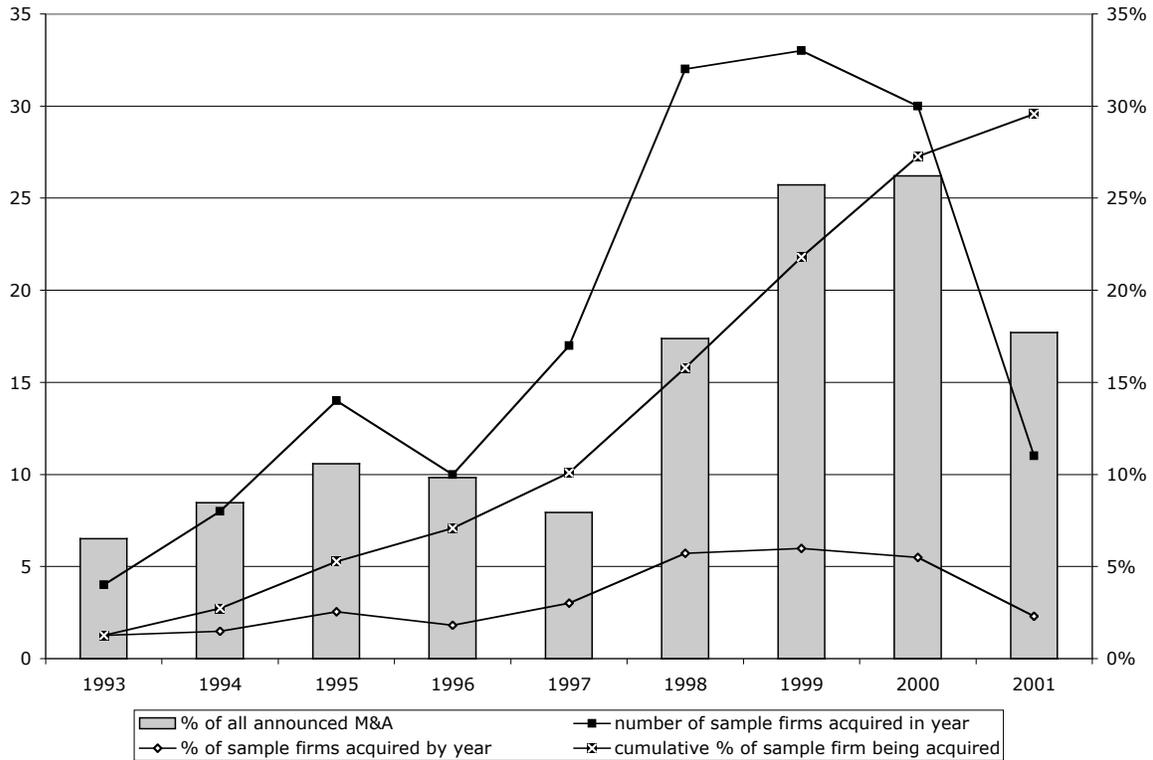
Next, we search the Thomson Financial Securities Data (formerly SDC) M&A database for each firm in our sample. Each yearly observation is then matched with the subsequent year's data from the M&A database, to produce a variable (DEAL), coded "0" if the company was not acquired in the subsequent year, or "1" if it was. To insure that the transactions are of the type in which we are primarily interested (sales of control, not acquisitions or partial block sales), we exclude deals unless they involve a merger or an acquisition of at least half a company's voting stock, and we review each deal in the sample to verify that the company in our sample was being acquired and not truly acquiror (as when NationsBank acquired BankAmerica but maintained BankAmerica's stock listing and renamed the combined company BankAmerica). We supplement this procedure by deriving a list of all companies that are removed from the S&P 500 before the end of the sample period, searching news reports in Lexis/News for an explanation for the removal, and correcting DEAL where news reports indicate the company was acquired. Where deals are found, we add data on deal premia (PREM1W, the difference between the deal price and target's market price one week prior to the deal announcement) by reference to SDC data supplemented by SEC filings.

Figure 2 shows the number of acquisitions of sample companies by year, the percent of the prior year's sample that are acquired by year, the cumulative percentage of sample firms acquired in the sample period, and the portion (percentage of dollar volume) of all M&A reported by SDC represented by deals in our sample. As can be seen, our sample represents a sizeable fraction of all M&A in the U.S. during our sample period.

¹⁸ Oddly, at the Wharton site, Execucomp maintains data on the current age of a CEO for any given observation year, even if the observation year is historic. That is, the "CEO Age" variable will be, say, 60 for each yearly observation for a given CEO who is 60 at the time the data is downloaded from the database. We have adjusted the CEO age data in our database accordingly.

¹⁹ Since parachutes and severance agreements have much the same general effect on manager incentives to sell the company, we also construct CHUTESEV, set to one if either CHUTE or SEV is one.

Figure 2. Acquisitions of Firms in S&P 500, 1993-2001



To control for causes of M&A found in prior empirical studies of deal incidence, we add annual accounting data on sales (SALES), sales growth (SALECHG), assets (ASSETS), and return on assets (ROA) from Execucomp, as well as total return to shareholders for the past one, three and five years (TRS1YR, TRS3YR and TRS5YR). All of these items are also as reported in Compustat. We compute MKTCAP (year-end stock price times number of shares outstanding) and MARKETBOOK (MKTCP / ASSETS). We then also calculate industry-adjusted versions of SALECHG, ROA, TRS3YR, and MARKETBOOK, by calculating annual averages for all firms in each one-digit SIC code and subtracting these annual amounts from the actual values for each observation. In the regression analysis, we include industry controls, using one- and two-digit SIC codes.²⁰ These variables are intended to control for time-invariant industry effects found in some prior studies, as well as the fact that industry-clustering of deals may be stimulated by regulatory shocks (e.g., repeal of the Glass-Steagall Act), technology shocks (the Internet), or factor-input shocks disproportionately affecting one or more industries in the sample period.

²⁰ We also follow Mitchell and Mulherin (1996) by using SDC data for a simple count of M&A transactions in a given two-digit SIC code for the two years ending with the year after the observation year (INDCLUS). We also calculated value- and number-weighted versions of the industry cluster variable by dividing total industry deal values or deal counts by the number of firms included in that industry in the Compustat database for those the relevant years. We find in unreported regressions that these variables have little effect in combination with and are no more powerful than the industry fixed effects in predicting deal incidence in our sample.

b. Summary Statistics

A typical CEO was receiving healthy annual compensation, over \$3 million at the median for all years in the sample, consisting of \$733,000 in salary, \$591,000 in bonus, and over \$1 million in new option grants (valued by Execucomp using the Black-Scholes method for options).²¹ Apple Computer's Steve Jobs earns the distinction of being both the highest paid (\$690 million in 2000, including a \$600 million option grant) and lowest paid (\$1 in 1998) CEO in the sample. Total compensation increases substantially over the sample period, from a median of \$1.9 million (including \$700,000 in stock grants) to almost \$6.1 million in 2000 (including \$2.9 million). Salary and bonus also grew, at much lower rates. Consistent with press reports, option grants made up an increasing fraction of a CEO's total compensation, from a median of 22% in 1992 to 46% in 2000.²²

But annual CEO payouts did not simply get bigger. The distribution also changed its shape. Pay became more variable: the standard deviation (SD) of total CEO compensation grew more rapidly than mean or median compensation, by a factor of 12. CEOs earned more, but the most highly paid CEOs earned even more: pay became more "right-skewed" (from 4.6 in 1993 to 12.2 in 2000) and kurtotic (38 to 194 in 2000). As a result, fewer CEOs earned compensation that was above average, falling from 31% in 1993 to 23% in 2000. Increased skew occurred throughout the distribution: CEOs receiving more than one standard deviation (SD) above median compensation fell from 12% to 5%, and those receiving more than two SDs fell from 6% to 2%. In a first-stage estimation of compensation (described in Section 4 below), the residuals or unexpected amount of compensation increased over the 1990s (consistent with growth in levels and variance in pay), but the percent of CEOs receiving positive abnormal compensation fell substantially, from 52% in 1992 to 23% in 2000. One non-obvious effect of the growth in stock option grants in the 1990s, then, was to *decrease* the number of CEOs who could (by several measures) look around at their peers and consider themselves to be paid more than the "norm."

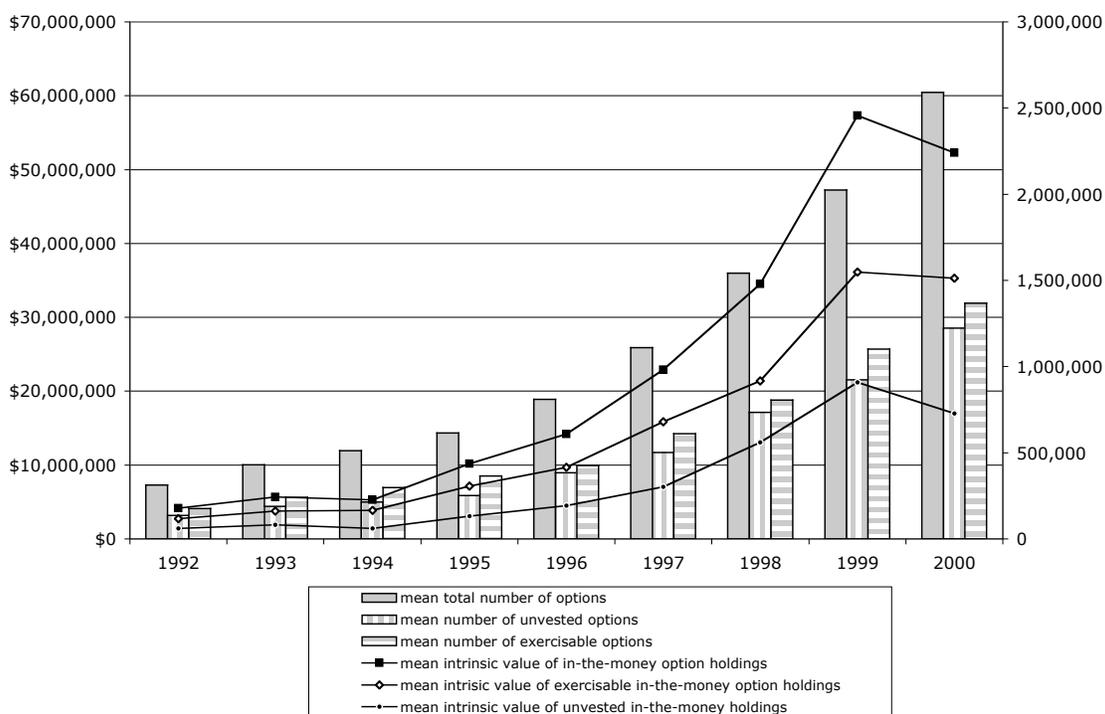
So much for flows. What about holdings? The value of a typical CEO's holdings of stock and options was substantial, equaling \$8.5 million and \$4.0 million at the median for the full sample,²³ and the value of CEOs' option holdings rose markedly during the sample period, as noted by Perry and Zenner (2000) and shown on **Figure 3**. The largest single stock holding was, of course, Bill Gates's stock in Microsoft, worth nearly \$71 billion in 1999. A small number of companies (fewer than 20) – often dominated by families, as at Ford Motor – had CEOs with a de minimis ownership stake.

