

Do Firms Replenish Executives' Incentives After Equity Sales?

Job Market Paper

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Abstract

Boards grant executives equity to align their incentives with those of shareholders. Yet executive equity sales are common — 60 percent of executives sell firm equity during their tenure — and can cause an executive's holdings in the firm to become suboptimally low. I empirically examine whether boards restore a selling executive's incentives by shifting the composition of his subsequent pay toward more equity. Firm-level changes can cause executives to sell equity and simultaneously reduce their need for incentives. I account for such variables by comparing executives who sell equity to other top executives *at the same firm* who do not sell. I find that boards grant similar pay to selling and non-selling executives at the same firm, and replenish at most 10 percent of incentives lost due to a sale. My results suggest that boards do not maintain executives' incentives at an optimal level, as predicted by efficient contracting theory.

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1 Introduction

Equity is the largest component of pay for most top executives. Since 2000, executives at large publicly traded U.S. firms have received on average 42% of their annual pay in stock or stock options (28% in salary and 24% in cash-based incentive pay).¹ This is consistent with agency theory, which predicts that an executive whose wealth is closely tied to firm performance will pursue value-maximizing decisions, instead of private benefits such as shirking or empire-building (Jensen & Meckling (1976)). Corporate boards also commonly state that the purpose of equity compensation is to align executives' incentives with those of shareholders.

At the same time, executives sometimes sell large amounts of firm equity. Sixty percent of top executives at S&P 1500 firms sell equity during their tenure, and the median annual sale decreases an executive's total holdings in the firm by 15 percent.² Executives are able to engage in such sales because equity grants typically begin to vest after one year, and fully vest in three to five years. Furthermore, few firms place explicit restrictions on sales of vested equity (Cook (2009)).³ Because executives have flexibility to sell equity, and because sales can substantially reduce executives' incentives, it is important to know how boards respond. The purpose of this paper is to examine empirically how an executive's pay changes following a sale of firm equity.

This question is framed by two broad perspectives on executive compensation, which offer competing explanations for why boards grant equity pay. The literature has traditionally viewed compensation contracts as the product of arms-length negotiations between the board and exec-

¹These statistics are for all executives listed in the Compustat Execucomp database at firms with market capitalization of at least \$1 billion, from 2000 to 2007. Cash-based incentive pay is the sum of bonuses and long-term incentive payments. The other six percent of pay includes perks and pension payments.

²These statistics are for a sample of top executives at S&P 1500 firms from 1996 to 2007. Equity transaction data is from the Thomson Insiders database, and data on executives' holdings of firm equity is from Compustat Execucomp. Statistics on median sale size are based on the annual dollar value of equity sold, and are conditional on a sale occurring. See Table 2 and Section 3 for more information.

³Providing executives flexibility to sell equity may be consistent with the efficient contracting view of executive pay. For example, an executive's wealth may become too closely tied to the firm following substantial stock price appreciation, causing the executive to undertake suboptimally conservative decisions, unless the board allows the executive to sell some of his holdings in the firm. In this paper, I do not attempt to explain how boards set vesting periods. My purpose is to examine whether boards respond to equity sales in an optimal manner, given the empirically observed contracting environment. Gopalan, Milbourn, Song & Thakor (2010) study how boards set equity pay duration.

utives.⁴ This “Efficient Contracting” perspective argues that boards attempt to set executives’ equity holdings at the unique level that most effectively mitigates agency problems. Boards grant equity compensation to maintain an executive’s incentives at this optimal level.

The more recent “Managerial Power” perspective argues that board directors have a stronger motivation to satisfy executives than shareholders, in order to secure future business with the firm or retain their seats on the board (Bebchuk & Fried (2004)). This perspective argues that executives use their leverage to negotiate pay that extracts excessive wealth from the firm. Instead of maintaining equity incentives at the optimal level, boards allow executives to reduce their exposure to firm performance by unwinding their equity holdings. In this view, equity pay serves to disguise wealth extraction from the firm.

If an executive owns the optimal amount of firm equity prior to a sale, his incentives become suboptimally low after the sale. In this paper, I examine whether boards respond by granting new compensation which restores the executive’s incentives back toward the optimal level. In particular, the board should shift the composition of subsequent pay toward more equity and less cash, because granting new equity on top of existing pay rewards the executive for selling. I use a simple hypothesis to test whether boards restore incentives in this manner:

An executive who sells equity should subsequently receive a higher proportion of pay in equity than an executive who does not sell.

My results show that boards in fact do not adjust compensation following equity sales. Boards grant similar pay to selling and non-selling executives, replenishing little to none of the incentives lost due to a sale. Small equity sales may not cause incentives to deviate far from the optimum, but boards also do not respond to large sales which decrease an executive’s total holdings in the firm by 25 percent or more. Boards therefore seem to either set executives’ incentives too high before a sale, or allow them to become too low after the sale. Either case is difficult to reconcile

⁴Examples of optimal contracting models in the presence of agency problems include Ross (1973), Grossman & Hart (1983), Holmstrom & Milgrom (1987), Holmstrom & Milgrom (1991), and Prendergast (2002). See also Adams, Hermalin & Weisbach (2008), Murphy (1999), and Core, Guay & Larcker (2003) for literature reviews on corporate governance and executive pay.

with the efficient contracting view of boards targeting an optimal level of incentives.

A key empirical challenge is to account for variables which reduce an executive's optimal incentives and simultaneously cause equity sales. In such cases, the executive's holdings in the firm may remain at the optimal level after the sale, causing the board to leave pay unchanged. It is important to emphasize that the board's objective is to set an executive's incentives at the level which is optimal for shareholders. Executives sell equity for a variety of reasons, such as to diversify wealth or to purchase a home. However, the board should not allow the executive's incentives to decrease unless doing so reduces agency problems and benefits shareholders. The primary source of bias which I must account for is endogenous changes to the executive's optimal incentive level.

Some firm-level changes may simultaneously decrease optimal incentives and cause equity sales. For example, a young firm may rely on high levels of equity pay to incentivize executives because the board is not able to evaluate which growth opportunity to pursue. If the executives choose a successful strategy and establish a profitable business, they may sell equity to lock in gains from stock price appreciation. At the same time, the board may be able to substitute direct monitoring for equity incentives. In such cases, both executives and shareholders may benefit from the executive owning less equity in the firm.

I develop a novel identification strategy to account for such variables: I compare executives who sell equity to other top executives *at the same firm* who at the same time do not sell. The executives in my sample include the Chief Executive Officer, Chief Financial Officer, Chief Operating Officer, and non-executive Chairman of the board. These executives are responsible for decisions that affect the entire firm. For example, the CFO oversees a firm's financial operations, and the COO is responsible for the firm's day-to-day operations. Therefore, firm-level changes should have a similar effect on the optimal incentive levels of these top executives. The board is unlikely, for example, to respond to poor firm performance or increased investment volatility by granting more equity to the CFO and less to the COO.

My empirical results indicate that boards grant similar pay changes to selling and non-selling

executives at the same firm, both in terms of the level of equity incentives and the composition of annual pay. I measure equity sales in two ways: the annual dollar value of equity sold minus the cost of exercising stock options, and the decrease in the executive's total incentives due to the sale. (I follow Baker & Hall (2005) by defining incentives as the change in dollar value of equity given a one-percent change in the firm's stock price.) I find that an executive whose incentives decrease by \$1 due to a sale receives at most \$0.1 in new incentives, relative to a non-selling executive at the same firm. In many specifications the magnitude of the response is even smaller, and some results indicate that boards grant *less* equity pay to selling executives than non-selling executives. My estimates strongly reject full replenishment by the board.

I address limitations to my identification strategy by conducting several robustness checks, and my results do not change. First, boards might evaluate the performance of division-level managers differently from that of other top executives, so firm-level changes may have a different effect on the pay of these executives (Aggarwal & Samwick (2003)). I repeat my analysis on a subsample of just "C-Suite" executives, who oversee the entire firm, and my results do not change.⁵

Second, top executives at the same firm often vary by tenure. Boards may grant more equity to junior executives to build up their ownership stake, or because they have not yet learned the executives' propensity to consume private benefits. Because junior executives sell equity less frequently than senior executives, my estimates may confound the effects of sales and tenure. To overcome this problem, I compare executives who joined the firm's upper ranks at the same time or have worked together for several years.

Third, my specification does not account for shocks to executives' wealth held outside the firm. Wealth shocks can increase an executive's risk aversion, and the board's optimal response may be to allow the executive to sell equity to diversify his remaining wealth. To account for this possibility, I use only executives who voluntarily contribute a portion of their annual pay into a deferred compensation account (which is similar in purpose to a 401-k account).

⁵C-Suite executives are the CEO, CFO, COO, and any other executive with "Chief" in their title. Table 1, Panel A shows that these executives account for 47 percent of the observations in my sample.

I also test whether boards do not replenish incentives because they anticipate that executives will sell equity, and incorporate this expectation *ex ante* into executives' annual equity grants. Ofek & Yermack (2000) find that executives frequently sell stock shortly after receiving new equity pay, and if boards expect such sales they may adjust the flow of annual equity grants prior to the sale. However, I show that boards also do not replenish incentives following unanticipated equity sales, such as sales following early exercise of stock options.

My paper's results raise questions about why boards grant equity pay. By not responding to equity sales, boards effectively allow executives to choose how much equity to hold in the firm. This finding is consistent with the Managerial Power perspective, but does not provide conclusive evidence that the purpose of equity pay is to disguise executives' wealth extraction from the firm. My results are also consistent with alternative explanations such as boards using equity primarily for retention purposes, by setting the flow of annual equity grants to ensure that executives own at least a minimum amount of unvested equity at all times.⁶

My paper provides two important contributions to the literature on executive compensation. First, while much work estimates the incentives conveyed to executives through annual pay grants, little is known about whether boards effectively maintain executives' overall holdings of firm equity.⁷ Core & Guay (1999) find that boards grant more equity to CEOs whose total equity incentives are below the value predicted by a regression model. However, they do not measure equity sales directly, and their empirical methodology differs from mine.⁸ Also, previous work has examined selling patterns by executives (Ofek & Yermack (2000), Jaffe (1974), Seyhun (1986)). However, to the best of my knowledge my paper is the first to examine how boards adjust pay following equity sales.

⁶Yermack (1995), Hall & Murphy (2003), and Perry & Zenner (2001) offer several additional explanations for why boards may grant equity pay for reasons other than incentive-alignment. For example, tax laws favor granting annual pay in the form of equity instead of cash, and accounting rules prior to 2006 favored stock options over grants of restricted stock.

⁷Papers that examine whether boards compensate CEOs efficiently include Jensen & Murphy (1990), Yermack (1995), Hall & Liebman (1998), and Morck, Schleifer & Vishny (1988).

⁸Core & Guay (1999) test whether the level of new incentives is higher for CEOs whose incentives fall below a benchmark model. I test whether the change in incentives is higher for executives who recently sold equity, to account for differences in the level of incentives across executives.

Second, the literature almost exclusively focuses on the compensation of CEOs. Even basic questions about other top executives, such as how does the board set their pay, have not been studied extensively. Among my results is the new finding that an executive's equity pay increases when he is promoted to a C-Suite position.⁹ My strategy of comparing top executives at the same firm also may be useful for empirically identifying other important questions in corporate governance.

The rest of this paper is organized as follows. Section 2 discusses data and empirical measures, and presents descriptive statistics on incentives and sales. Section 3 develops the empirical specification and identification strategy. Section 4 presents results comparing executives across firms, and Section 5 presents results comparing executives within the same firm. Section 6 conducts robustness tests, and Section 7 concludes. Detailed variable definitions are in the Data Appendix.

2 Data and Descriptive Statistics

In this section I describe my sample, the data sources which I use in this paper, and my empirical measures of executive equity sales and pay changes. I also present descriptive statistics which, to the best of my knowledge, show for the first time detailed information on the frequency and size of executive equity sales, as well as how equity incentives and sales vary by executive type.