²¹ Unsurprisingly, distributions of annual compensation were heavily skewed: CEOs received an average of \$6.7 million per year.

²² Murphy (1999) notes this trend held through 1996 across all industries; our data confirm that in every one-digit SIC code for which we have 10+ firms per year (SIC 1-7), the share of CEO compensation represented by options rose nearly monotonically from 1993 to 2000, at both mean and median.

²³ Unsurprisingly, distributions of stock and option holdings were also heavily skewed: CEOs had large amounts of stock holdings, which average an astonishing \$180 million in market value, and stock options, with intrinsic value averaging \$23 million.

Figure 3. Mean CEO Option Holdings
S&P 500 1992-2000



Although stock options were widely and increasingly used as a CEO compensation device in the 1990s, CEO option holdings were not uniform, even among the relatively large firms that make up the S&P 500. CEO option holdings grew rapidly at the 75th percentile, but only modestly at the 25th percentile, so that as the 1990s progressed, the interquartile difference between the intrinsic value of options held by CEOs – the distance between the CEO option “haves” and “have-nots” – grew at an annual rate of 36%. In 1992, the “haves” had \$4.1 million more in options; by 2000, they had \$38 million more. The same trend can be seen in the interquartile comparison of CEOs’ aggregate numbers of options (which grew by 24% per year), and the same growth was as true for CEOs at relatively low levels (<0.8%) of stock ownership as it was for CEOs overall. Thus, despite growth in option usage, the degree of inter-firm heterogeneity in option holdings increased, rather than decreased, making it plausible that inter-firm differences in CEO incentives may have had effects on the M&A wave of the 1990s.

Despite the widespread growth in the use of stock options, CEO ownership as a percentage of outstanding shares actually declined during the period, both at the mean and the median, consistent with findings by Murphy (1999) and Ofek and Yermack (2000). In 1993, CEOs in the S&P 500 owned an average of 1.8% (0.17% at the median) of their companies’ outstanding shares, exclusive of options. In 2000, CEOs in the S&P 500 owned an average of 1.3% (0.13% at the median) of their companies’ outstanding shares, exclusive of options. If one adds the number of a CEO’s options to the CEO’s

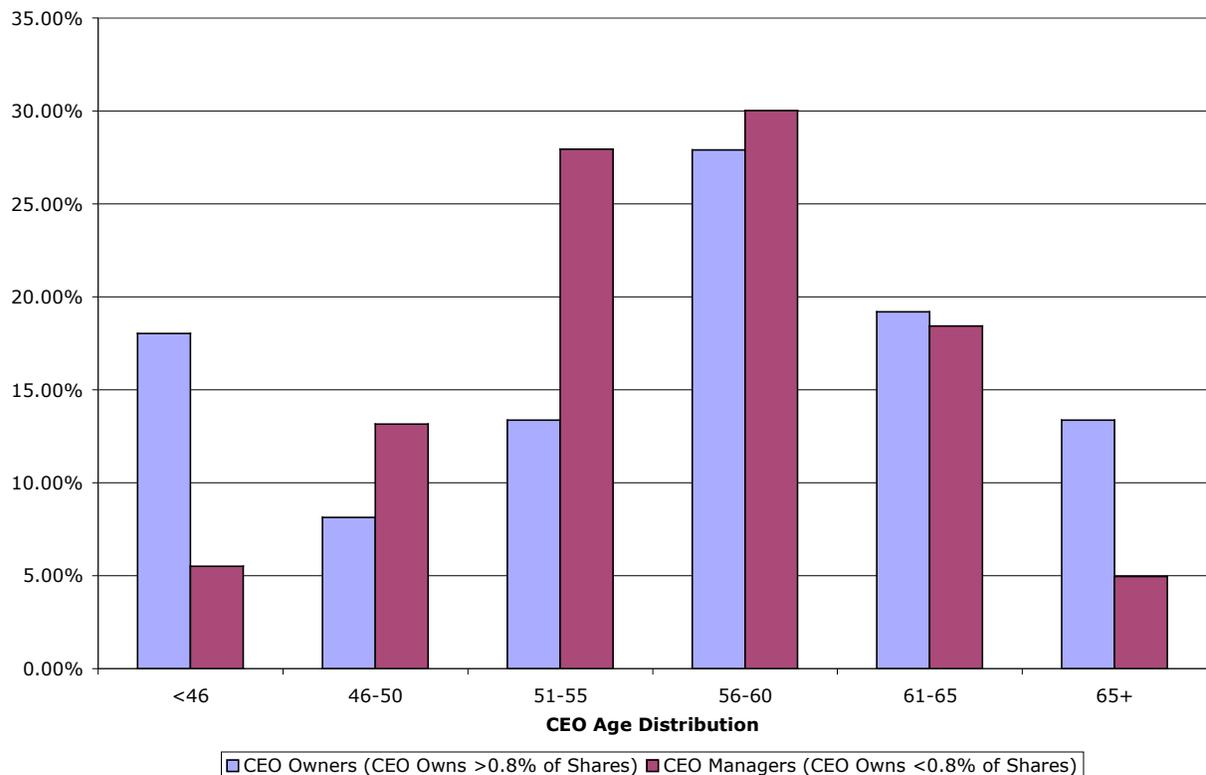
share holdings and does not do the same for other option holders – which biases CEO percent ownership up over time, given that stock options were increasingly used as a compensation device generally in the 1990s – CEOs still owned less at the mean (2.3% in 1993 vs. 2.1% in 2000) and only slightly more at the median (0.58% in 1993 vs. 0.79% in 2000).

Of course, the stock market grew rapidly during the sample period (the S&P 500 Index was 2.4x higher in 1998 than in 1993), which would have increased the value of any given CEO's stock holdings, even if they were fixed, but CEOs also held a much larger *number* of shares at the end of the sample period (from 140,000 in 1993 to 324,000 in 2000, at the median). The reason CEO percent ownership stakes decreased was that companies more than doubled total shares outstanding during the 1990s (from a median of 101 million in 1992 to 219 million in 2000).²⁴ The net effect of these changes, then, was that CEOs had an increasingly large amount of their wealth tied up in their firms, even as their relative share of their firms declined.

CEOs in our sample are 56 years old, on average, and although the youngest is quite young (28), and the oldest is quite old (83), the distribution of ages is packed fairly tightly around the median, also 56. The distribution of CEO ages is stable in our sample period: 56 is the median age in every year from 1992 to 2000. The distribution of CEO ages, however, varies significantly with CEO stock ownership, as is reflected in **Figure 4**. The tails on the distribution of ages among CEOs who own less than 0.8% of their companies' shares ("managers", ~80% of the sample) are much less "fat," and the center of the distribution is much closer to normal, than the distribution of CEOs who own more than 0.8% ("owners", ~20% of the sample), and a Kolmogorov-Smirnov test easily rejects the hypothesis that sample CEO ages are drawn from the same distribution ($p < .001$). In English, many more CEO-owners are very young and very old than CEOs who are managers.

²⁴ Our explanation of the decline in CEO percent ownership adds to Murphy (1999), who suggests that the increase in share values caused by the stock market run-up allowed CEOs to maintain a fixed or rising level of dollar ownership under corporate or board policies requiring that they do so, while liquidating as many shares as possible, consistent with those policies, due to risk-aversion and the desire for diversification. While those policies may have played a role in constraining some CEOs from selling more than a certain amount of their stock, the fact that CEOs actually held more shares by number as well as value suggests that neither corporate policies nor risk-aversion can explain the decrease in percentage share ownership without taking into account the dramatic growth in total shares outstanding.

Figure 4. Age of CEO Owners vs. CEO Managers
S&P 500 1992-2000



Nearly two-thirds (63%) have either golden parachutes (52%) or some form of severance agreement (11%), or both, which in either case would provide additional payments in the event the CEO is laid off following a deal.²⁵ Incidence of parachutes grew over our sample period, but only modestly, from 59% in 1993 to 64% in 2000.

From 1993 to 2001, there were 159 acquisitions (24%) of the 660 companies in the S&P 500 during at least one of those years. As reflected in Figure 2, acquisition activity in the S&P 500 (as among companies generally) increased substantially over the period, from less than 1% of the S&P 500 in 1992 to over 5% at the peak in 1999. The mean (median) acquisition premium paid was 36% (30%) over the price one week before announcement.

In the sample period, S&P 500 had median assets of \$5.5 billion, sales of \$4.1 billion, and market capitalization of \$5.0 billion, and produced a return-on-assets of 4.6%. Annual sales growth at the median firm in the full sample was 8%, but ranged from a negative 67% (due to Hilton Hotels’ spin-off of its gaming operations in 1997), to plus 1170% (due to HCA-Healthcare’s meteoric acquisition-led growth in the early 1990s).

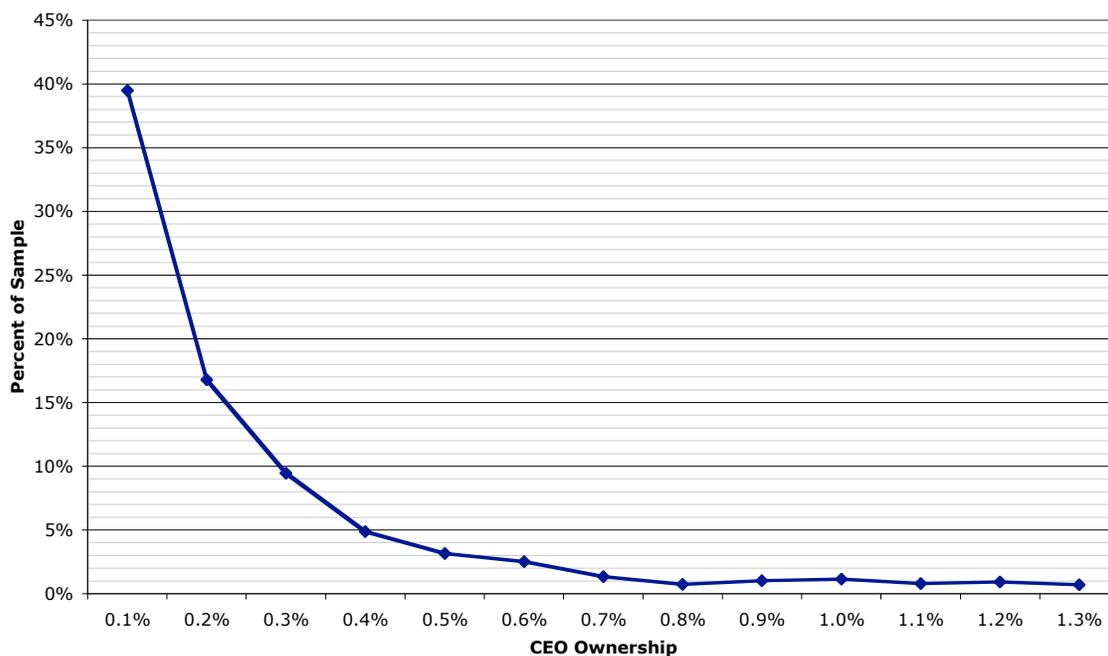
²⁵ Cf. Lefanowicz et al. (2000), who find that 59% of CEOs were entitled to parachute payments in their sample of deals from the 1980s and early 1990s, and Cotter & Zenner (1994), who find 65% of CEOs were entitled to parachute payments in their sample of tender offers from 1989 and 1990.

c. Owners versus Managers

Our finding, described above, that the value of CEO stock and options increased dramatically in the 1990s whereas their percentage of outstanding shares did not, leads us to analyze each variable in more detail. Consistent with our finding on the distributions of CEO ages, described above, the data suggest that CEOs who hold large stakes in their own companies are different from the rest. Needless to add, this difference bears on how CEO incentives affect the choice of whether to sell the company.

More than half of all sample CEOs held less than 0.2% of their companies' shares sample, while 5% of CEOs owned more than 10% of these shares. **Figure 5** shows that the numbers of CEOs in the S&P 500 declined sharply as CEO ownership levels rose to an inflexion point at about 0.8% of outstanding shares, after which the distribution remained flat at progressively greater ownership levels. Thus it seems that CEOs come in two flavors: those with less than about 0.8% of company shares and those with more. CEOs who owned more than this are called "owners" in the rest of our discussion; CEOs who held less are "managers." This translates into about 100 owners and 400 managers in each year's S&P 500.

Figure 5. **Distribution of CEO Ownership**
S&P 500 1992-2000

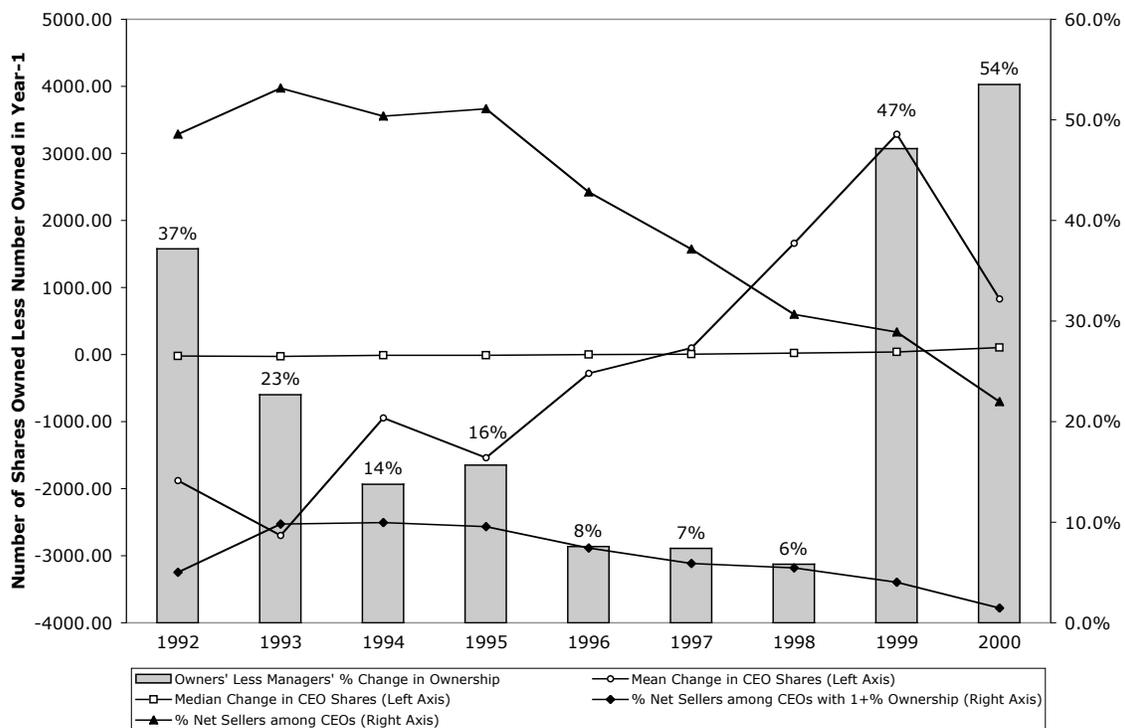


A ranking of firms by the dollar values of CEO shareholdings (instead of the percentages) reveals that 75% of manager-CEOs held less than \$31 million of company stock during the 1990s, and 50% held less than \$9 million of stock. Of the CEOs who held less than \$30 million, *almost every one* was a manager rather than an owner. By contrast, the

median dollar value of owners' shares in their own firms was \$133 million, and only a handful of owners held less than \$30 million of stock. Thus, managers and owners divide starkly in dollar terms as well as in percentage terms. We have good a priori reasons to expect these two groups to respond quite differently to compensation incentives and the attentions of friendly bidders.

Figure 6 shows that ownership trends in the 1990s were also different for owners and managers. In the first half of the period, nearly 50% or more of managers reduced rather than increased their share holdings each year, compared to fewer than 10% of owners who reduced their holdings. In every year in the period, the difference in the annual percentage change in share holdings of owners less managers was positive, and substantial, with owners acquiring or retaining between 6% and 54% more stock per year than managers. Median shareholdings of managers are almost perfectly flat during the period, while mean shareholdings (which by construction overweight the holdings of owners) increased from 1992 to 1999, before falling somewhat in 2000.

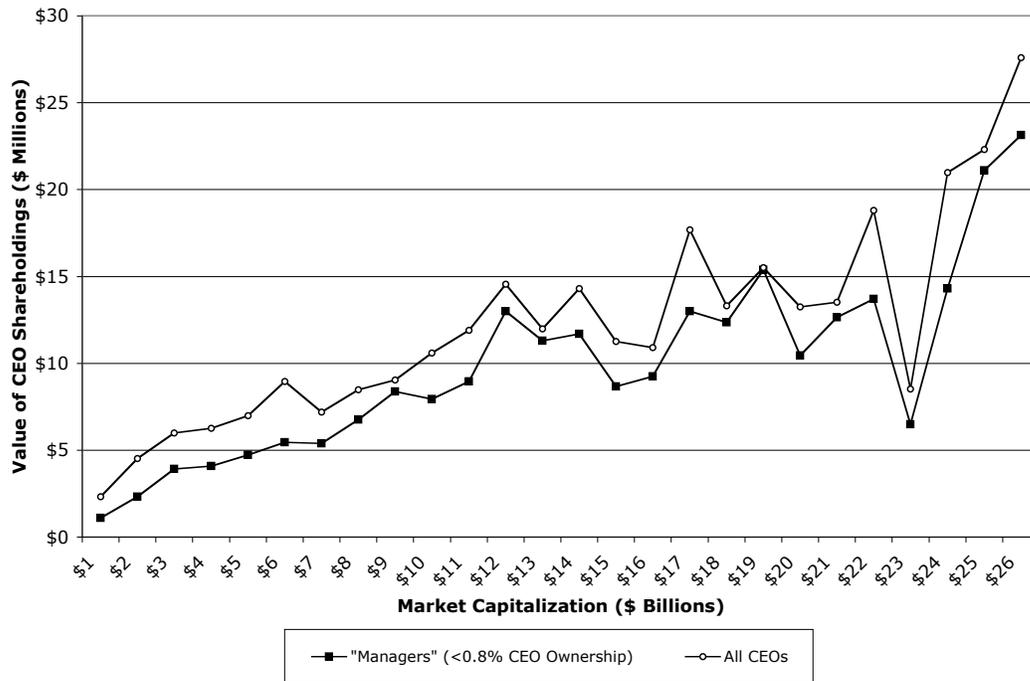
Figure 6. Year-over-Year Changes in CEO Ownership
S&P 500 1992-2000



Not surprisingly, a firm's size, measured by market capitalization (price times shares outstanding), is the single best predictor of SHARVAL (price times shares held by the CEO). As Figure 7 indicates, median SHARVAL for managers increases at a rate of about \$1 million for every \$1 billion in market capitalization, as market capitalization increases from under \$1 billion to about \$11 billion. The median manager-CEO of a \$9