2.1 Data and Sample

I use Compustat Execucomp to obtain data on the annual compensation of firms' top executives, as well as their total holdings of firm equity. Execucomp covers mostly S&P 1500 firms starting in 1992. It contains the dollar value of annual total pay, as well as the value of pay components such

⁹This finding may be consistent with either the efficient contracting or managerial power perspectives. This is because boards which have been captured by executives may disguise large increases in total pay by granting equity which the executive can easily sell.

as salary, cash-based incentive payments, stock options, and regular stock. It also contains the total number and value of regular shares and stock options owned by each executive at the end of each fiscal year. Firms are required to report this data for the CEO and four other highest-paid executives in their annual proxy statement to shareholders. Most Execucomp firms report data for five to seven top executives.¹⁰

I obtain data on executives' transactions of firm equity from Thomson Insiders. All top executives, as well as directors and large shareholders, are required to report any transaction of firm equity to the Securities and Exchange Commission (some transactions, such as short sales, are banned). The most common transactions are stock sales, option exercises, open-market equity purchases, and the disposition of shares to pay tax obligations or option exercise cost. Thomson Insiders covers all publicly traded firms, with full data available starting in 1996.

My sample starts with all firms which are in both databases. I drop 42 Execucomp firms which I am unable to match to firms in Thomson Insiders, 37 firms which do not grant equity to a single executive in any year, and 142 firms which do not remain in Execucomp past 1995.¹¹ My final sample contains 30,875 executives at 2,819 firms, and it covers the years 1996 to 2007.

Table 1, Panel A shows the different types of executives who comprise my sample. The panel shows the number of firm-years in which an executive has a certain role at the firm (some executives change roles during their tenure). Forty-seven percent of my observations are C-Suite executives. Nineteen percent of these executives are CEOs, 16 percent are CFOs, eight percent are COOs, and four percent are other chief executives. Additionally, six percent of observations are

¹⁰In 80% of the firm-year observations in my sample, compensation data is available for five to seven top executives. In eight percent of firm-years, data is reported for fewer than five executives, even though the Securities and Exchange Commission requires firms to report data for their five highest-paid executives. In 12 percent of firm-years, data is reported for eight or more executives.

¹¹In order to merge the two databases, I matched firms by CUSIP number and stock ticker. I verified all matches by comparing firm names, and hand-checked any matches for which the names were not virtually identical. After matching firms, I matched executives using an algorithm which compares the first and last name of all Execucomp executives to the first and last names of all Thomson executives at the same firm. I then compared unmatched executives by last name and first initial, and hand-checked all resulting matches. All programs used to generate my combined dataset are available upon request.

I was unable to directly match 15 Execucomp firms to Thomson Insiders. Additionally, for 24 firms I was unable to match any of the CEOs listed in Execucomp to individuals listed in Thomson, and for three firms I was unable to match non-CEO executives listed in Execucomp to individuals listed in Thomson. For firms remaining in my sample, I was unable to match 964 executives across databases.

non-executive Chairman, six percent of executives have only the title “Senior Vice President”, and 10 percent of executives have titles which indicate a specialized role in the firm.¹² The remaining 30 percent of executives have titles which do not clearly fall into any particular category.

Panel A also shows that about half of observations are junior executives who have been at the top of the firm for less than five years. Throughout the paper, I use an indicator variable for junior executives to control for tenure. I do this because for many executives in Execucomp, there is no information on the year in which they became top executives. I can identify executives who are listed at a firm for the first time, and executives who as of 1996 have been listed at the firm for at least five years (because most firms enter Execucomp in 1992).

2.2 Pay and Equity Sales Measures

2.2.1 Measures of Pay

I use three different empirical measures of changes to an executive’s pay. Two of these measure how annual pay changes affect an executive’s incentives. Throughout the paper, I define incentives as the dollar change in the value of equity for a one percent change in the stock price. This is a standard measure used by the literature (Baker & Hall (2005)).¹³ I winsorize all three measures at the fifth and 95th percentiles. Information on the construction of all variables is in the Data Appendix.

1. **Pct. Chg. New Incentives [t]** is the annual percentage change in incentives received from new equity compensation.

¹²I label an executive as specialized if his title includes certain terms, such as “group”, “division”, “marketing”, “research and development”, etc. This definition differs from that of Aggarwal & Samwick (2003), who identify specialized executives by hand-checking all executive titles in Execucomp.

¹³Specifically, incentives from new equity granted in year t are $S_t \cdot P_t/100 + \sum_i N_{i,t} \cdot \Delta_i \cdot P_t/100$, where S_t is the number of regular shares granted in year time t , P_t is the grant-date stock price, $N_{i,t}$ is the number of stock options in each new grant i made to the executive in year t , and Δ_i is the option delta. I follow the literature by defining the option delta as the derivative of the Black-Scholes value of the stock options with respect to the stock price.

2. **Chg. Pay Ratio [t]** is the annual change in the ratio of equity pay to total pay, multiplied by 100. Equity pay is the dollar value of new stock grants and the Black-Scholes value of new option grants. Total pay is the dollar value of all pay received by the executive during the year.
3. **Chg. Total Incentives [t]** is the amount by which a new equity grant increases the executive's total incentives from holdings in the firm. It equals incentives from annual equity pay divided by total incentives from the start of the previous year, multiplied by 100.¹⁴ This variable does not measure changes in incentives due to changes in the firm's stock price, and it is bounded from below by zero.

Each of these three variables tests a different way in which the board could respond to equity sales. The first variable tests whether boards grant more equity incentives to executives following a sale. The second tests whether boards shift the composition of pay toward more equity. The third tests the extent to which the board replenishes an executive's total incentives following a sale.¹⁵ While my hypothesis is that boards should respond to sales by changing the pay ratio, I use the other two measures because it is also important to know whether boards grant more equity.

I measure incentives using the sensitivity of pay to firm performance based on the Black-Scholes option delta. As others have pointed out, pay-for-performance sensitivity may lead to biased estimates of the level of incentives because it does not accurately account for changes in the executive's marginal utility (Ross (2004), Jenter (2002)).¹⁶ My empirical specification compares changes in incentives instead of the level of incentives, so this will not cause a problem for my

¹⁴I do not scale by end-of-year total incentives because equity sales during the year decrease this number, creating a mechanical relationship between sales and subsequent changes in total incentives.

¹⁵Changes in annual equity pay may not accurately capture the increase in an executive's total holdings. For an executive who received abnormally low pay in the previous year, the percentage change in annual pay may be high even if the incentives from new pay are small relative to the amount of equity sold.

¹⁶An executive's incentives depend on his marginal utility with respect to changes in effort. Jenter (2002) argues that marginal utility is negatively correlated with changes in pay-for-performance sensitivity. For example, the option delta rises with a stock price increase, but the executive's marginal utility may decrease. This causes commonly used empirical measures of incentives, which are based on pay-for-performance sensitivity, to overstate the true level of incentives.

results as long as the change in marginal utility is approximately the same for executives at the same firm.

2.2.2 Measures of Equity Sales

Throughout the paper, I use two different measures of the size of equity sales:

1. **Sale Indicators:** I generate three binary indicators for small, medium, and large equity sales. I measure the dollar value of equity sold in a year divided by the dollar value of the executive's total holdings of firm equity at the start of the year.¹⁷ For stock options, I subtract the option exercise price from the dollar value of shares sold. Small sales equal less than 10 percent of total holdings, medium sales are 10 to 25 percent of total holdings, and large sales are more than 25 percent of total holdings.¹⁸ I also create a purchase indicator equal to one if the executive buys any equity on the open market.

To measure changes in the amount of equity sold, I take the change in each indicator from year $t - 2$ to $t - 1$. For example, "Large Sale [t]" equals one if the executive sold a large amount of equity in the previous year but not two years ago, and equals zero if the executive sold large amounts in both years or neither. This accounts for the possibility that the board increases equity pay in response to a sale in year $t - 2$, and then leaves equity pay unchanged when the executive sells again in year $t - 1$. (My results do not change substantially if I use regular indicators.)

2. **Pct. Drop Incentives [t-1]** is the amount by which an equity sale causes an executive's total incentives to decrease. I first measure the total incentives that an executive would have had at the end of the year, had he not sold or purchased any equity.¹⁹ Then I take

¹⁷When generating these indicators, I also include the dollar value of equity which the executive relinquishes to the firm to pay tax obligations or cover option exercise costs (these dispositions are labeled with transaction code F in Thomson Insiders). The results do not change if I omit these equity dispositions.

¹⁸The 10 percent and 25 percent cutoffs are approximately equal to the 33rd and 66th percentiles of the distribution of dollars of equity sold divided by total dollar value of equity holdings, conditional on a sale occurring.

¹⁹Calculating incentives in this way is not equivalent to observing the counterfactual in which the executive does not sell equity. The reason is that the year-end stock price, which I use to calculate the incentives, may be

the difference between this number and the executive’s actual year-end incentives, divide by total incentives from the start of the year, and multiply by 100.

The sale indicators are a simple way to test whether executives who sell equity receive different pay changes than executives who do not sell, and whether pay changes vary with the size of sales. However, the indicators do not use all of the variation in equity sales. Also, they are correlated with contemporaneous stock returns — increases in the stock price increase the value of equity sold during the year. “Pct. Drop Incentives” is a different and perhaps more precise measure. It measures incentives instead of dollars sold, and it is not affected by contemporaneous stock returns or changes in volatility, because both hypothetical and actual incentives are valued using the same year-end inputs.

2.3 Descriptive Statistics

2.3.1 Annual Pay and Incentives

Table 1, Panel B presents descriptive statistics on annual pay and total equity holdings for the executives in my sample. The median executive receives about \$1 million in annual total pay and \$340,000 in annual equity pay; at the median, 36.6 percent of annual pay is equity. The median executive owns \$2.5 million worth of firm equity, but the average ownership of firm equity is much higher, about \$20 million.

The statistics for total incentives indicate that a one-percent increase in the stock price causes the value of total equity holdings in the firm to increase by \$61,000 at the median, and \$471,000 on average. Incentives from new equity compensation are substantially lower, \$5,400 at the median and \$22,400 on average.

Panel C of Table 1 shows statistics for the three measures of equity pay which I use as dependent

affected by decisions the executive makes after selling equity. However, such decisions should be more likely to lead to stock price decreases, because the executive has weaker incentives after selling equity (also, the market could interpret managerial sales as a negative signal). Therefore, my measure likely understates the true decrease in incentives due to equity sales.

variables in regressions throughout this paper. Incentives from new equity pay increase by about 26 percent on average, but the pay ratio decreases by about one percent, indicating that total pay may be rising slightly faster than equity pay. For both measures, the median pay change is zero. Total incentives increase by 19 percent on average and 11 percent at the median. (The median change in total incentives is higher than the median change in annual incentives because the variable is bounded from below by zero).

Panel D shows mean and median values for each measure of equity pay changes, broken down by executive type. The statistics show that Senior Vice Presidents receive the largest increases in new equity incentives — 29 percent on average and 7.2 percent at the median, compared to a mean of 26.1 percent and median of zero for CEOs. The decrease in pay ratio is also smallest for Senior Vice Presidents. The panel also shows that CFOs and COOs receive the largest increases in total incentives, while CEOs receive the smallest — 15 percent on average and 7.4 percent at the median. CEOs may receive the smallest percentage changes because their annual pay and total incentives are larger than those of other executives.

2.3.2 Frequency of Equity Sales

Table 2 presents descriptive statistics on the frequency and size of equity sales, for all top executives and separated by executive type. Panel A shows that there is significant variation across firms in the fraction of top executives who sell equity. In 26 percent of firm-years, none of the firm's top-level executives sell equity, and in another 26 percent of firm-years fewer than half of executives sell. In 30 percent of firm-years more than half of executives sell, and in 14 percent of firm-years each executive sells. The panel also shows that in 54 percent of firm-years, at least one executive engages in a medium or large sale, and in 19 percent of firm years half or more of executives do. The final column of Panel A shows sales at firms which experienced stock returns above the median for all firms in the year. In 52 percent of firm-years, half of more of executives sold equity, but in 20 percent of firm-years no executive engaged in a sale.

Panel B shows that 60 percent of executives sell equity at least once while in my sample. Ad-

ditionally, 45 percent of executives sell equity in half of their years in the sample. While some of these sales are small, 43 percent of executives engage in a medium or large sale at least once, and 22 percent of executives do so as often as every other year.