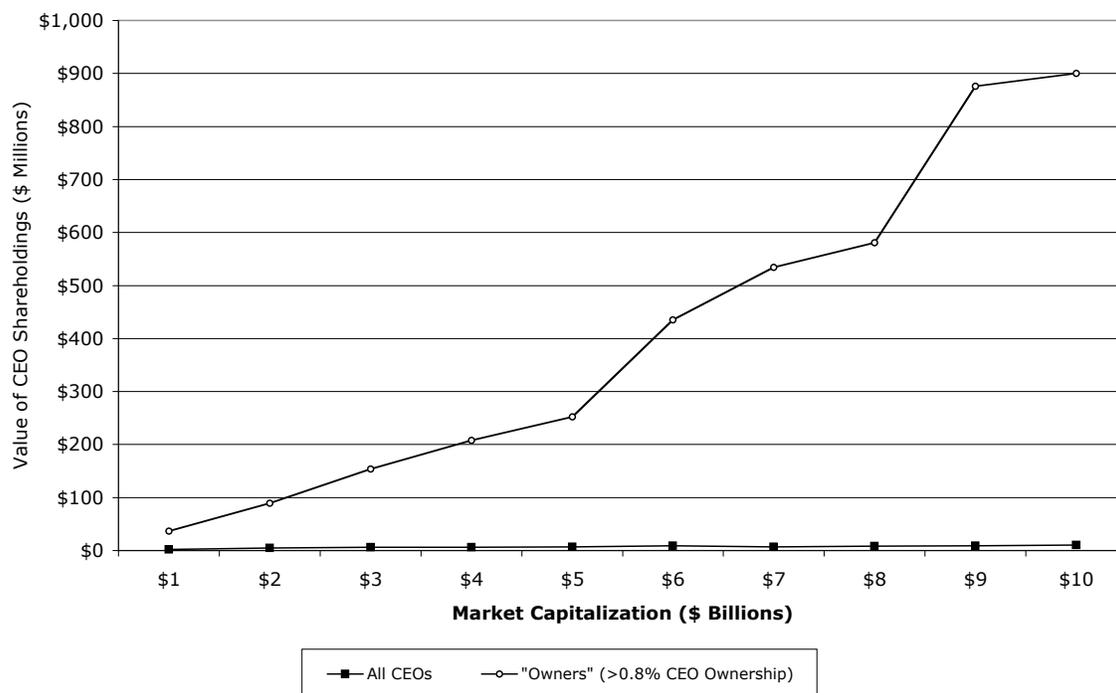
billion company holds shares worth almost \$9 million. Between capitalization levels of \$12 - \$23 billion, median SHARVAL remains fairly stable in the \$7-\$15 million range. Between capitalization levels of \$23-\$30 billion, it increases again, from \$11 million to about \$22 million. Finally, after \$30 billion capitalization levels, median SHARVAL values for manager-CEOs stabilize again, in a zone of \$20-\$25 million, no matter how large firms are.

**Figure 7. Managers vs. All CEOs:
Value of CEO Shareholdings by Firm Market Capitalization**
S&P 500 1992-2000



By contrast, **Figure 8** shows that median SHARVAL values for *owners* increase much more rapidly as company capitalization levels increase. Owners retain roughly the same percentage stake in their companies from one level of capitalization to the next, at least until their companies grow very large. This implies large increases in SHARVAL from one capitalization level to the next. While this effect is partly an artifact of our definition of owner-CEO (a CEO with more than 0.8% of her company’s stock), it is also a structural feature of the data. Consistent with our analysis of changes in share ownership during the 1990s, above, the relationship between SHARVAL and MKTCAP is fundamentally different for owners (who retain very large dollar amounts of company stock as firm value grows) and managers (who, relatively speaking, do not).

Figure 8. Owners vs. All CEOs
Value of CEO Shareholdings by Firm Market Capitalization
S&P 500 1992-2000

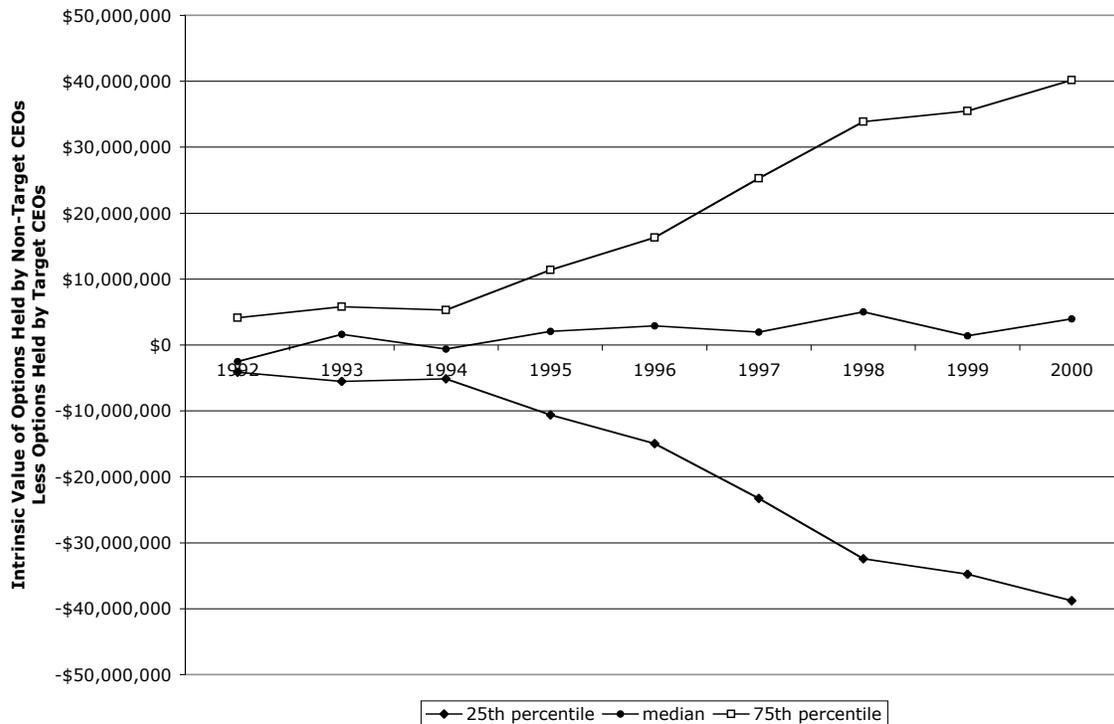


c. Mean and Median Comparisons

In **Table 3**, we compare mean and median data for our CEO variables between subsets of observations where the company was the target of an acquisition, and those where the company remained independent. Differences that are statistically significance at the 95% confidence level are in bold; all tests assume unequal variances. As can be seen, the average value of CEO option holdings are significantly less for acquired companies than for those remaining independent ($p < .001$). On average, the effect of options on deals is negative, inconsistent with the simple motivating story with which we began.

Over the sample period, the relationship between mean and median OPTVAL and deals remains relatively constant. One interesting and large divergence in the relationship between options and deals does develop, however. As **Figure 9** displays, over time the difference between the intrinsic value of options held by CEOs of targets and non-targets diverges sharply over the interquartile range of the distribution: at the 25th percentile, target CEOs began increasingly to hold greater amounts of options (measured by intrinsic value) than non-target CEOs, whereas at the 75th percentile, the opposite was true. This divergence suggests that at moderate levels of option holdings, the premium effect of options dominates the real option effect, but at higher levels, the reverse is true. Alternatively, there may be something different about the companies granting higher-than-average levels of stock options, and it is that cause that also deters acquisitions.

Figure 9. Effect of CEO Option Holdings, by Quartile
S&P 500 1992-2000



How might firms headed by CEOs with larger option holdings differ from those headed by CEOs with low holdings? And how might those differences influence the firms' proclivity to be acquired? One possibility is implicit in our model: perhaps CEOs of firms that are risky are more likely to retain stock options (because of the option value of the stock options themselves), and perhaps those same CEOs are more likely to hold off selling the company (because of the option value of the deal decision itself). If so, we would expect risk to correlate with option holdings. In fact, that is the case. If firms are classified as "high risk" (above median stock price volatility) and "low risk" (below median), CEOs of high-risk firms retain 2.7x the intrinsic value in options per year and retain 2.5x the number of options. Overall, CEOs of high-risk firms have 2.5x the levels of option holdings of CEOs of low-risk firms. Option holdings are higher for CEOs of high-risk firms in every year from 1993 to 2000, and both the mean and median difference in the value of option holdings is statistically significant at the 99% confidence level in each of those years.

Turning from stock options to ownership, mean SHARPCT is lower for target companies ($p < .001$) than for companies that remain independent. For the entire sample, 2.5% of firms with CEO-owners are acquired, while 3.7% of firms with CEO-managers are acquired ($p < .03$); correlatively, the percent of target firms that have CEO-owners is 16%, versus 22% for non-targets ($p < .03$). Each of these findings is consistent with the conjecture that greater share ownership allows CEO to entrench themselves. Likewise,

the value of shares held by CEOs of target firms is lower than it is for non-target firms ($p < .001$).

Golden parachutes provide another comparison that is consistent with our model. They are more likely to be found at targets (79%) than non-targets (63%) ($p < .001$), even when they have been in place for more than one year prior to the deal (LONCHU) ($p < .001$).²⁶ On the other hand, CEOs of acquired companies are not, on average or at the median, older or younger than non-acquired companies. All components of compensation are roughly equivalent at the means, but median option grants and total direct compensation are both significantly higher in the year prior to a deal for acquired firms.

4. Regression Analysis

In this section, we use regression analysis to study the relationship between CEO's total direct compensation, stock and option holdings, and parachute protection, on the one hand, with deal incidence, on the other hand. Our modeling framework is primarily as follows. We pool all observation-years in our sample. Then we use logit estimations to determine whether there is a significant relationship between our compensation variables in year Y and the incidence of an acquisition of the company in question in year Y+1. All reported standard errors are White-Huber adjusted to eliminate the effects of heteroscedasticity.

a. The direct effects of stock options alone

We focus first on the relationship between OPTVAL and DEAL (column (1) of **Table 4**). To include a measure of the premiums to be paid in a given transaction, we estimate a first-stage model for PREM_{HAT},²⁷ and then multiply the fitted coefficients from this regression by the firm's share price and the number of options held (OPTNUM) to produce a measure of the premium value on options (PREMOPT). As can be seen, option value, standing alone, is insignificantly related to deal incidence.²⁸ The expected premium value on stock options, however, is positively related to deals, and is statistically significant at the 95% level.