The panel also shows frequencies for different types of executives.²⁰ CEOs are most likely to engage in an equity sale, with 70 percent doing so at least once. (CEOs are also in my sample for seven years on average, compared to five for CFOs, COOs, and Senior Vice Presidents.) A similar fraction of CEOs engage in a medium or large sale as other types of executives. Executives who are not senior vice presidents or part of the C-Suite sell equity least frequently, with 57 percent selling any equity and 41 percent engaging in a medium or large sale at least once.

Panel B also shows that 20 percent of executives buy equity on the open market. C-Suite executives are more likely to purchase equity, with 39 percent of CEOs and 27 percent of CFOs or COOs doing so at least once.

2.4 Size of Transactions

Panel C presents statistics on the size of annual equity transactions, conditional on a sale or purchase occurring. The panel shows that the median amount of equity sold is \$560,000, and one quarter of all equity sales are for more than \$2 million. Equity sales equal 16 percent of an executive's total holdings of firm equity at the median, and more than a third of total holdings on average. Equity sales reduce total incentives by 15 percent on average, and nine percent at the median. Some large sales decrease incentives by 30 percent or more.

On the other hand, executives purchase equity in much smaller amounts. The median purchase is \$56,000, and is equal to four percent of the executive's total holdings in the firm. Few large purchases exceed a couple hundreds of thousand dollars.

Panel D shows that CEOs engage in the smallest equity sales relative to their total holdings in

²⁰Because these statistics cover the executive's entire time in the sample, each column includes all executives who have ever served in that role while in my sample.

the firm. For a CEO, the median sale is equal to 10 percent of equity holdings, and reduces total incentives by six percent. For non-CEO executives, the median sale is from 16 to 19 percent of equity holdings, and decreases incentives by about 10 percent.²¹

3 Empirical Specification

In this section I develop a regression specification based on the hypothesis that boards use annual pay to adjust an executive’s incentives toward the optimal level. The purpose of this specification is to test empirically whether boards grant a higher proportion of equity pay to executives who sold more equity in the previous year. I describe several variables which may cause executives to sell equity and optimal incentives to change, thus confounding the empirical analysis. I then explain my identification strategy for accounting for some of these variables.

3.1 Regression Model

My empirical specification is for executive m at firm f at time t . The specification includes the following variables:

- pay_{mft} : a measure of equity pay granted at time t .
- α_{mft}^* : the executive’s optimal incentive level at the beginning of year t .
- α_{mft} : the executive’s actual incentives in year t , before the board determines annual pay.
- \vec{x}_{ft} : a vector of time-varying firm-level characteristics.
- \vec{z}_{mt} : a vector of time-varying executive-level characteristics.
- $\lambda_f, \mu_t, \delta_m$: firm, year, and executive fixed effects.

²¹Table 1 shows that CEOs also receive smaller increases in pay than other top executives. This indicates that my empirical results could be affected by CEOs who have much larger holdings of firm equity than other types of executives. I repeat all of my specifications excluding the CEO, and my results do not change substantially.

The theoretical benchmark for my regression model is based on Holmstrom & Milgrom (1987), who predict that each executive has a unique level of incentives which most effectively mitigates agency problems, and that boards grant pay to set executives at this optimal incentive level. My empirical model does not assume that boards set executives precisely at this level, but rather that boards grant pay to bring executives' incentives back toward the optimum following equity sales.

I model an executive's annual compensation as a linear function of the difference between optimal incentives and the executive's actual incentives from holdings of firm equity:²²

$$pay_{mft} = \beta_0 + \beta_1 \cdot (\alpha_{mft}^* - \alpha_{mft}) + \lambda_f + \delta_m + \mu_t + \epsilon_{mft} \quad (1)$$

The optimal incentive level α_{mft}^* depends in part on unobservable variables, such as the shape of the executive's utility function. Because theory predicts that the optimal incentive level depends on firm- and executive-level characteristics, I model α_{mft}^* as a linear function of these variables:

$$\alpha_{mft}^* = \eta_{m,0} + \eta_{m,1} \cdot \vec{x}_{ft} + \eta_{m,2} \cdot \vec{z}_{mt} + e_{mft} \quad (2)$$

Substituting (2) into (1) and rearranging terms yields:

$$pay_{mft} = \beta_{m,1} \cdot \vec{x}_{ft} + \beta_{m,2} \cdot \vec{z}_{mt} + \beta_3 \cdot \alpha_{mft} + \lambda_f + \mu_t + \delta_m + \tilde{\epsilon}_{mft} \quad (3)$$

where $\beta_{m,1} = \beta_1 \cdot \eta_{m,1}$, $\beta_{m,2} = \beta_1 \cdot \eta_{m,2}$, $\beta_3 = -\beta_1$, and $\tilde{\epsilon}_{mft} = \beta_1 \cdot e_{mft} + \epsilon_{mft}$.

²²The literature finds that compensation also depends directly on firm-level characteristics such as tax and accounting considerations. For example, since 1993 the limit on corporate tax deductions for non-performance-based executive pay has been one million dollars, causing some firms to award pay raises primarily through increased equity pay (Perry & Zenner (2001), Yermack (1995)). Additionally, prior to 2006 firms did not have to write down in their accounting statements the cost of granting at-the-money stock options, and some firms granted executives large amounts of stock options in order to avoid reducing their earnings (Carter & Lynch (2001), Core & Guay (1999)).

While \vec{x}_{ft} does not directly enter my specification for annual pay, equations (1) and (2) are both linear, so the final regression specification will not depend on how firm and executive-level characteristics enter the model.

Equation (3) is similar to the model developed by Core & Guay (1999). Like my paper, Core & Guay (1999) hypothesize that new equity incentives depend on the deviation between an executive's optimal and actual incentives, and they also model the optimal incentive level as a function of firm and executive characteristics.

Equation (3) states that annual compensation depends on firm- and executive-level variables which affect optimal incentives, as well as the executive's actual incentives from holdings of firm equity at the start of year t . In this equation, the m subscript on $\beta_{m,1}$ indicates that firm-level characteristics can have a different effect on the optimal incentives, and hence compensation, of each executive at firm f . My identification strategy will make a key assumption about this coefficient.

Optimal incentives depend partly on executive-level characteristics which are unobservable but fixed over time, such as the coefficient of risk aversion. I therefore formulate my specification in terms of changes in pay by taking the first difference of (3):

$$\Delta pay_{mft} = \beta_{m,1} \cdot \Delta \vec{x}_{ft} + \beta_{m,2} \cdot \Delta \vec{z}_{mt} + \beta_3 \cdot \Delta \alpha_{mft} + \mu_t + \Delta \tilde{\epsilon}_{mft} \quad (4)$$

where $\Delta pay_{mft} = pay_{m,f,t} - pay_{m,f,t-1}$, etc.

I refer to equation (4) as the across-firm model, and in the next section I use this specification to estimate the relationship between pay changes and equity sales for top executives across firms. This model states that changes in equity pay depend on two channels: 1) changes to the optimal incentive level caused by changes to firm- and executive-level characteristics, and 2) changes to the executive's actual incentives due to changes in total holdings of firm equity. Because equity sales decrease total equity holdings, reducing the executive's actual incentives, the primary coefficient of interest is β_3 .

3.2 Potential Confounding Variables

The model (4) states that boards should grant larger increases in equity pay to executives whose actual incentives are below the optimal level. This does not mean that the board should always grant more equity following a sale, because the executive's optimal incentive level may also decrease. In this case, actual incentives may remain at the optimal level after the sale, and the board's optimal response would be to leave pay unchanged.

It is likely that various elements of $\Delta\vec{x}_{ft}$ and $\Delta\vec{z}_{mt}$ are empirically unobservable, and therefore will be in the error term of a cross-sectional regression. If these variables are correlated with equity sales and also cause equity pay to decrease, my empirical estimate of β_3 will be biased downward. If the effect of the variables is large relative to the equity sale, β_3 may be statistically indistinguishable from zero, or even negative.

Several types of confounding variables could have this effect:

1. **Changes to Monitoring Ability:** Theory predicts that the optimal incentive level depends on the board's ability to monitor executives (Prendergast (2002)). Boards which are better able to evaluate an executive's decisions will not need to rely as heavily on equity pay to convey incentives. Firm-level changes, such as a reduction in the set of investment opportunities or a decrease in stock price volatility, may increase the board's monitoring ability and also cause executives to sell equity. Additionally, a few years after hiring an executive, the board may learn information about him that helps improve its monitoring. At the same time, the executive may begin selling equity.
2. **Poor Firm Performance:** Executives may sell equity in anticipation of poor future firm performance, and when the performance is realized boards may reduce the executives' total pay and equity. The board may decrease pay due to private information which is not yet reflected in the firm's stock price or sales and earnings.
3. **Shocks to Outside Wealth:** Decreases in outside wealth may cause the executive to

become more risk averse by increasing the covariance between marginal utility and the firm’s idiosyncratic risk (Jenter (2002)). The board’s optimal response may be to allow the executive to reduce his ownership stake in the firm, to prevent his decisions from becoming overly conservative.²³

Each of these confounding variables show that a reduction in the sensitivity of an executive’s wealth to firm performance can be a Pareto improvement. These variables provide alternative explanations — which are consistent with efficient contracting — for why the data show no empirical relationship between equity sales and subsequent pay.

The across-firm model does not account for reverse causality. An executive may sell equity because he anticipates that doing so will cause the board to grant new equity pay. However, my results indicate that boards respond to equity sales with at most small pay increases, which are unlikely to induce executives to sell equity. I therefore conclude that reverse causality is unlikely to be affecting my empirical estimates.

3.3 Identification Strategy

To account for some of the above variables, I compare executives who sell equity to executives at the same firm who in the same year do not sell equity. I derive this specification by replacing $\beta_{m,1} \cdot \Delta \vec{x}_{ft}$ in the across-firm model with a firm-year fixed effect:

$$\Delta pay_{mft} = \mu_{ft} + \beta_{m,2} \cdot \Delta \vec{z}_{mt} + \beta_3 \cdot \Delta \alpha_{mft} + \Delta \tilde{\epsilon}_{mft} \quad (5)$$

In this within-firm model, β_3 measures how changes in total incentives affect the change in executive m ’s equity pay, relative to other executives at the same firm. Top executives who do not sell equity serve as a control group for executives at the same firm who do.

²³Risk aversion also depends on other executive-level characteristics such as age and the shape of the utility function. However, these characteristics do not vary substantially from year to year, and hence are filtered out by first differences in equation (4).

This specification is invalid if the pay changes of non-selling executives would be different from the pay changes of selling executives, in the counterfactual case in which they do not sell equity. My key identifying assumption is that changes to the firm do not have a differential effect on the pay of the firm’s top executives — in other words, that $\beta_{m,1}$ is the same for each top executive m at firm f . If this is not true, some elements of $\Delta\vec{x}_{ft}$ will be in the error term of a regression based on (5), and the results will be biased if these elements are correlated with $\Delta\alpha_{mft}$. In order for my identification strategy to be valid, any firm-level change which causes an executive to sell equity should not affect that executive’s pay differently than the pay of non-selling executives at the same firm.

As I argued in the introduction, the identifying assumption is likely to hold for the top executives in my sample. Table 1 shows that my sample primarily consists of executives who have important leadership roles within the firms. The most common executive roles are the CEO, CFO, and COO. The actions of these executives affect the entire firm, so it is reasonable to assume that firm-level changes affect their pay in a similar manner. Furthermore, boards set annual pay for each of these top executives, and they often tie the executives’ pay to the same firm performance metrics.

However, this identification strategy does not account for all of the above confounding variables. In particular, unobservable elements of $\Delta\vec{z}_{mt}$ remain in the regression error term, and some of these variables likely affect $\Delta\alpha_{mft}$. Section 6 discusses this limitation in more detail, and conducts tests using subsamples of executives whose individual characteristics are unlikely to bias regression results.

4 Main Results: Across-firm Model

In this section, I present estimates of the relationship between equity sales and subsequent pay using regressions that are based on the across-firm model (4). The specifications in this section do not include firm-year fixed effects, so the results are obtained by comparing pay changes for all executives who sell equity to all executives who do not, across firms.

The results are presented in Tables 3 and 4. The specifications in the two tables differ only in the measure of equity sales. In Table 3 I use the sale indicators, and in Table 4 I use the decrease in total incentives. In each table, the dependent variable in the first two regressions is the percentage change in incentives from new equity pay. In the next two regressions, the dependent variable is the change in pay ratio, and in the last two regressions it is the change in total incentives. For each dependent variable, I first compute results using all top executives, and second using just CEOs. Each regression includes a variety of firm and executive-level control variables, as well as year and industry fixed effects.²⁴

4.1 Results using sale indicators

If boards replenish executives' holdings of firm equity following sales, the regression results should show that selling executives receive larger increases in equity pay than non-selling executives. In Table 3, the coefficients on the sale indicators estimate the average pay increase for executives who sell small, medium, or large amounts of equity relative to the excluded group, executives who do not sell equity. These coefficients should be positive and increasing in the size of sale.

Instead, Table 3 shows that the coefficients on each sale indicator are negative and in most regressions statistically indistinguishable from zero. Furthermore, in five of the six models the coefficient on large sales is more negative than the coefficients on small and medium sales. For example, the first regression indicates that executives who sell medium amounts of equity on average receive a 1.5 percent smaller increase in new incentives than executives who do not sell, while executives who sell large amounts of equity on average receive a 4 percent smaller increase in new incentives, which is statistically different from zero. The results show no relationship between equity sales and changes in pay ratio, but executives who sell medium or large amounts of equity receive smaller increases in total incentives than executives who sell little to no equity.

²⁴To conserve space, I do not report results for all control variables. The unreported firm-level controls are growth in sales, growth in net income, and an indicator for tech firms. The unreported executive-level controls are indicators for executives who in year t were promoted to the C-Suite, became chairman of the board, became CEO, or stepped down from the CEO post, as well as indicators for the executive's role at the firm.

The estimates from regressions using just CEOs are similar to the estimates for the entire sample. However, the (perversely negative) relationship between large sales and changes in new incentives is not statistically significant. The pay ratio for CEOs shifts toward more equity following large sales, but this relationship also is not significant.

Most of the specifications in Table 3 cannot reject the null hypothesis that selling executives receive similar changes to equity pay as non-selling executives. However, all of the specifications reject, with 99 percent confidence, an alternative null hypothesis that selling executives receive five percent larger increases in equity incentives than non-selling executives. Such an increase in equity pay would not fully replenish an executive's incentives following even the smallest of equity sales — Table 2, Panel C shows that small equity sales reduce executives' total incentives by 6.7 percent on average.

Table 3 shows that some firm- and executive-level variables do explain changes in equity pay. Each regression shows that firms with higher stock returns grant larger increases in equity pay. Firms with higher stock volatility grant smaller increases in annual incentives, but not total incentives. Interestingly, top executives in their first four years of tenure on average receive larger increases in annual and total incentives than more senior executives. This is not consistent with the hypothesis that senior executives are more likely to become entrenched, and hence need stronger incentives.

4.2 Results using decrease in total incentives

In Table 4, I measure equity sales using “Pct. Drop Incentives”, the change in an executive's total incentives due to sales or open-market purchases of firm equity. Larger values of this variable indicate larger decreases in total incentives. Therefore, a positive coefficient would indicate that boards grant more equity pay to executives whose incentives fall more due to sales.

Unlike the previous table, Table 4 shows that the relationship between equity sales and subsequent pay changes is positive, and statistically significant at the one-percent level. The coefficient on

“Pct. Drop Incentives” in the first regression indicates that for each 1 percent drop in total incentives due to an equity sale, an executive receives a 0.13 percent larger increase in new incentives. Similarly, in the third regression a 1 percent drop in total incentives is associated with a 0.04 percent larger increase in pay ratio, and in the fifth regression it is associated with a 0.15 percent larger increase in total incentives.

The direction and significance of these relationships is similar for CEOs, and the coefficients are about one-third larger in size. A CEOs whose total incentives decrease 1 percent receives a 0.18 percent larger increase in new incentives, and a 0.2 percent larger increase in total incentives, than a CEO who does not sell equity.

The specifications in Table 4 reject with 99 percent confidence the alternative null hypothesis that the coefficient on “Pct. Drop Incentives” is 1. A coefficient of one would indicate that boards grant an executive one percent higher new incentives for each one percent drop in total incentives from sales.

4.3 Discussion of Results

The results in Table 3 show that across firms in my sample, executives who sell equity do not on average receive larger increases in equity pay than executives who do not sell, and may in fact receive smaller increases. These results provide no evidence that boards replenish executives’ equity holdings following sales.

When equity sales are measured differently in Table 4, the results show some evidence of replenishment. However, the next section shows that when I compare executives within the same firm, the coefficients on “Pct. Drop Incentives” become substantially smaller. Additionally, the relationship between this measure of equity sales and subsequent pay weakens when executives with the smallest holdings of firm equity are excluded from the analysis.

Furthermore, the results in Table 4 indicate that the magnitude of the board’s response to an

equity sale is small. This is because an executive’s total incentives are substantially larger than the new equity incentives received each year. Therefore, a 1 percent drop in total incentives is not offset by a 0.13 percent increase in new incentives. The first regression of Table 4 implies that for the median executive, each \$1 decrease in incentives from equity sales leads to \$0.01 higher incentives, relative to executives who do not sell.

The relationship between “Pct. Drop Incentives” and “Chg. Total Incentives”, in the last two columns of Table 4, directly measures the degree to which boards replenish an executive’s total incentives. The coefficient of 0.15 in regression five indicates that boards replenish about 15 percent of an executive’s total incentives following a sale (20 percent for CEOs). This is below full replenishment, and in the next section I show that the replenishment rate becomes smaller when I compare executives at the same firm.

5 Main Results — within-firm model

In this section, I present results based on empirical specification (5), which implements my identification strategy of comparing executives at the same firm. All regressions in this section include firm-year fixed effects. My first set of results tests whether executives who sell equity receive larger increases in annual equity pay than executives who do not sell. My second set of results tests whether boards replenish a selling executive’s total incentives from holdings of firm equity. To account for the possibility that boards set pay differently for division-level managers, I then repeat the analysis using a subsample of just C-Suite executives.

5.1 Results for Changes in Annual Pay

Table 5 tests whether executives who sold larger dollar amounts of equity subsequently received larger increases in equity pay. In this table, I measure equity sales using the three indicators for small, medium, and large sales in year $t - 1$. The dependent variable in the first two regressions is

the percentage change in new incentives, and the dependent variable in the next two regressions is the change in pay ratio. For both dependent variables, I first estimate specifications with no control variables, and then add measures of an executive’s tenure, role at the firm, and promotions to various leadership positions.²⁵

If boards are responding optimally to equity sales, the coefficients on all of the sale indicators should be positive, and they should be increasing in the size of sale. Positive coefficients in the first two regressions would indicate that selling executives receive larger increases in equity incentives than the excluded group, non-selling executives at the same firm. Positive coefficients in the third and fourth regressions would indicate that boards shift the composition of selling executives’ pay toward more equity.

Instead, Table 5 shows that the coefficients on all of the sale indicators are negative. For example, the first regression shows that executives who sell large amounts of equity subsequently receive 1.6 percent smaller increases in new incentives than executives at the same firm who do not sell. All but one of the coefficients is statistically indistinguishable from zero; the perverse relationship between large sales and changes to the pay ratio is marginally significant. The sign of the coefficient on equity purchases is consistent with efficient contracting — it may be optimal for the board to grant less equity to an executive who purchased stock on his own — but the relationship is also statistically insignificant. As in Table 3, all specifications reject the alternative null hypothesis that the coefficient on the sale indicators is greater than or equal to five.

The coefficients on the sales indicators are virtually unchanged when I include executive-level control variables in the specification. These controls show that executives receive larger increases in both equity incentives and the ratio of equity to total pay during their first four years at the firm. Executives receive substantial increases in equity pay following promotions to the C-Suite, or when becoming chairman of the board or CEO. Also, the “C-Suite” indicator shows that this category of executives on average receives larger increases in incentives than other executives at

²⁵To conserve space, I do not report indicator variables which are equal to one if the executive’s title is “Senior Vice President”, if the executive is non-executive chairman of the board, or if the executive has a specialized role in the firm. Also, my results do not change if I replace the “C-Suite” indicator variable with separate indicators for the CEO, CFO, and COO.

the firm.

Table 6 is similar to Table 5, but equity transactions are measured using the percentage change in total incentives due to an equity transaction. Because larger values of this variable mean that total incentives decrease more, a positive coefficient would indicate that boards are replenishing some of the executive's equity holdings.

Indeed, Table 6 shows that the coefficient on "Pct. Drop Incentives" is positive in all of the regressions. The first two regressions indicate that for each 1 percent decrease in total incentives due to equity sales, an executive's new incentives increase by 0.04 percent, relative to executives at the same firm who do not sell. The relationship becomes statistically insignificant when executive-level control variables are added to regression two. Regression four shows that an executive's pay ratio increases by 0.01 percent for each 1 percent decrease in total incentives, and this relationship is statistically significant at the five percent level.

The direction of the results in Table 6 is consistent with boards optimally responding to equity sales, but the economic magnitude indicates that the rate of replenishment is even smaller than in the cross-section. The median executive has total incentives of about \$60,800, and receives \$5,400 in annual equity incentives. Therefore, the coefficient on "Pct. Drop Incentives" in the second regression implies that when the median executive's incentives decrease by \$1, the board's equity grant increases total incentives by \$0.04. Similarly, the coefficient of 0.01 in the fourth regression implies that the pay ratio of an executive who sells all of his equity would increase by one percent, from 36.6 to 37.6 percent of total pay. Furthermore, the regressions strongly reject the alternative null hypothesis that the coefficient on "Pct. Drop Incentives" is equal to 1.

5.2 Results for Changes in Total Incentives

The results presented above show that boards increase annual equity pay by at most a small amount in response to executives' equity sales. Next I directly measure the degree to which boards replenish an executive's total incentives from holdings in the firm after an equity sale.

In Table 7, the dependent variable in all regressions is the increase in total incentives due to new equity pay. I measure equity sales using sale indicators in the first two regressions, and the decrease in total incentives from equity sales in the next two regressions. I estimate both sets of regressions first without, and then with, executive-level control variables.

If boards are replenishing an executive's equity holdings, a new equity grant should increase total incentives by an amount similar to the decrease caused by the sale. The coefficient on "Pct. Drop Incentives" in the third and fourth regressions indicates the rate at which boards replenish an executive, and it should be close to one if boards are fully restoring firm holdings.

Table 7 shows that executives who sell large amounts of equity receive about a 1.5 percent smaller increase in total incentives than executives who do not sell. This relationship is statistically significant at the one percent level. The first regression in Table 7 also shows that executives who sell small amounts of equity receive a 0.5 percent larger increase in total incentives, but the coefficient decreases to zero and becomes statistically insignificant when control variables are included.

The third and fourth regressions show that "Pct. Drop Incentives" is positively associated with subsequent increases in total incentives. The coefficient in the fourth regression indicates that for each 1 percent drop in total incentives due to equity sales, the executive subsequently receives a 0.11 percent larger increase in total incentives than an executive who does not sell. This relationship is statistically significant at the one percent level, and becomes slightly stronger when executive-level variables are included.

This result indicates that boards replenish about 11 percent of an executive's holdings of firm equity in the year following a sale. This replenishment rate is far from the coefficient of 1 which would imply that boards restore all of an executive's equity holdings, and the standard error of 0.1 percent indicates that the replenishment rate is precisely estimated. The results strongly reject the alternative null hypothesis that the coefficient on "Pct. Drop Incentives" is even as high as .15.

5.3 Results for C-Suite Executives

As I pointed out in the introduction, my identification strategy assumes that unobserved firm-level changes which cause executives to sell equity do not have a differential effect on the pay of a firm's top executives. This identifying assumption may not be valid if some of the top executives manage divisions or subsidiaries of the firm, or if they are tasked with specialized responsibilities, such as directing research or product development. Firms may base the pay of these executives primarily on the performance of the unit of the firm which they oversee (Aggarwal & Samwick (2003)).