²⁶ Compared to her unprotected counterpart, a CEO with a golden parachute or severance agreement own less than half as much stock at both the mean and median ($p < .001$ in each case), a finding consistent with Knoeber (1986). At the median, comparisons reject the hypothesis of Choi (2001) that targets pay protected CEOs less than unprotected CEOs, in terms of total direct compensation or bonus.

²⁷ For this unreported regression, our dependent variable is PREM_{1W}, and our regressors are: ROA, SALECHG, INDCLUS, annual dummies for 1994, 1997 and 1999, TRS3YR and TRS5YR and LNSALES, which collectively represent the regressors that produce the highest adjusted R-squared (32%) for PREM_{1W} for our sample of deals. Our main findings are robust to alternative specifications of PREM_{HAT} that drop various one or two-variable combinations of these regressors, or which simply use a crude mean or yearly average premium instead.

²⁸ This is not due to collinearity between PREMOPT and OPTVAL – the latter is statistically unrelated to DEAL when PREMOPT is dropped from the regression in column (1) of Table 4.

We include controls for firm performance (change in sales from the prior year, or SALECHG, and industry-adjusted market/book, or IMARKETBOOK), as well as a control for firm size (log of assets, or LNASS).²⁹ These controls are important both because prior work has found a correlation between declining target performance and deal activity and because of potential omitted variable bias: if CEO ownership affects firm value (e.g., Morck et al. (1988)), and if firm value affects deal activity (e.g., Palepu (1986)), then findings on ownership variables may simply reflect the past or expected relationship between these variables and firm performance. Each variable is significant at the 90% confidence, with signs in the expected direction: larger companies are less likely to be taken over (presumably because of financing constraints), and companies are more likely to be taken over if they perform less well. For the regressions reported in Table 4, we also include yearly dummy variables (which control for time-varying deals during the sample period) and industry dummy variables (which control for industry fixed effects), which should control further for omitted variable bias, using 1-digit SIC codes.³⁰

b. The effects of risk and real options

Next, in column (2) of Table 4, we add variables that attempt to capture the option value of stock options and of private benefits more generally: RISK (the standard deviation of stock prices over the prior 60 months), RISKOPTVAL (the interaction of RISK and OPTVAL), ABNORMCOMP (the residuals from a first-stage estimation of TDCMAX³¹), and SDTDC (the standard deviation of TDC within a one-digit SIC code). With the inclusion of these controls, OPTVAL turns positive and statistically significant. RISK, too, is positive and statistically significant, and PREMOPT remains positive and significant, but the interaction of RISK and OPTVAL is negative and statistically significant. The coefficients on ABNORMCOMP and SDTDC are also negative and significant at the 99% confidence level.

We interpret these results as being consistent with our model: controlling for risk, options (and option premiums) make deals more likely, and controlling for options, risk makes deals more likely, but for risky firms, high levels of options counteract these effects, and make deals less likely. The more variance in the CEO's annual flows of compensation (measured at the industry level), the greater the option value of choosing when to "put" the company to a premium bidder in exchange for that volatile stream of compensation payments, and the less likely a deal in a given year. Using the method of recycled predictions, the coefficients in any of the three last columns of Table 4, imply

²⁹ Substituting log of market capitalization and log of sales for LNASS does not change our results.

³⁰ Table 5 reproduces the results from columns (1) through (4) of Table 4 using 2-digit SIC code industry dummy variables rather than 1-digit SIC code dummy variables, with no qualitative change in results. For CEO-owners, we have too few observations to estimate meaningful equivalent to column (5) from Table 4.

³¹ For this unreported regression, our dependent variable is TDCMAX (the highest TDC in the current or two prior years), and our regressors are: industry-adjusted SALECHG, LNASS, industry-adjusted MARKETBOOK, BIGCEO, AGE, and industry and yearly dummies, which collectively represent the regressors that produce the highest adjusted R-squared (14%) for TDCMAX (or any other annual compensation measure) for our sample of CEOs. Our main findings are robust to alternative specifications of ABNORMCOMP that drop one or two-variable combinations of these regressors.

that the net effect of risk and options on deal odds is slightly negative for the sample average, but can be as much as 50% higher or lower than the sample average (holding RISK constant and moving from the 10th to the 90th percentile of OPTVAL). The finding on ABNORMCOMP suggests that CEOs making higher than expected current compensation are less likely to be willing to sell the company (and move to a much lower level of next-best compensation).

- c. The apparent effect of golden parachutes, the non-effect of age, and the possibility of quasi-insider trading

In column (3) of Table 4, we add three additional variables of interest: AGE, CHUTESEV, and CEOSELLING. The first controls for the likelihood that a CEO's incentives to use voting power to retain control presumably diminish as retirement (or death) approaches. The second controls for the likelihood that a CEO's incentives to sell the company should be higher if she is protected by a golden parachute or executive severance agreement. The third is a dummy set to 1 if the CEO's stock ownership fell from year Y-1 to year Y prior to a sale of the company in year Y+1, and controls for the possibility that the CEO may alter his stock holdings in anticipation of a deal – specifically by being less likely to sell shares when he knows he is likely to be able to “sell” them with an acquisition premium by waiting a bit longer.

None of the findings described above change, AGE is insignificant and has an unexpected sign, and we are not able to change this result for firms generally by using various transformations of CEO age (log age, age raised to various powers, step functions, or functions that treat very young and very old CEOs differently). CHUTESEV, on the other hand, looks to be statistically significant and in the expected direction; however, as discussed below, this finding turns out to be limited to the subset of firms with CEO-owners. And CEOSELLING is negative and significant at the 90% level, at least suggestive of a type of quasi-insider trading related to deals.

- d. An alternative explanation of RISKOPTVAL

This last finding (on CEOSELLING) suggests an alternative possible explanation of our finding on RISKOPTVAL. Assume, as seems plausible, that CEOs generally have some private information about firm value; assume further, as also seems plausible, that CEOs of more risky firms have more private information than CEOs of less risky firms; and assume finally that at least some of this private information is not credibly verifiable to either the market or to potential firm acquirors. If that is true, then CEOs of more risky firms may accumulate more options (and thus have high values for RISKOPTVAL) when they believe the firm to be undervalued – which also leads them to be less willing to sell the company, and we would see what we in fact do see: a negative and statistically significant relationship between RISKOPTVAL and DEAL.

We do find some evidence consistent with this alternative hypothesis. The standard deviations of both of our measures of absolute changes in CEO option holdings (DELTAOPV and DELTAOPN, the yearly change in the intrinsic value of option

holdings and in the number of options, respectively) are statistically higher ($F < .001$) for high-risk firms than for low-risk firms. Likewise, looking at the distributions of these variables, as well as a normalized equivalent of each (TRENDOPV and TRENDOPN, which are simply the percent change in option holdings), we can see a clear pattern: CEOs of high-risk firms are more likely to both increase and decrease their option holdings by larger amounts from year to year than their counterparts at low-risk firms. This is true at all percentage cuts. Put simply, CEOs of high-risk firms alter their option holdings by more each year than do other CEOs. While far from dispositive, we view this as consistent with CEOs of high-risk firms using their private information to make informed changes in their financial exposure to firm risk.

However, when we look for direct evidence of inside-information driven deals, the evidence is not there. In unreported regressions we add DELTAOPV, DELTAOPN, TRENDOPV and TRENDOPN to our DEAL regressions, without significant results. (Including these controls did not affect our other reported results.) Nor do we find any significant results when we include dummy variables equivalent to CEOSELLING based on changes in option holdings. Unlike near-term changes in stock holdings, short-term changes in option holdings do not seem to anticipate deals. Thus, while we believe it is possible that insider trading may be part of the explanation for the relationship between RISKOPTVAL and DEAL, we do not believe it is the whole story.

e. The effects of significant CEO ownership: CEO owners vs. CEO managers

Finally, based on the theory discussed in Section 1 and our findings discussed in Section 3, we have reason to think that the effect of OPTVAL on DEAL will not be linear or even monotonic in SHARPCT: as SHARPCT increases, the incentive for a CEO to sell may increase, but so too may his power to resist hostile bids, shareholder activists, or disaffected board members, particularly the value from a deal arises primarily due to prior poor performance under that CEO's management. A simple if crude way to reflect non-monotonicity is simply to drop observations where SHARPCT exceeds 0.8%. Column (4) repeats the regression in column (3) but keeps only observations where the firm has a CEO-manager (i.e., a CEO holding less than 0.8% of outstanding shares), and Column (5) does the same but keeps only observations where the firm has a CEO-owner (i.e., a CEO holding more than 0.8% of outstanding shares).³²

The results are consistent and quite similar to those for all firms, with three exceptions: First, the finding on CHUTESEV falls to statistical insignificance for CEO-managers, whereas CHUTESEV not only remains statistically significant but the coefficient rises nearly ten-fold for CEO-owners, suggesting that golden parachutes are more important in motivating CEO-owners to sell than CEO-managers. The same result obtains substituting LONGCHU (golden parachutes or executive severance agreements in place for more than one prior to the observation year) for CHUTESEV (regression not reported), so this result for CEO-owners seems not to be a near-term signal effect (i.e., CEOs who anticipate

³² We also included SHARPCT and LNSHARPCT (a CEO's percentage ownership, and its logged value) in the regressions in Tables 4 and 5 do not change our results qualitatively, nor do SHARPCT or LNSHARPCT have a statistically significant relationship to DEAL.

near-term sales adopt parachutes, rather than parachutes motivating sales).³³ The coefficients on CHUTESEV (and LONGCHU) imply that the odds of a deal are 33% higher for CEO-owners with parachutes in place than for those without. The raw averages are also stark: Of the 18 CEO-owners that sold their companies nearly 90% (or 16) had golden parachutes in place; but of the 968 year-observations of firms with CEO-owners that did not involve a sale, only 49% had a parachute in place. Still, 18 deals represents only 11% of the S&P 500 firms with CEO-owners in the 1990s, and so the effect of parachutes on CEO-owners cannot be seen as a major cause of M&A in the 1990s, despite its relative strength.

Second, the relationship between deals and ABNORMCOMP falls to insignificance and the coefficient flips signs for CEO-owners. This is intuitive: CEOs that typically own in excess of \$30 million worth of stock (including stakes that run up to 45% of all outstanding shares) are less likely to be extracting supra-normal rents than CEO-managers. CEO-managers are less wealthy, and thus benefit more, dollar for dollar, from the same level of excessive compensation, and they own less of their firms, and thus lose less, dollar for dollar, for the same reduction in firm value that excessive compensation causes.

Third, AGEYEAR becomes significant – but with an unexpected sign (negative), implying that older CEO-owners are *less* likely to sell out than younger CEO-owners (or CEO-managers of any age). The coefficient on AGEYEAR suggests the odds of a deal decline by about 1% for every year the CEO is older. Why might older CEOs with significant ownership be less likely to sell their companies than either similarly aged CEOs with less ownership or younger CEOs with similar ownership? We leave this puzzle as an exercise for the reader.

f. “Economic significance”

An important remaining element of the regression analysis remains: How important are the effects of options and abnormal compensation that we find? What are the implied net effects across time of these variables? In what follows, we use the coefficients in column (4) of Table 4 to estimate the effect on deal odds for our explanatory variables for different in-sample subsets of our data, as well as for out-of-sample predictions. We also compare the model reflected in column (4) with a simpler model that drops all of the compensation and compensation-related variables.

The simplest way of making the coefficients intuitive is to simply multiply the relevant coefficients for the full sample by their average sample values. We can also get a sense of the degree of variation within the sample by multiplying the coefficients by the differences for our variables of interest at the 25th and 75th percentiles. Finally, we can explore the effect of moving from the median values observed for our variables of

³³ Parachutes adopted more than a year in advance could still represent in some significant part a signal of a CEO-owner’s intention to sell over the medium term, and thus this finding may not represent purely the incentive effects of parachutes. And the signal remains relatively noisy: in only 3.4% of the observation-years were firms with CEO-owners who had golden parachutes acquired.

interest at the beginning of our sample period to the end, to get a sense of how much if any of the overall increase in M&A in the 1990s can be attributed to stock option use. In **Table 6**, we show the resulting implied effects on deal odds for each of the explanatory variables of interest. (CEOSELLING does not directly measure a CEO incentive, *per se*, and we do not discuss its effect here, but include it in Table 6 for completeness.)

As can be seen, the effects for any one variable of interest were quite large. Controlling for other factors, the implied effect of OPTVAL at its average value is to increase deal odds by a sizeable amount (almost 90%). But that coefficient is only statistically meaningful if it is estimated in the presence of RISKOPTVAL, which implies an even larger negative effect of -133%. With the effect of expected deal premiums (+25%) added in, the net effect of the stock option variables, based on sample means, is -18% – reducing deal odds by 0.6%, off an average deal rate of 3.4% per year to 2.8% per year. Put differently, our results imply that, on average, stock options *decreased* M&A activity in the S&P 500 in the 1990s by roughly 20% of what it would have been without options, because the interaction of risk and options outweighs the effect of options alone. The effect of variation in CEO compensation (SDTDC) had an even larger average negative impact, decreasing deal odds by almost 180% at the mean of the sample.³⁴

The results of the interquartile comparison are somewhat different. The positive effect of OPTVAL, moving from the 25th to the 75th percentile, is almost 60%, but more than offset by the negative effect of RISKOPTVAL (-76%), as one moves within its interquartile range. This time, however, the cumulative effect of PREMOPT (+19%) is to make the overall odds of a deal increase by a net 13%. These results imply that although the average effect of stock options on M&A was negative, a substantial minority of CEOs faced higher sale incentives as a result of the increase of stock options during the 1990s. But even the interquartile effect of stock options cannot be assessed without taking into account the fact that stock options has increased not only the amount but the dispersion in CEO compensation. As a result, selling the company for many CEOs would have meant giving up abnormally high flows of annual compensation, and more importantly, selling out would have meant giving up a valuable put option to sell in the future in the face of highly variable annual compensation. When we make a similar interquartile shift for SDTDC and ABNORMCOMP, the combined effect is total -158%. Thus, our results imply that sale incentives increased in the 1990s only for CEOs who were holding above-average levels of options *and* facing a below-average level of stock-price related risk, receiving a below-average amount of annual compensation, or in an industry characterized by below-average variation in CEO compensation.

What do our results imply about changes over time for “typical” CEOs in the S&P 500? If we shift along annual medians, the results in Panel C of Table 5 suggest that the net effects of stock options themselves are close to a wash (-0.2% at the median). The effects of CEO compensation in the center of the distribution across time are quite different than their effects across the distribution for the overall period. At median values, the amount of abnormal compensation has actually been declining during the 1990s, and within-

³⁴ The average effect of abnormal CEO compensation is, not surprisingly, very close to zero, since we constructed “abnormal compensation” by reference to average values.

industry variation in annual compensation has been increasing only modestly. The former result is consistent with our earlier finding that the interquartile difference in CEO option holdings – the gap between the option “haves” and “have nots” – has been increasing, so that the bulk of abnormal compensation can increasingly be found outside the center of the distribution as time has passed. The latter result suggests that the bulk of the increase in extremely high annual compensation has occurred between industries, rather than within them. As a result, at the median, the effects of abnormal compensation have been to increase deals as time has passed – more and more “typical” (median) CEOs are making much less than overall CEO pay would predict, and thus fewer and fewer “typical” (median) have an annual-compensation-driven reason to not sell, an effect offset only somewhat by the increased value of the “put” option over time.

The net effect of all compensation-related variables (other than CEOSELLING) appears to have been to increase deal odds substantially (+16%) from 1993 to 2000. Our data suggest that the increase has come primarily not through the channel of option holdings, but rather through increased variation in annual compensation. Of course, increased variation in total CEO compensation has been driven by option grants. But we have come quite far from our initial simple story, or from any traditional theory of optimal compensation. Options appear to have increased deal odds not primarily because they created a direct incentive to sell, but because they increased the amount of unusually high annual compensation. That increase cut the number of CEOs who could rightly understand themselves to be overcompensated, relative to their peers. With fewer CEOs feeling *relatively* overpaid, fewer CEOs resisted selling the company as the 1990s passed.

As a final measure of the relative importance of our findings, we compare goodness of fit measures for deal-prediction models with and without our explanatory variables of interest. Using just the control variables (RISK, SALECHG, IMARKETBOOK and LNASS), 2-digit SIC code industry dummies, and yearly dummies, an estimation of deal odds for our sample yields a pseudo R-squared of .1073. When we add in our explanatory variables (OPTVAL, RISKOPTVAL, PREMOPT, ABNORMCOMP, SDTDC, CHUTESEV, and AGEYEAR), the equivalent measure rises to .1859 (see column (3) of Table 5). This is a healthy increase of 73% in the goodness of fit measure, implying that the explanatory variables are almost as important in explaining variation in deal activity in the S&P 500 during the 1990s as the more conventional predictors. Even with these variables, however, we are still left with a great deal of unexplained heterogeneity in corporate sales. Viewed from that perspective, the CEO incentive variables explain only about 5-10% more of the variation in deal activity than the simpler model could explain. Similarly sized shifts in the goodness-of-fit measures obtain when we compare a CEO-manager only model with and without our CEO incentive variables. In sum, while we believe we have added an important category of explanatory variables to the deal-prediction toolkit, the growth in stock option compensation contributes only marginally to our understanding of deal activity, and a great deal of uncertainty remains about why very large companies sell when they do.

g. Further robustness checks and further findings

In unreported regressions using the models in Tables 4 and 5, results were robust to controls for log sales, various corporate governance variables (such as classified boards, board ownership, dual class structures, and the Gompers et al. “GINDEX”), and raw measures of current, lagged or average compensation, such as TDC, BLKSVHAL, SALARY, and BONUS. We also obtain qualitatively similar results with Box-Cox transformations (Box and Cox, 1964) of OPTVAL, PREMOPT and RISKOPTVAL.

We also tested robustness with different econometric models. In unreported regressions, we also estimate the following models: Weibull proportional hazard, random effects logit, year-by-year logits, and firm fixed effects logit (with and without yearly dummies). Overall, we find qualitatively similar findings. In the firm fixed effects model without yearly dummies, for examples, all of the statistically significant explanatory variables discussed above retain their significance levels, and the estimated coefficients shift only modestly.³⁵

Finally, we also look for the expected positive effect of the deal premium on CEO share holdings (as opposed to option holdings) and the expected “real option” effect of risk on that variable. Because of the possibility of entrenchment for CEO-owners, we estimate these effects for CEO-owners and CEO-managers separately, as above. Because of multicollinearity between share and option measures, we do not include both sets of equity variables in the same regression.³⁶ In unreported regressions, our results are consistent with our findings on the CEO option variables. For CEO-managers, RISKPREMSHR is negative and statistically significant at the 90% confidence level, and PREMSHR is positive and marginally significant ($p < .115$). For CEO-owners, the signs are the same, but neither variable is even close to statistical significance.

5. Discussion

³⁵ The only exception is a firm fixed effects (FE) model with yearly dummies, in which all variables fall to statistical insignificance. This non-result is neither surprising nor troubling, given that our explanatory variables vary only across firms – a tiny number of executives were CEOs of more than one S&P 500 firm in our sample period. A firm FE model leaves only year-by-year changes (flows) as potential regressors, and including yearly dummies eliminates average trends in those flows; with 159 deals it would have been surprising if detrended yearly changes did produce significant results. Reassuring us on this point, our yearly logits with industry FE produce qualitatively similar findings on a majority of our principal variables of interest in a majority of sample years, with negative significant coefficients on RISKOPTVAL in five of six years for which there are sufficient observations, positive significant coefficients on RISK and OPTVAL in four of six years; negative significant coefficients on ABNORMCOMP in three of six years; and none show significant coefficients with opposite signs in any year.