To account for this possibility, I compute this section's results on a subsample of just C-Suite executives. I restrict my sample to firm-years in which at least three such executives were listed in Execucomp. While C-Suite executives such as the Chief Financial Officer and Chief Technology Officer often have specific responsibilities, their decisions affect the entire firm. Therefore, the effect of firm-level changes on the pay of these executives should be more similar than the effect on the pay of all top executives.

Table 8 presents two sets of regressions. In the first three regressions, I use the indicator variables to measure equity sales, and in the next three regressions I use the decrease in total incentives. In each set of regressions, I present results for all three measures of pay changes. All regressions include variables controlling for executives' tenure at the firm and for promotions.

The first three regressions show that the coefficients on most of the sale indicators are negative and statistically insignificant. One relationship which is significant at the one-percent level is that C-Suite executives who sell large amounts of equity receive a 2.9 percent smaller increase in total incentives than C-Suite executives who do not sell. C-Suite executives who sell medium amounts of equity receive a 0.8 percent smaller increase in total incentives, and this relationship is marginally significant.

Regressions four and five show that the relationship between "Pct. Drop Incentives" and changes in annual pay remains positive and similar in magnitude, but is no longer statistically distin-

guishable from zero. The sixth regression shows that the board responds to a 1 percent decrease in total incentives from equity sales by subsequently increasing total incentives by 0.13 percent. This coefficient is significant at the one-percent level.

Table 8 shows that the relationship between equity sales and subsequent pay changes for C-Suite executives is similar to the relationship for all top executives. In particular, the board replenishes the equity holdings of C-Suite executives at almost the same rate as all top executives at the firm. This indicates that my results are unlikely affected by differential pay changes across top executives.

Some unobserved firm-level changes may affect only the CEO's pay. The CEO has the most influence over the board, and is often the public face of the company. If the CEO crafts a certain strategy which destroys firm value, such as a failed acquisition, the board may choose to decrease just the CEO's pay. To account for this possibility, I computed all of the regressions in tables 5, 6, and 7 using all top executives except the CEO. I do not report these results, but the sign and magnitude of the coefficients on the equity sales measures do not change substantially.

5.4 Discussion of results

The main empirical results of my paper are the following:

1. Executives who sell larger dollar amounts of equity do not subsequently receive a higher proportion of annual pay in equity, or a larger increase in annual equity incentives, than executives at the same firm who do not sell.
2. A positive association exists between the percentage decrease in total incentives due to equity sales and subsequent increases in the level and ratio of equity pay. However, the magnitude of the effect is small.
3. Boards replenish at most 10 percent of the decrease in incentives caused by an equity sale.

4. The results are the same for a subsample of C-Suite executives, indicating that my estimates are likely not affected by differential pay changes across executives.

Given these results, it seems unlikely that boards restore executives' incentives following sales of firm equity. Boards have considerable flexibility in setting executive pay, so contracting costs should not prevent boards from replenishing more than a small amount of executives' incentives. In particular, the board should be able to increase the ratio of equity to total pay, which is 37 percent at the median. Furthermore, any confounding variable which remains in the error term of the within-firm regressions would have to cause a substantial decrease in optimal incentives whenever an executive sells equity. Such a variable would have to reduce the optimal replenishment rate of close to 1 to the empirically observed estimate of about 0.1. In the next section, I account for some possible confounding variables, and show that my results do not change substantially.

The economic implication of these results is that the incentives of executives who sell equity decrease relative to the incentives of executives at the same firm who do not sell. The relative interpretation of the results is important — it indicates that the board either allows the incentives of selling executives to decrease below the optimum, or allows the incentives of non-selling executives to increase above the optimum. In either case, one type of executive's incentives are suboptimal, and the board does not respond by adjusting them. This calls into question whether boards are granting high levels of equity pay in order to properly incentivize executives, as they say they are.

The positive, statistically significant relationship between “Pct. Drop Incentives” and changes in annual equity pay is puzzling, because the coefficients on the sale indicators are negative or zero. This relationship is caused by the sales of executives with the smallest holdings in the firm. In Table 9, I estimate the relationship between “Pct. Drop Incentives” and the three measures of pay changes, excluding from the sample executives whose total incentives are in the lowest decile of my sample (i.e. less than \$7,620). The first four regressions show that the coefficient on “Pct. Drop Incentives” is smaller than the result for the full sample, and is no longer statistically distinguishable from zero. Regressions five and six show that the rate of replenishment remains

positive, but decreases to about six percent.

The executives excluded from Table 9 tend to work for smaller firms (with median market value \$650 million) which underperformed the market in year prior to, but not the year of, an equity sale.²⁶ Executives with small holdings are also less likely to be CEOs or C-Suite executives. Fewer than 20 percent of these executives sell equity in any given year, but their total incentives decrease more when they do sell. This may be because the denominator of “Pct. Drop Incentives” is the executive’s total holdings of firm equity at the start of the year — the variable will be larger for executives with smaller holdings (to account for outliers, I winsorize this measure at the 5th and 95th percentiles).

6 Robustness Checks

In this section I address alternative explanations for why the board’s decision not restore an executive’s incentives after an equity sale may be consistent with efficient contracting. My empirical specification accounts for firm-level changes which affect the optimal incentives of all of a firm’s top executives, but not for unobservable variables that only affect the optimal incentives of some executives. Examples of such variables include shocks to an executive’s wealth held outside the firm, differences in compensation structure between junior and senior executives, and changes in the board’s information about an executive’s willingness to consume private benefits. If these variables cause executives to sell equity and also decrease optimal incentives, my empirical estimates from the previous section will be biased downward.

In this section, I identify several such executive-level variables, and repeat my analysis on subsamples of executives who are likely unaffected by these variables. I also examine whether boards anticipate executives’ selling behavior, and grant compensation ex ante to prevent the executive’s incentives from decreasing. I show that my main results from the previous section are robust to

²⁶The median stock return for these firms in the year prior to an equity sale was -12 percent, compared to 11 percent for other firms. In the year of the equity sale, the median stock return was 12.7 percent, compared to 10.8 percent for other firms.

these tests.

6.1 Executive Tenure and Board Learning

Executives at the same firm, but in different stages of their career, may differ in several ways. First, boards may grant a higher fraction of pay in equity to executives who have recently been hired or promoted to top management positions, in order to build up their holdings in the firm. These executives are also less likely to sell equity than senior executives. Therefore, differences in tenure across executives at the same firm may explain why selling executives do not receive more equity than non-selling executives.

Second, when a board hires an executive, it may not know his propensity to consume private benefits. If the board is contracting efficiently, it may form an expectation about the executive's type, and grant compensation that conveys the optimal incentives based on this expectation. In the executive's first few years at the firm, the board has numerous opportunities to observe the executive and learn additional information about him. If the board learns that it initially overestimated the executive's willingness to shirk or underestimated his risk aversion, it may reduce his optimal incentives. Such changes in the board's information may occur just as the executive is beginning to sell equity.

To account for such differences across executives, I identify cohorts of executives, defined as groups of three or more executives who joined a firm's top management in the same year, or who have served together in top management for at least four years.²⁷ Forty-three percent of executives are part of a cohort at some point during my sample, and 45 percent of firm-years in my sample have a cohort of executives.

²⁷Specifically, I identify all firm-years in which at least three executives are listed for the first time as top executives at that firm. (These executives did not necessarily join the firm at the same time; some may have previously worked in lower-level management positions.) I define this group of executives as a cohort in all subsequent years in which at least three of the executives stay at the firm.

I cannot observe the tenure of the top executives listed in the firm's first year in the Execucomp database, if the firm is listed in Execucomp in 1992, the first year of database coverage. However, starting in 1996, I am certain that any of the initial executives who are still listed at the firm have worked there for at least four years. I define these executives as a cohort if at least three of them are still with the firm after four years. Finally, if a firm has just begun to trade publicly, I define its initial top executives as a cohort.

Executives in the same cohort have similar tenure. Additionally, if a board learns valuable information about one executive, it may at the same time learn information about other executives who joined top management at the same time. I therefore repeat my analysis on a subsample of just executives who belong to a cohort.

Table 10 presents these results. The table is similar to Table 8 — I show results for two sets of regressions, the first using indicator variables to measure equity sales, and the second using the decrease in total incentives. Each set of regressions also includes results for all three measures of pay changes, and all regressions include executive-level control variables.

The results for executives belonging to a cohort are similar to my results for all top executives. The coefficients on the sale indicators are all negative, and the relationship between medium or large sales and changes in total incentives is statistically significant. The coefficients on “Pct. Drop Incentives” are all positive and similar in magnitude to previous results, but only the relationship with changes in total incentives is significant.

These results indicate that differences in tenure levels across executives, and differences in the amount of information that the board possesses on executives, are not affecting my estimates.

6.2 Wealth effects

If an executive’s utility is concave in wealth (e.g. a constant relative risk aversion utility function), the executive will become more risk averse following a decrease in wealth held outside the firm. The executive may begin to undertake decisions which shareholders consider to be suboptimally conservative because he wants to preserve his remaining wealth, and after the shock a higher fraction of his wealth is held in firm equity. The board’s optimal response may be to allow the executive to better diversify his remaining wealth by reducing his holdings in the firm.²⁸ My

²⁸A wealth shock may also increase an executive’s incentives to work hard, even after he sells some of his equity, which could allow the board to reduce equity pay. The executive chooses optimal effort by weighing the marginal benefit of working harder against the marginal cost. The executive’s marginal utility with respect to pay may increase following a wealth shock, and if the marginal cost of effort does not change, the executive will work harder. The precise effect of a wealth shock on the executive’s effort level depends on several factors, including

empirical results may be consistent with efficient contracting if a large fraction of the executives in my sample sell equity after experiencing wealth shocks.

I cannot directly control for wealth changes, because executives do not need to report to the public any information on wealth held outside the firm. Instead, I use data on executives' non-qualified deferred compensation (NQDC) accounts. NQDC plans are similar in purpose to 401(k) accounts.²⁹ Executives allocate a portion of their annual pay (usually salary or a cash bonus) into the account, and the firm invests the savings on behalf of the executive. Income taxes are only paid when money is withdrawn from the account.

In 2006, the SEC required firms to begin reporting data on the size of NQDC accounts and contributions to the accounts. About half of the firms in my sample in 2006 offered NQDC plans.³⁰ The median executive who contributes to an NQDC account defers 17 percent of annual salary and has savings of \$564,000 in the account (equal to about 13 percent of the value of firm equity holdings).

Executives who voluntarily delay receipt of a significant fraction of their annual income, or who have substantial wealth in their accounts, are less likely to have recently experienced large wealth or liquidity shocks. I therefore repeat my analysis on two subsamples: 1) executives who contributed money to an NQDC account in the same year they sold equity, and 2) executives whose NQDC accounts are equal to at least 10 percent of the value of their firm equity, and who did not withdraw money from the account, in the year after a sale.

Because data is not available before 2006, I am only able to compute results using the last two years of my sample. I also only use firms at which at least three executives made NQDC contributions or had substantial savings in the accounts. I still have data on executives from

the degree to which a change in effort affects the executive's pay (Ladika (2011)).

²⁹One of the purposes of these plans is to allow executives to bypass the \$22,000 cap on annual contributions to a 401(k) account. However, unlike the savings in a 401(k) account, NQDC accounts are not protected from creditors in the event of bankruptcy. See Reda, Reifler & Thatcher (2007) for more information.

³⁰Execucomp does not include a variable indicating which firms have active NQDC plans, but there are separate variables for the amount of money contributed by the executive and firm to the account. I define a firm as having an active plan if in 2006 at least one executive contributed money to an NQDC account, or the firm made a contribution on behalf of at least one executive. By this definition, 49% of firms in my sample offered plans in 2006.

about 300 firms for the first subsample, and 400 firms for the second subsample.