³⁶ Each of the following pairs have correlations over 0.25: OPTVAL / SHARVAL, OPTVAL / RISKSHARVAL, RISKOPTVAL / SHARVAL, and RISKOPTVAL / RISKSHARVAL. When we do include our option variables and our share variables in the same regression, and control for the presence of CEO-owners, all of the equity variables have the same signs as in our separate regressions, and the significance levels on the option variables remain above the 90% confidence level, but statistical significance levels on the share holding variables fall, consistent with multicollinearity, the presence of which implies inefficient estimations (i.e., significance levels artificially reduced), but no bias in the coefficients.

The simple motivating story with which we began turns out to be simply wrong: options do not generally increase deal incidence, neither options nor other CEO-compensation related variables increase deal incidence on average, and only 5 to 10% of the variation in the incidence of acquisitions of firms in the S&P 500 during the 1990s can be explained with CEO-compensation or related variables. Overall mean and median measures of in-the-money options are actually lower for target CEOs than for non-target CEOs. Nor do these results change when we examine all options or when we multiply all options by predicted premiums from a first-stage regression. While the coefficients on OPTVAL and PREMOPT are positive and statistically significant in the empirical estimation that best fits the data, they are swamped by the coefficient on RISKOPTVAL for the majority of firms, and on average, for firms in the S&P 500 in the 1990s. These non-effects are robust to performance, industry, year, and firm fixed effects that have been found by prior researchers to correlate with deal incidence.

Nor is the motivating story just a false correlation we can ignore. Instead, CEO compensation trends of the 1990s had more complicated (and more interesting) effects. For some CEOs (and firms), stock options did increase deal odds; but for others, they decreased deal odds; and for most, the direct effects of options were a wash. In regressions with controls for risk and risk interacted with options, options do increase deal odds by a significant amount. Controlling for risk, moving from the 25th to the 75th percentile of value of in-the-money stock options increases annual deal odds from a baseline average of 3.4% to 5.4%, an increase of almost 60%. Including the effect of (predicted) premiums further increases the positive effect of options on deals. However, moving from the 25th to the 75th percentile on the interaction of RISK and OPTVAL reduces deal odds by a similarly large amount, so that the net positive effect of stock options – even when one is moving from the 25th to 75th percentiles – is +13% (from 3.4% to 3.9% per year).

CEOs with extremely large options face much bigger incentives to sell than other CEOs, controlling for risk. But risk, and its impact on the real option value of holding onto control, reduces or eliminates those incentives for most CEOs. Risk itself increases the odds of a sale, as do options on their own. But the presence of risk makes the option value of options effectively cancel out the sale incentive effect of options. Extreme variation in pay itself increases the “real option value” of holding onto control, and decreases deal odds. Variation in CEO compensation also leads unusually highly paid CEOs to be less likely to sell, but increased upward skew in CEO pay has meant that fewer CEOs are “unusually highly paid,” and has thus mitigated one of the CEO-incentive drags on deal activity. As CEO compensation seems to have plateaued in 2001, this trend may have played itself out, and we may thus see an increased resistance to deals (even putting aside the effects of the stock market downturn and the recession).

[Discussion of implications and conclusion to come in future drafts.]

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Table 1. Summary Statistics, Variable Descriptions and Data Sources

variable	sales	assets	mktcap	salechg	roa	marketbook
n	4659	4660	4653	4651	4659	4653
explanation of variable	annual sales (millions)	year-end assets (millions)	year-end share price times number of common shares outstanding (thousands)	change in sales from prior year (% points)	return on assets (% points)	year-end share price times common shares outstanding divided by assets
data source	Execucomp	Execucomp	Derived from Execucomp	Execucomp	Execucomp	Derived from Execucomp
mean	\$8,555	\$20,270	\$12,900,000	15.71	5.36	1.61
std dev	\$15,375	\$52,228	\$29,000,000	36.91	6.98	2.58
1%	\$199	\$283	\$371,229	-34.13	-14.14	0.06
5%	\$563	\$680	\$889,467	-13.01	-2.30	0.12
10%	\$915	\$1,009	\$1,346,610	-5.64	0.26	0.20
25%	\$1,835	\$2,111	\$2,553,542	2.01	1.66	0.46
50%	\$4,072	\$5,507	\$4,939,684	8.66	4.58	0.92
75%	\$9,108	\$15,770	\$10,700,000	19.88	8.48	1.86
90%	\$18,938	\$41,564	\$27,800,000	41.97	12.80	3.47
95%	\$29,192	\$84,704	\$50,000,000	65.39	16.48	5.29
99%	\$76,431	\$268,238	\$144,000,000	146.51	23.77	10.13

Table 1 Continued

variable	sharval	optval	optnum	premopt	sharpct	risk
n	4631	4665	4665	4370	4564	4532
explanation of variable	year-end share price times number of shares owned by ceo	total intrinsic value of ceo's in-the-money options (vested and unvested)	number of ceo's (vested and unvested)	year-end share price times optnum plus predicted premium (from first-stage regression)	number of shares owned by ceo divided by common shares outstanding	standard deviation of stock prices over past 60 months
data source	Derived from Execucomp	Derived from Execucomp	Derived from Execucomp	Derived from Execucomp and SDC	Derived from Execucomp	Execucomp
mean	\$180,000,000	\$23,400,000	1,121,153	\$15,900,000	1.61%	1121.153
std dev	\$1,750,000,000	\$96,800,000	2,480,860	\$54,700,000	0.05	2480.86
1%	\$1	\$0	0	-\$70,284	0.00%	0
5%	\$174,587	\$0	0	\$0	0.01%	0
10%	\$661,667	\$0	17,000	\$0	0.02%	17
25%	\$2,650,926	\$581,959	194,000	\$1,850,715	0.05%	194
50%	\$8,539,039	\$4,035,845	498,000	\$5,320,077	0.15%	498
75%	\$30,600,000	\$16,300,000	1,116,000	\$13,800,000	0.55%	1116
90%	\$169,000,000	\$47,400,000	2,557,740	\$34,100,000	3.64%	2557.74
95%	\$526,000,000	\$90,500,000	4,075,696	\$61,200,000	11.06%	4075.696
99%	\$2,620,000,000	\$304,000,000	10,389,000	\$173,000,000	23.09%	10389

Table 1 Continued

variable	ceo "owner"	dopercentcd	deltaown	ceoselling	chutesev	ageyear
n	4666	3391	3850	4666	4189	4506
explanation of variable	ceo owns more than 1% of common shares	number of shares owned by all directors and officers divided by common shares outstanding	number of shares owned by ceo less number owned in prior year	ceo reduced share holdings from prior year	ceo has golden parachutes or severance agreement	age of ceo
data source	Derived from Execucomp	Derived from Execucomp	Derived from Execucomp	Derived from Execucomp	Derived from IRRC	Exeucomp and proxy statements
mean	21.24%	6.37%	-104.6401	40.40%	62.99%	55.83955
std dev	0.41	0.10	24615.63	0.49	0.48	6.643565
1%		0.04%	-25745.5			39
5%		0.14%	2398.947			45
10%		0.32%	694.8005			47
25%		0.92%	-112.422			52
50%		2.28%	0			56
75%		6.50%	125.4805			60
90%		18.83%	714.4366			63
95%		29.87%	2844.623			66
99%		46.78%	24000.09			72

Table 2. CEO Compensation ("Flows") – S&P 500, 1992 to 2000

variable	tdc	salary	bonus	blkshval	rstkgrnt	ltip	othann	allothto
explanation of variable	ceo's total direct compensation in current year (thousands)	ceo's salary in current year (thousands)	ceo's bonus in current year (thousands)	black-scholes value of option grants to ceo in current year (thousands)	value of restricted stock grants to ceo in current year (thousands)	long-term incentive payments to ceo in current year (thousands)	other annual compensation to ceo in current year (thousands)	all other compensation to ceo in current year (thousands)
data source	Execucomp 4610 (\$1,000s)	Execucomp 4666 (\$1,000s)	Execucomp 4666 (\$1,000s)	Execucomp 3624 (\$1,000s)	Execucomp 4666 (\$1,000s)	Execucomp 4666 (\$1,000s)	Execucomp 4666 (\$1,000s)	Execucomp 4666 (\$1,000s)
minimum	\$0	\$0	\$0	\$1	\$0	\$0	\$0	\$0
mean	\$6,684	\$755	\$1,034	\$3,106	\$626	\$329	\$70	\$259
median	\$3,219	\$733	\$591	\$1,112	\$0	\$0	\$0	\$45
maximum	\$690,347	\$4,000	\$102,015	\$600,347	\$650,812	\$31,325	\$10,183	\$95,196
std dev	18979	339	2659	12287	9725	1345	331	1952

Table 2 Continued

	tdc	salary	bonus	blkshval	rstkgrnt	ltip	othann	allothtot
	(\$1,000s)	(\$1,000s)	(\$1,000s)	(\$1,000s)	(\$1,000s)	(\$1,000s)	(\$1,000s)	(\$1,000s)
	means							
1992	\$2,704	\$697	\$610	\$802	\$272	\$173	\$54	\$64
1993	\$2,712	\$671	\$616	\$875	\$200	\$179	\$58	\$133
1994	\$3,344	\$694	\$748	\$1,330	\$237	\$182	\$66	\$104
1995	\$3,832	\$720	\$906	\$1,290	\$294	\$267	\$60	\$150
1996	\$5,459	\$743	\$1,113	\$2,263	\$414	\$364	\$71	\$141
1997	\$6,855	\$767	\$1,102	\$2,667	\$539	\$411	\$66	\$392
1998	\$9,001	\$795	\$1,087	\$3,469	\$1,788	\$374	\$74	\$327
1999	\$10,390	\$829	\$1,329	\$5,300	\$698	\$480	\$81	\$420
2000	\$14,922	\$870	\$1,694	\$8,500	\$1,113	\$481	\$102	\$560
	medians							
1992	\$2,107	\$680	\$446	\$463	\$0	\$0	\$0	\$32
1993	\$1,865	\$650	\$410	\$530	\$0	\$0	\$0	\$35
1994	\$2,376	\$664	\$495	\$755	\$0	\$0	\$0	\$33
1995	\$2,584	\$681	\$550	\$705	\$0	\$0	\$0	\$41
1996	\$3,142	\$700	\$630	\$962	\$0	\$0	\$0	\$45
1997	\$3,841	\$750	\$694	\$1,246	\$0	\$0	\$0	\$50
1998	\$4,495	\$782	\$680	\$1,664	\$0	\$0	\$0	\$55
1999	\$5,518	\$806	\$825	\$2,535	\$0	\$0	\$0	\$56
2000	\$6,157	\$848	\$894	\$2,852	\$0	\$0	\$0	\$61