The results are in Table 11. Panel A shows results for the first subsample of executives who contribute to NQDC accounts, and Panel B shows results for the second subsample of executives with substantial savings in their accounts. Each panel presents two sets of regressions using the two different measures of equity sales, and I show results for each of the three measures of pay changes.

The results in this table are similar to my main results. Most of the coefficients on the sale indicators are statistically insignificant. In the first subsample, small equity sales are positively and significantly associated with increases in total incentives, but the coefficient on large sales is negative. There is also no relationship between “Pct. Drop Incentives” and either changes in annual pay or changes in total incentives.

Although this table shows results for only two years in my sample, the estimates in this table are likely not affected by shocks to outside wealth. If such wealth shocks are the primary reason that boards do not replenish equity holdings, Table 11 should show a positive association between sales and subsequent pay changes.

One limitation of using NQDC contributions is that young executives may continue to contribute to the accounts, even after experiencing wealth shocks, to defer tax payments. In unreported tests, I repeat the analysis from Table 11 using alternate measures of wealth shocks: I exclude firms which experienced below-median stock returns in the past year, firms from industries which experienced poor performance (measured by annual or two-year value-weighted stock returns), and firms from states which experienced decreases in real estate prices. My results do not change substantially in these tests.

6.3 Anticipation of equity sales

If directors on the board are forward-looking, they know that executives will eventually sell the equity that they receive each year. The board may anticipate that equity which it granted in previous years, and which is about to vest, will soon be sold by the executive. Instead of replenishing executives' incentives after an equity sale, the board instead may set the flow of annual equity grants ex ante such that incentives remain at the optimal level. In this case, the board grants new equity each year to replace the equity that is about to vest, which the executive may soon sell.

If boards are maintaining executives' incentives in this manner, they will not adjust pay in response to anticipated sales. However, they should respond to unanticipated equity sales — those which occur earlier than expected. To test whether this occurs, I identify equity sales which occur following early exercise of stock options. I define an early exercise as the exercise of an option that has at least six years left until expiration. Options typically fully vest three to five years after the grant date and expire after 10 years, so these exercises occur after the option has begun to vest but likely has not finished vesting (I obtain similar results using a seven-year threshold). Boards may be less likely to anticipate executives' exercises and sales of options that have not fully vested.

In Table 12, "Early Exercise" is an indicator equal to one if at least half of the dollar value of equity sold by the executive in year $t - 1$ is shares acquired from early exercise of a stock option.³¹ In the table, the interaction of the sale indicator and the "Early Exercise" indicator captures the difference in the change in pay between executives who engage in regular equity sales and executives who sell equity following early option exercise. If boards are more likely to respond to unanticipated equity sales, the coefficients on the interaction terms should be positive and significant.

³¹Specifically, I identify the date on which an executive exercises a stock option with at least six years left until expiration, and the number of shares acquired from the option exercise. I then measure the number of acquired shares that the executive proceeds to sell in the same fiscal year, and the dollar value obtained from selling the shares. I divide this value by the total value of equity sold in the fiscal year.

The results in Table 12 indicate that boards do not respond differently to equity sales following early stock option exercise. For example, the coefficient of -3.8 on “Small Sale [t-1] * Early Exercise” in the first column indicates that boards grant 3.8 percent smaller increases in new equity incentives to executives who sold small amounts following early option exercise, than to executives who engaged in other small sales. This coefficient is statistically indistinguishable from zero, as are all the other interaction term coefficients.

Another possibility is that when boards are setting annual equity pay for the upcoming fiscal year, they anticipate sales which will occur early in the year, and replenish incentives ex ante. Boards may be able to anticipate sales over the next few months because some executives draft pre-arranged written trading plans that specify when and how many shares the executive will sell. The SEC provides a legal defense against insider trading allegations for executives who trade within the guidelines of such plans (Jagolinzer (February 2009)).³²

Boards typically determine executives’ annual pay for year t toward the end of year $t - 1$. If the board knows that the executive is planning to sell equity at the beginning of year t , it may grant increased equity incentives in the upcoming year instead of replenishing incentives in the year after the sale. Therefore there may be no relationship between sales which occur early in year t and equity pay granted in year $t + 1$. However, the board is less likely to anticipate sales which occur toward the end of year t , so it should respond to such sales by replenishing incentives in the following year.

To account for this possibility, I separately measure equity sales which occur in the first and second halves of each fiscal year. In Table 13, I present results showing the relationship between executives’ pay changes and indicators for sales in the first half and second half of the year. In the table, “Small Sale Early [t]” is the change in an indicator equal to 1 if in the first half of

³²In October 2000, the SEC established Rule 10b5-1, which states that an individual can be found to have engaged in insider trading if he transacted equity while in possession of material information. The rule also provides an affirmative defense against litigation for insiders who transact equity within the guidelines of a pre-arranged trading plan. In order to qualify for the defense, the insider must develop a written plan that specifies equity selling dates and the amounts of equity to be sold on each date, specifies a formula or algorithm for transacting equity, or delegates the selling decision to a third party which does not possess inside information. Rule 10b5-1 grants insiders flexibility in choosing the length of the plan or the number of shares sold on each trading date (Jagolinzer (February 2009)).

the fiscal year the executive sold equity equal to less than 10 percent of his total holdings, while “Small Sale Late [t]” is the change in an indicator for small sales in the second half of the fiscal year. Other sale indicators are similarly defined. There may be no relationship between pay changes and early sales, but the coefficients on the late sales should be positive and statistically significant if the board does not anticipate these sales and replenishes incentives following them.

The results in Table 13 show that boards do not respond to equity sales which occur early or late in the fiscal year. For example, the coefficients on “Medium Sale Early [t]” and “Medium Sale Late [t]” in the first column are similar in size (and both statistically insignificant), indicating that boards do not grant larger increases in equity incentives to executives who sell equity early in the fiscal year or executives who sell equity later in the year. The results are similar for other types of sales and measures of pay changes.

Also, I obtain similar results when I generate indicators for sales which occur in the first three months and last nine months of each fiscal year, or the first nine months and last three months of each year.

7 Conclusion

Theory predicts that corporate boards should set an executive’s incentives at the unique optimum which most effectively mitigates agency problems. When an executive whose incentives are at the optimal level sells equity, his incentives become suboptimally low. This paper shows that the subsequent pay granted by the board does not replenish the executive’s lost incentives. To account for the possibility that the board leaves pay unchanged because unobservable variables simultaneously decrease optimal incentives and cause executives to sell, I compare top executives who sell equity to other top executives at the same firm who do not sell. I show that boards grant similar pay to selling and non-selling executives at the same firm, and restore at most 10 percent of a selling executive’s incentives. My results are robust to a variety of alternative explanations for why boards may optimally allow an executive’s incentives to decrease.

If boards grant executives equity primarily to incentivize them, it is difficult to explain why boards let some executives reduce their holdings in the firm, but at the same time maintain the holdings of other top executives. If shareholders are better off when a selling executive's incentives decrease, why did the board grant the executive substantial equity prior to the sale? Why does the board grant the same amount of equity to non-selling executives, whose incentives did not decrease, as to selling executives? An executive's incentives may remain approximately at the optimal level following small equity sales, but boards also do not adjust pay following large decreases in an executive's total holdings in the firm.

In principle, boards can write a variety of different contracts to incentivize executives. But in practice, most boards grant executives equity which begins to vest after one year, and allow executives to freely sell equity upon vesting. It is difficult to explain how this empirically observed contracting arrangement, combined with the result that boards do not adjust compensation after equity sales, is consistent with the efficient contracting view of boards targeting an optimal incentive level.

I offer three alternative explanations for why boards grant equity pay. First, the Managerial Power perspective predicts that boards disguise wealth extraction from the firm by granting executives large amounts of equity pay, and allowing them to later unwind their equity incentives. My results are consistent with boards allowing executives to choose their level of equity holdings in the firm, but they do not prove that boards grant equity to facilitate wealth extraction. One way to test this is to examine whether executives who receive large increases in equity pay, such as following a promotion or merger, subsequently sell equity and prevent their holdings in the firm from increasing.

A second alternative is that boards target the amount of unvested equity granted to executives, instead of the level of total holdings in the firm. Boards may grant equity each year to ensure that a certain portion of an executive's holdings is unvested at all times. This may allow boards to retain top executives, because they lose unvested equity upon leaving the firm. Under this alternative, boards view sales of vested equity as personal portfolio decisions, and hence do not

respond to them. This can be tested by examining whether boards increase an executive's annual equity pay after a large fraction of his holdings vest.

A third alternative is that boards find it cheaper to compensate executives with equity than cash, perhaps for tax or accounting reasons. If this is the case, boards may grant equity primarily to reward executives for strong performance, or to benchmark their pay to that of executives at peer firms. One test is to examine whether boards respond to increases in equity pay at peer firms by increasing their own executives' equity pay.

Future work can examine whether these alternatives, or others, better explain how boards manage executives' equity holdings over time. Future work can also examine whether firms which more effectively maintain executives' total incentives perform better in the long run.

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8 Data Appendix

This section provides detailed definitions of the variables I use in my empirical tests.

Firm-level Variables

| Variable | Definition | Notes |
|-----------------------|---|--|
| Assets [t] | $AT[t]$ | Data from Compustat |
| Firm Q [t] | $\frac{(PRCC[t]*CSHO[t]+LT[t])}{AT[t-1]}$ | Data from Compustat |
| Log Stock Return [t] | $\ln \left[1 + \frac{(PRCC[t]+DVPSX[t]-PRCC[t-1])}{PRCC[t-1]} \right]$ | Data from Compustat. Prices are split-adjusted. Winsorized at .05 level. |
| Stock Volatility [t] | St. Deviation of past 24 month's returns | Price data from Compustat. Returns are logarithmic |
| Sales Growth [t] | $\frac{(SALE[t]-SALE[t-1])}{SALE[t-1]}$ | Data from Compustat, winsorized at .05 level |
| Net Income Growth [t] | $\frac{(NI[t]-NI[t-1])}{SALE[t-1]}$ | Data from Compustat, winsorized at .05 level |
| Tech Firm | Indicator equal to 1 for tech firm | Definition based on Murphy (2003) |

Executive-level Variables

| Variable | Definition | Notes |
|-------------------|---|---|
| Junior Executive | Indicator equal to 1 if executive has less than five years of tenure | If executive is at firm when it enters Execucomp, indicator set to missing until firm's fifth year in sample |
| Promoted CEO | Indicator equal to 1 if executive became CEO in year t | |
| Stepped Down CEO | Indicator equal to 1 if executive left CEO position in year t | |
| Promoted Chair | Indicator equal to 1 if executive became non-CEO chairman in year t | |
| Promoted C-Suite | Indicator equal to 1 if executive promoted to C-Suite in year t | C-Suite is any exec. with "chief" in title |
| CEO | Indicator equal to 1 for CEO | |
| CFO | Indicator equal to 1 for CFO | |
| COO | Indicator equal to 1 for COO | |
| Chair | Indicator equal to 1 for Chairman of board | Indicator only equal to 1 for non-CEO chair |
| Senior V.P. | Indicator equal to 1 if executive's title is just "Senior Vice President" | |
| Specialized Exec. | Indicator equal to 1 if executive has specialized role at firm | Equals 1 if executive's title includes terms like "subsidiary", "division", "marketing", "research and development", etc. |

Measures of pay changes

| Variable | Definition | Notes |
|------------------------------|--|---|
| Pct. Chg. New Incentives [t] | Percent change from year t-1 to t in incentives from new equity pay ³³ | Data from Execucomp. Winsorized at .05 level. |
| Chg. Pay Ratio [t] | Change in pay ratio ³⁴ from year t-1 to t, multiplied by 100 | Data from Execucomp. Winsorized at .05 level. |
| Chg. Total Incentives [t] | (Incentives from new equity in year [t])/(Total incentives from start of year t-1)*100 ³⁵ | Data from Execucomp. Winsorized at .05 level. |

³³Incentives from new equity granted in year t are $S_t \cdot P_t/100 + \sum_i N_{i,t} \cdot \Delta_i \cdot P_t/100$, where S_t is the number of regular shares granted in year time t , P_t is the grant-date stock price, $N_{i,t}$ is the number of stock options in each new grant i made to the executive in year t , and Δ_i is the Black-Scholes option delta. For new incentives, the formula inputs are: 1) the grant-date stock price; 2) the number of days between the end of the previous fiscal year and the option expiration date; 3) the standard deviation of monthly logarithmic stock returns over the 24 months prior to the start of fiscal year t ; 4) the yield on the 10-year U.S. treasury bond in fiscal year $t - 1$; and 5) the value of dividends granted in fiscal year $t - 1$ divided by the end-of-year stock price. Volatility is set to missing if monthly returns are available in fewer than 12 of the previous 24 months. For any executive, new incentives are set to missing if the delta of any of his new option grants is undefined.

³⁴Pay ratio is defined as $RSTKGRNT + OPTION_AWARDS_FV + STOCK_AWARDS_FV + OPTION_AWARDS_BLK_VALUE$, divided by $TDC1$.

³⁵For incentives from total equity holdings at the start of year $t - 1$, I first compute incentives from shares by multiplying the total number of shares beneficially owned at the end of fiscal year $t - 2$ (Execucomp item `SHOWN_EXCL_OPTS`) by the stock price at the end of fiscal year $t - 2$. I then add incentives from stock options by multiplying the number of exercisable and unexercisable options at the end of fiscal year $t - 2$ (data items `OPT_UNEX_EXER_NUM` and `OPT_UNEX_UNEXER_NUM`) by their respective option deltas. Prior to year 2006, I need to estimate the option exercise prices and time to expiration; to do this I follow the procedure developed by Core & Guay (2002) with slight modifications. Finally, I add incentives from new equity granted at the start of fiscal year $t - 1$.

Measures of equity sales

| Variable | Definition | Notes |
|----------------------------|---|--|
| Small Sale [t-1] | Change from year t-2 to t-1 in indicator equal to one if dollar value of equity sold divided by dollar value of total equity holdings is less than .1 | Data from Thomson Insiders and Execucomp. For stock options, I subtract exercise cost for shares which are sold. ³⁶ Total holdings valued at start of year. |
| Medium Sale [t-1] | Same as above, except sale size between .1 and .25. | |
| Large Sale [t-1] | Same as above, except sale size greater than .25. | |
| Pct. Drop Incentives [t-1] | $(\text{Total incentives at year-end had exec. not sold equity} - \text{actual year-end incentives}) / (\text{Total incentives from start of year}) * 100.$ | See footnotes from previous table for information on how incentives are calculated. Winsorized at .05 level. |

³⁶Specifically, I count the number of shares sold and options exercised during the year, and stop deducting the exercise cost from the cash proceeds of selling equity once the number of options exercised becomes larger than number of shares sold.

Table 1. Descriptive Statistics, Executive Roles and Compensation

This table presents descriptive statistics for executives in my sample. My sample is all firms in the Execucomp and Thomson Insiders databases, and covers the year 1996 to 2007. All statistics are at the firm-year level. In Panel A, "Other C-Suite" is an executive with "chief" in his title who is not a CEO, CFO, or COO. "Non-Exec. Chairman" is a chairman of the board who is also not CEO, CFO, or COO. "Senior Vice President" is an executive whose title is just that. "Specialized Exec." is an executive whose title includes terms like "division", "subsidiary", "marketing", or "research and development". Junior Exec. is an executive who has been in the firm's top management for less than five years. is the market value of the firm's common equity. In Panel B, "Equity Pay" is the sum of annual stock and stock option compensation. "Pay Ratio" is the ratio of annual equity to annual total pay. "Equity Holdings" is the dollar value of all beneficially owned shares, valued at fiscal-year-end price, plus the value of all stock options. "Total Incentives" is the year-end incentives from total equity holdings in the firm. Incentives are defined as the change in dollar value of equity for a one-percent change in stock price. "New Incentives" is the incentives conveyed by annual equity compensation. In Panel C and D, "Pct. Chg. New Incentives" is the percentage change in new incentives from year t-1 to t. "Chg. Pay Ratio" is the change in the pay ratio from year t-1 to t, multiplied by 100. "Chg. Total Incentives" is new incentives in year t divided by total incentives from the start of year t-1, multiplied by 100. See the Data Appendix for complete details on variable construction.

Panel A. Executive Roles

| | N | Pct. | | N | Pct. |
|---------------|--------|------|-----------------------|--------|------|
| CEO | 20,322 | 19 | Non-Exec. Chairman | 5,930 | 6 |
| CFO | 16,369 | 15 | Senior Vice President | 6,869 | 6 |
| COO | 8,651 | 8 | Specialized Exec. | 10,818 | 10 |
| Other C-Suite | 4,427 | 4 | Junior Exec. | 49,717 | 50 |

Panel B. Executive Pay and Incentives

| | N | Mean | St. Dev. | 25 th Per. | Median | 75 th Per. |
|------------------------------|---------|--------|----------|-----------------------|--------|-----------------------|
| Total Pay (\$ Thous.) | 116,049 | 2,377 | 6,164 | 528 | 1,051 | 2,280 |
| Salary (\$ Thous.) | 116,049 | 388 | 272 | 222 | 315 | 475 |
| Equity Pay (\$ Thous.) | 116,049 | 1,344 | 5,412 | 46 | 344 | 1,108 |
| Pay Ratio | 116,049 | 36.6 | 27.9 | 10.1 | 36.6 | 58.3 |
| Equity Holdings (\$ Thous.) | 103,668 | 20,438 | 86,408 | 637 | 2,507 | 9,145 |
| Total Incentives (\$ Thous.) | 79,199 | 470.9 | 6,241.9 | 18.6 | 60.8 | 196.9 |
| New Incentives (\$ Thous.) | 111,387 | 22.4 | 86.2 | 0.6 | 5.4 | 18.3 |

Panel C. Changes in Equity Pay

| | N | Mean | St. Dev. | 25 th Per. | Median | 75 th Per. |
|--------------------------|--------|------|----------|-----------------------|--------|-----------------------|
| Pct. Chg. New Incentives | 87,936 | 25.6 | 95.7 | -38.0 | 0 | 93.7 |
| Chg. Pay Ratio | 89,513 | -0.9 | 29.8 | -11.9 | 0 | 11.3 |
| Chg. Total Incentives | 58,508 | 19.0 | 23.8 | 1.8 | 10.9 | 24.6 |

Panel D. Pay Changes by Executive Type

| Type of Executive | Pct. Chg. New Incentives | | Chg. Pay Ratio | | Chg. Total Incentives | |
|-------------------|--------------------------|--------|----------------|--------|-----------------------|--------|
| | Mean | Median | Mean | Median | Mean | Median |
| CEO | 26.1 | 0 | -1.3 | 0 | 15.0 | 7.4 |
| CFO or COO | 26.7 | 2.5 | -1.5 | 0 | 21.6 | 13.1 |
| Senior V.P. | 29.0 | 7.2 | -0.2 | 0 | 19.2 | 12.3 |
| Other | 25.2 | 0 | -0.6 | 0 | 20.0 | 11.8 |

Table 2. Descriptive Statistics, Executive Equity Transactions

This table presents descriptive statistics on the frequency and size of executives' equity transactions. My sample is all firms in the Execucomp and Thomson Insiders databases, and covers the year 1996 to 2007. Throughout the table, small, medium, and large sales refer to annual sales with dollar value equal to less than 10 percent of equity holdings, 10 to 25 percent of holdings, and more than 25 percent of holdings, respectively. In Panel A, "few executives" means less than half of the firm's executives, and "most executives" means half or more, but not all, executives. A "good year" is one in which the firm's stock return is above the median return for all firms in that year. In Panel B, the CEO column shows statistics for executives who served as CEO at some point in their tenure; other columns are similarly defined. In Panel C and D, all statistics are conditional on a sale or purchase occurring. "Equity Sold" is the annual dollar value of all equity sold. For stock options, I subtract the exercise cost of options which are sold. "Equity Holdings" is the dollar value of all firm equity by the executive at the start of year t-1. "Pct. Drop Incentives" is the total incentives from equity holdings that the executive would have had at year end if he did not sell equity minus actual total incentives at year end, divided by total incentives at the start of the year, multiplied by 100. "Equity Purchased" is the dollar value of all open-market stock purchases. In Panel D, the CEO column shows statistics for executives serving as CEO at the time; other columns are similarly defined. See the Data Appendix for complete details on variable construction.

Panel A. Fraction of Firm's Executives Selling Equity

| Pct. of firm-years in which... | All sales | Medium and Large Sales | All sales in good years |
|--------------------------------|-----------|------------------------|-------------------------|
| No executives sell | 26 | 46 | 20 |
| Few executives sell | 26 | 31 | 24 |
| Most executives sell | 30 | 16 | 34 |
| All executives sell | 14 | 3 | 18 |

Panel B. Frequency of Equity Transactions

| Pct. of executives who... | All | CEO | CFO / COO | Senior V.P. | Other |
|---|------|------|-----------|-------------|-------|
| Sell equity at least once | 59.9 | 69.9 | 63.8 | 66.6 | 57.3 |
| Sell equity in at least half of years | 44.9 | 43.7 | 44.3 | 48.5 | 45.5 |
| Sell medium / large amount at least once | 43.4 | 47.2 | 47.0 | 48.4 | 41.1 |
| Sell medium / large amount in half of years | 21.9 | 13.3 | 20.1 | 22.0 | 24.8 |
| Purchase equity on open market | 20.7 | 38.5 | 27.2 | 18.4 | 13.6 |

Panel C. Size of Annual Equity Transactions

| | N | Mean | St. Dev. | 25 th Per. | Median | 75 th Per. |
|-------------------------------------|--------|-------|----------|-----------------------|--------|-----------------------|
| Equity Sold (\$ Thous) | 48,609 | 9,239 | 586,890 | 141 | 566 | 2,009 |
| Equity Sold / Equity Holdings | 36,402 | 0.35 | 0.52 | 0.05 | 0.16 | 0.40 |
| Pct. Drop. Incentives | 34,568 | 15.3 | 21.1 | 1.9 | 9.2 | 24.2 |
| Pct. Drop. Incentives - small sale | 16,773 | 6.7 | 15.5 | 0.5 | 3.7 | 9.6 |
| Pct. Drop. Incentives - medium sale | 9,914 | 17.8 | 19.1 | 6.6 | 15.0 | 26.2 |
| Pct. Drop. Incentives - large sale | 7,742 | 30.4 | 24.3 | 12.0 | 28.3 | 50.8 |
| Equity Purchased (\$ Thous.) | 8,979 | 557 | 7,688 | 18 | 56 | 188 |
| Equity Purchased / Equity Holdings | 5,253 | 0.10 | 0.12 | 0.01 | 0.04 | 0.15 |

Panel D. Size of Annual Equity Sales by Executive Type

| Type of Executive | Equity Sold / Equity Holdings | | | Pct. Drop. Incentives | | |
|-------------------|-------------------------------|--------|-----------------------|-----------------------|--------|-----------------------|
| | 25 th Per. | Median | 75 th Per. | 25 th Per. | Median | 75 th Per. |
| CEO | 0.03 | 0.10 | 0.03 | 1.2 | 6.4 | 17.5 |
| CFO or COO | 0.06 | 0.17 | 0.42 | 1.9 | 9.9 | 25.1 |
| Senior V.P. | 0.06 | 0.16 | 0.39 | 2.5 | 9.6 | 24.9 |
| Other | 0.06 | 0.19 | 0.46 | 2.3 | 10.5 | 26.9 |

Table 3. Dollar value of equity sold and subsequent pay changes across firms

This table examines whether executives who sell equity subsequently receive larger increases in equity pay than executives who do not sell, across firms in my sample. My sample is all firms in the Execucomp and Thomson Insiders databases, and covers the year 1996 to 2007. Standard errors are reported in parentheses, and *, **, *** denote statistical significance at the 1, 5, and 10 percent levels. In all regressions, standard errors are adjusted for heteroskedasticity and clustering at the firm level. For the dependent variables, "Pct. Chg. New Incentives" is the percentage change in new incentives from year t-1 to t. "Chg. Pay Ratio" is the change in the ratio of equity to total pay from year t-1 to t, multiplied by 100. "Chg. Total Incentives" is new incentives in year t divided by total incentives from the start of year t-1, multiplied by 100. All dependent variables are winsorized at the 5-95 level. Incentives are defined as the change in dollar value of equity for a one-percent change in stock price. "Small sale [t-1]" is the change from year t-2 to t-1 in an indicator variable equal to 1 if the dollar value of annual equity sales equals less than 10 percent of total equity holdings. For "Medium sale [t-1]" and "Large sale [t-1]" of total holdings, or more than 25 percent of total holdings. For "Purchase [t-1]", the indicator equals 1 if the executive purchases equity on the open market. "Junior Executive" is an indicator equal to 1 if the executive has been in the firm's top management for less than five years. "Firm Q" is defined as firm market value plus liabilities, divided by assets. "Log Stock Return [t-1]" is the log of 1 plus the fractional change in stock price from year t-1 to t. "Stock Volatility [t-1]" is the standard deviation of monthly stock returns in years t-1 and t-2. "Promoted to CEO", "Stepped Down CEO", and "Promoted to C-Suite" are indicators equal to 1 if the given event occurred in year t. Other variables included in the regressions, but not shown, are "Sales Growth [t-1]", "Net Income Growth [t-1]", "Tech Firm", "Promoted Chair", and executive role indicators. Industries are defined according to the Fama-French 48 industry classification. See the Data Appendix for complete details on variable construction.