Table 3. One-Way Analysis of Variance: Targets vs. Non-Targets

	sharval (\$mm)		premsshr (\$mm)		sharpct	
<u>target?</u>	mean	median	mean	median	mean	median
yes	\$50.56	\$5.80	\$22.50	\$1.80	0.94%	0.13%
no	\$185.00	\$8.66	\$53.10	\$2.48	1.64%	0.15%
difference	-\$134.44	-\$2.86	-\$30.60	-\$0.68	-\$0.01	\$0.00
p-value	0.0001	0.0068	0.0028	0.0388	0.0055	0.0798
n	4631	4631	4342	4342	4564	4564
	optval (\$mm)		optnum (mm)		premopt (\$mm)	
<u>target?</u>	mean	median	mean	median	mean	median
yes	\$15.90	\$4.01	1105.268	630.538	\$15.40	\$5.91
no	\$23.70	\$4.04	1121.714	495.05	\$15.90	\$5.28
difference	-\$7.80	-\$0.03	-16.446	135.488	-\$0.50	\$0.63
p-value	0.0148	0.5136	0.4673	0.0817	0.4294	0.1734
n	4665	4665	4665	4665	4370	4370
	deltaown		deltashp		deltaopn	
<u>target?</u>	mean	median	mean	median	mean	median
yes	580.83	18.88	-0.04%	0.01%	223.95	85.45
no	-124.80	0.00	0.00%	0.00%	299.02	65.52
difference	705.63	18.88	0.00	0.00	-75.07	19.93
p-value	0.1557	0.0321	0.4032	0.5704	0.0635	0.1546
n	3850	3850	3834	3834	4005	4005
	tdc		salary		blkshval	
<u>target?</u>	mean	median	mean	median	mean	median
yes	\$6,454	\$3,851	\$777	\$2,500	\$2,815	\$1,464
no	\$6,692	\$3,182	\$754	\$4,000	\$3,117	\$1,105
difference	-\$237	\$669	\$23	-\$1,500	-\$302	\$359
p-value	0.3594	0.0192	0.1846	0.1999	0.2122	0.0068
n	4610	4610	4666	4666	3624	3624
	chutesev	longchu	ageyear	ceo "owner"	dopercentcd	
<u>target?</u>	sample %	sample %	mean	sample %	mean	median
yes	78.76%	71.68%	56.05	16.02%	5.07%	1.90%
no	62.56%	53.04%	55.83	21.52%	6.40%	2.29%
difference	-16.20%	-18.64%	-0.22	5.50%	1.33%	0.39%
p-value	0.0001	0.0000	0.3379	0.0015	0.1165	0.0847
n	4189	4189	4506	4666	3391	3391

P-values are for t-test of means or ranksum test of medians, assuming unequal variances. Significant differences at 95% confidence in bold.

Table 4 Pooled Logit Regressions
(with yearly and 1-digit SIC code fixed effects)

Dependent variable: DEAL	(1)		(2)		(3)		(4)		(5)	
	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value
optval	-3.0e-09	.328	2.3e-08	.003	3.6e-08	.000	3.8e-08	.000	2.2e-07	.042
premopt	4.6e-09	.044	1.6e-08	.010	1.6e-08	.053	1.6e-08	.061	1.3e-07	.000
risk			3.8	.000	4.3	.003	5.0	.002	5.6	.067
riskoptval			-8.9e-08	.000	-1.4e-07	.000	-1.4e-07	.001	-1.2e-06	.020
abnormcomp			-1.7e-05	.042	-2.0e-05	.059	-3.6e-05	.061	3.3e-05	.376
sdtcd			-7.6e-05	.003	-9.0e-05	.001	-1.1e-04	.000	-1.2e-04	.004
salechg	-1.2e-02	.055	-1.9e-02	.000	-2.5e-02	.001	-2.5e-02	.002	-7.1e-02	.000
imarketbook	-3.0e-04	.002	-3.3e-04	.001	-1.8e-04	.070	-2.4e-04	.049	3.5e-05	.913
lnass	-1.9e-01	.020	-2.7e-01	.001	-1.3e-01	.365	-2.7e-01	.108	1.2e-01	.718
chutesev					5.6e-01	.075	2.3e-01	.512	3.3	.022
ageyear					-1.9e-02	.344	-9.3e-03	.708	-1.1e-01	.056
ceoselling					-5.3e-01	.071	-5.3e-01	.079	-1.8	.041
CEO ownership level	All firms						CEO-managers only (sharpct<.008)		CEO-owners only (sharpct>.008)	
Yearly dummies?	Yes		Yes		Yes		Yes		Yes	
1-digit SIC industry dummies?	Yes		Yes		Yes		Yes		Yes	
obs	4326		3536		2923		2290		271	
chi square	86.64		96.37		91.62		85.62		47.15	
p > chi square	.0000		.0000		.0000		.0000		.0003	
Pseudo R2	.0740		.1139		.1550		.1595		.4809	

Table 5 Pooled Logit Regressions
(with yearly and 2-digit SIC code fixed effects)

Dependent variable: DEAL	(1)		(2)		(3)		(4)	
	coef	p-value	coef	p-value	coef	p-value	coef	p-value
optval	1.4e-08	.222	1.4e-08	.084	2.4e-08	.019	2.5e-08	.053
premopt	5.8e-09	.019	2.1e-08	.009	2.0e-08	.022	1.8e-08	.036
risk			3.3	.003	4.1	.005	4.7	.008
riskoptval			-7.7e-08	.001	-1.1e-07	.001	-9.9e-08	.027
abnormcomp			-1.5e-05	.056	-1.7e-05	.061	-2.2e-05	.105
sdt dc			-7.8e-05	.002	-8.0e-05	.003	-9.1e-04	.005
salechg	-1.4e-02	.026	-2.3e-02	.000	-2.7e-02	.000	-2.7e-02	.001
imarketbook	-3.5e-04	.003	-4.0e-04	.001	-1.8e-04	.166	-2.0e-04	.080
lnass	-3.3e-01	.000	-4.0e-01	.000	-1.6e-01	.122	-2.9e-01	.098
chutesev					4.7e-01	.140	2.6e-01	.459
ageyear					-2.0e-02	.314	-9.1e-03	.715
ceoselling					-5.3e-01	.072	-5.1e-01	.097
CEO ownership level	All firms						CEO-managers only (sharpct<.008)	
Yearly dummies?	Yes		Yes		Yes		Yes	
2-digit SIC industry dummies?	Yes		Yes		Yes		Yes	
obs	3828		2893		2372		1898	
Wald chi square	144.95		136.34		125.33		125.35	
p > chi square	.0000		.0000		.0000		.0000	
Pseudo R2	.1045		.1319		.1859		.1847	

Table 6. Economic Significance

Panel A. Implied Effect on Deal Odds at Mean of Variable

Variable	Coefficient from column (4) of Table 4	Odds ratio (e [^] coefficient)	Change in odds for one-unit change	Sample Mean	Implied Effect of Variable at Mean	x 3.4% (average odds of deal) = effect of variable	+3.4% = odds of deal with effect of variable
optval	3.80E-08	1.00000004	0.000004%	23400000	88.92%	3.02%	6.42%
premopt	1.60E-08	1.00000002	0.000002%	15900000	25.44%	0.86%	4.26%
riskoptval	-1.40E-07	0.99999986	-0.000014%	9464801	-132.51%	-4.51%	-1.11%
Subtotal					-18.15%	-0.62%	2.78%
ceoselling	-5.30E-01	0.58860497	-41.1395%	0.4039863	-16.62%	-0.57%	-0.02%
sdt dc	-1.10E-04	0.99989001	-0.010999%	16245	-178.68%	-6.08%	-2.68%
abnormcomp	-3.60E-05	0.99996400	-0.003600%	0.000012	0.00%	0.00%	3.40%
Total					-213.45%	-7.26%	-3.86%

Panel B. Implied Change in Deal Odds from 25th to 75th Percentile of Variable

Variable	25th Percentile	75th Percentile	Difference	Implied Interquartile Effect	x 3.4% = effect of variable	+3.4% = deal odds with variable
optval	581959	16300000	15718041	59.73%	2.03%	5.43%
premopt	1850715	13800000	11949285	19.12%	0.65%	4.05%
riskoptval	162913	4845660	4682747	-65.56%	-2.23%	1.17%
Subtotal				13.29%	0.45%	3.85%
ceoselling	0	1	1	-41.14%	-1.40%	2.00%
sdt dc	9442	22296	12854	-141.39%	-4.81%	-1.41%
abnormcomp	-6038	2198	8236	-29.65%	-1.01%	2.39%
Total				-198.89%	-6.76%	-3.36%

Panel C. Implied Change in Deal Odds from 1992 to 2000 at Median of Variable

Variable	1993 Median	2000 Median	Difference	Implied Change in the 1990s	x 1.5% (odds of deal in 1993)	+1.5% (deal odds with variable)
optval	1688876	10800000	9111124	34.62%	0.52%	2.02%
premopt	1993038	9747548	7754510	12.41%	0.19%	1.69%
riskoptval	444669	3816906	3372237	-47.21%	-0.71%	0.79%
Subtotal				-0.18%	0.00%	1.50%
ceoselling	1	0	-1	41.14%	0.62%	2.12%
sdt dc	13689	14752	1064	-11.70%	-0.18%	1.32%
abnormcomp	357	-7721	-8079	29.08%	0.44%	1.94%
Total				58.34%	0.88%	2.38%