The null hypothesis is that the coefficient on the sale indicators is zero. An alternative hypothesis, that selling executives receive 5 percent more equity pay than non-selling executives, is rejected in all regressions with 99 percent confidence.

| Dependent Variable | Pct. Chg. New Incentives [t] [st. dev. = 95.7] | | Chg. Pay Ratio [t] [st. dev. = 29.8] | | Chg. Total Incentives [t] [st. dev. = 23.8] | |
|--------------------|---|--------------------|---|-----------------|--|--------------------|
| | All | CEO | All | CEO | All | CEO |
| Type of Executive | | | | | | |
| Small Sale [t-1] | -1.03 (1.18) | -0.36 (1.91) | -0.54 (0.38) | -0.24 (0.63) | -0.19 (0.22) | -0.33 (0.33) |
| Medium Sale [t-1] | -1.51 (1.34) | -1.56 (2.40) | -0.16 (0.44) | 0.05 (0.85) | -0.75*** (0.25) | -0.91** (0.43) |
| Large Sale [t-1] | -4.01** (1.59) | -3.57 (3.09) | -0.21 (0.55) | 0.80 (1.18) | -2.31*** (0.31) | -1.81*** (0.61) |
| Purchase [t-1] | 0.21 (1.61) | -2.24 (2.44) | -0.12 (0.54) | -0.61 (0.79) | 0.16 (0.35) | -0.23 (0.50) |
| Junior Executive | 6.51*** (1.03) | 10.04*** (2.62) | 0.29 (0.29) | 1.13 (0.81) | 10.94*** (0.33) | 16.46*** (0.85) |
| Log Assets [t-1] | 0.86* (0.46) | 0.20 (0.57) | -0.08 (0.12) | 0.11 (0.15) | 1.05*** (0.18) | 1.40*** (0.22) |

| | | | | | | |
|------------------------|---------------------|--------------------|---------------------|-------------------|---------------------|--------------------|
| Firm Q [t-1] | -1.68*** (0.57) | -1.97*** (0.68) | -0.28* (0.16) | -0.36* (0.21) | -1.09*** (0.21) | -1.05*** (0.24) |
| Book-Market [t-1] | -2.37 (4.73) | -7.82 (5.33) | -1.23 (1.34) | -2.15 (1.60) | 1.27 (1.65) | -0.43 (1.99) |
| Change Assets [t-1] | -0.04 (0.04) | -0.05 (0.05) | -0.02* (0.01) | -0.03* (0.01) | -0.00 (0.01) | -0.01 (0.01) |
| Change Firm Q [t-1] | 0.07 (0.05) | 0.08 (0.06) | -0.01 (0.02) | -0.01 (0.02) | 0.08*** (0.01) | 0.06*** (0.02) |
| Log Stock Return [t-1] | 33.57*** (3.51) | 32.12*** (4.14) | 7.19*** (1.13) | 7.00*** (1.38) | 8.77*** (0.89) | 8.51*** (1.09) |
| Log Stock Return [t-2] | -4.38** (2.06) | -6.46*** (2.46) | 1.52** (0.67) | 0.65 (0.83) | -6.25*** (0.49) | -5.60*** (0.59) |
| Stock Volatility [t-1] | -0.20* (0.12) | -0.25* (0.14) | -0.14*** (0.03) | -0.11** (0.04) | 0.15*** (0.04) | 0.16*** (0.05) |
| Promoted CEO [t-1] | 41.84*** (3.93) | 46.19*** (4.83) | 6.51*** (1.03) | 6.44*** (1.23) | 12.03*** (0.93) | 13.64*** (1.20) |
| Stepped Down CEO [t-1] | -45.45*** (3.94) | | -15.73*** (1.55) | | -11.60*** (0.89) | |
| Promoted C-Suite [t-1] | 16.05*** (2.65) | | 1.86** (0.75) | | 4.56*** (0.65) | |
| Other Controls | + | + | + | + | + | + |
| Year Fixed Effects | + | + | + | + | + | + |
| Industry Fixed Effects | + | + | + | + | + | + |
| Observations | 47,146 | 13,237 | 47,488 | 13,337 | 47,003 | 13,199 |
| R-squared | 0.05 | 0.06 | 0.03 | 0.02 | 0.16 | 0.18 |

Takeaway:

Across firms in my sample, executives who sell larger dollar amounts of equity do not receive larger pay increases than executives who do not sell.

Table 4. Decrease in total incentives and subsequent pay changes across firms

This table examines whether executives who sell equity subsequently receive larger increases in equity pay than executives who do not sell, across firms in my sample. My sample is all firms in the Execucomp and Thomson Insiders databases, and covers the year 1996 to 2007. Standard errors are reported in parentheses, and *, **, *** denote statistical significance at the 1, 5, and 10 percent levels. In all regressions, standard errors are adjusted for heteroskedasticity and clustering at the firm level. For the dependent variables, "Pct. Chg. New Incentives" is the percentage change in new incentives from year t-1 to t. "Chg. Pay Ratio" is the change in the ratio of equity to total pay from year t-1 to t, multiplied by 100. "Chg. Total Incentives" is new incentives in year t divided by total incentives from the start of year t-1, multiplied by 100. All dependent variables are winsorized at the 5-95 level. Incentives are defined as the change in dollar value of equity for a one-percent change in stock price. "Pct. Drop Incentives" is the total incentives from equity holdings that the executive would have had at year end if he did not sell equity minus actual total incentives at year end, divided by total incentives at the start of the year, multiplied by 100. For "Purchase [t-1]", the indicator equals 1 if the executive purchases equity on the open market. "Junior Executive" is an indicator equal to 1 if the executive has been in the firm's top management for less than five years. "Firm Q" is defined as firm market value plus liabilities, divided by assets. "Log Stock Return [t-1]" is the log of 1 plus the fractional change in stock price from year t-1 to t. "Stock Volatility [t-1]" is the standard deviation of monthly stock returns in years t-1 and t-2. "Promoted to CEO", "Stepped Down CEO", and "Promoted to C-Suite" are indicators equal to 1 if the given event occurred in year t. Other variables included in the regressions, but not shown, are "Sales Growth [t-1]", "Net Income Growth [t-1]", "Tech Firm", "Promoted Chair", and executive role indicators. Industries are defined according to the Fama-French 48 industry classification. See the Data Appendix for complete details on variable construction.

The null hypothesis is that the coefficient on "Pct. Drop Incentives [t-1]" is zero. An alternative hypothesis, that boards grant 1 percent more incentives for each 1 percent decrease in incentives due to sales, is rejected in all regressions with 99 percent confidence.

| Dependent Variable | Pct. Chg. New Incentives [t] [st. dev. = 95.7] | | Chg. Pay Ratio [t] [st. dev. = 29.8] | | Chg. Total Incentives [t] [st. dev. = 23.8] | |
|----------------------------|---|-------------------|---|-------------------|--|--------------------|
| | All | CEO | All | CEO | All | CEO |
| Type of Executive | | | | | | |
| Pct. Drop Incentives [t-1] | 0.13*** (0.03) | 0.18*** (0.05) | 0.04*** (0.01) | 0.05*** (0.01) | 0.15*** (0.01) | 0.20*** (0.02) |
| Junior Executive | 5.79*** (1.04) | 9.29*** (2.65) | 0.11 (0.30) | 0.78 (0.82) | 11.44*** (0.34) | 16.89*** (0.84) |
| Log Assets [t-1] | 0.82* (0.46) | 0.39 (0.56) | | 0.06 (0.15) | 0.93*** (0.18) | 1.45*** (0.21) |
| Firm Q [t-1] | -1.62*** (0.57) | -1.74** (0.69) | | -0.28 (0.21) | -1.12*** (0.21) | -1.02*** (0.23) |
| Book-Market [t-1] | -2.56 (4.76) | -4.25 (5.39) | | -1.28 (1.63) | 0.97 (1.65) | 0.37 (1.87) |

| | | | | | | |
|------------------------|---------------------|--------------------|---------------------|--------------------|---------------------|--------------------|
| Change Assets [t-1] | -0.02 (0.04) | -0.04 (0.05) | -0.02 (0.01) | -0.03* (0.01) | -0.00 (0.01) | -0.01 (0.01) |
| Change Firm Q [t-1] | 0.08 (0.05) | 0.09 (0.06) | -0.00 (0.02) | -0.00 (0.02) | 0.08*** (0.01) | 0.06*** (0.02) |
| Log Stock Return [t-1] | 30.85*** (3.57) | 30.30*** (4.13) | 6.22*** (1.16) | 6.48*** (1.40) | 7.38*** (0.91) | 7.20*** (1.08) |
| Log Stock Return [t-2] | -3.29 (2.11) | -4.82* (2.51) | 1.76*** (0.67) | 1.22 (0.85) | -5.96*** (0.49) | -4.63*** (0.58) |
| Stock Volatility [t-1] | -0.27** (0.12) | -0.33** (0.14) | -0.16*** (0.03) | -0.14*** (0.04) | 0.10** (0.04) | 0.09* (0.05) |
| Promoted CEO [t-1] | 42.48*** (3.99) | 48.20*** (4.89) | 6.78*** (1.05) | 6.61*** (1.24) | 12.09*** (0.94) | 14.07*** (1.17) |
| Stepped Down CEO [t-1] | -45.07*** (4.07) | | -15.71*** (1.59) | | -11.44*** (0.93) | |
| Promoted C-Suite [t-1] | 15.27*** (2.69) | | 1.59** (0.77) | | 4.40*** (0.66) | |
| Other Controls | + | + | + | + | + | + |
| Year Fixed Effects | + | + | + | + | + | + |
| Industry Fixed Effects | + | + | + | + | + | + |
| Observations | 45,846 | 12,889 | 45,986 | 12,859 | 45,846 | 12,889 |
| R-squared | 0.05 | 0.06 | 0.03 | 0.02 | 0.18 | 0.21 |

Takeaway: Across firms in my sample, executives whose incentives decrease more due to equity sales receive larger increases in annual equity pay and total incentives than executives who do not sell. However, the magnitude of the relationship is small.

Table 5. Dollar value of equity sold and subsequent pay changes within firms

This table examines whether executives who sell larger amounts of equity subsequently receive larger increases in equity pay than executives at the same firm who do not sell. All regressions include firm-year fixed effects. My sample is all firms in the Execucomp and Thomson Insiders databases, and covers the year 1996 to 2007. Standard errors are reported in parentheses, and *, **, *** denote statistical significance at the 1, 5, and 10 percent levels. In all regressions, standard errors are adjusted for heteroskedasticity and clustering at the firm level. For the dependent variables, "Pct. Chg. New Incentives" is the percentage change in new incentives from year t-1 to t. "Chg. Pay Ratio" is the change in the ratio of equity to total pay from year t-1 to t, multiplied by 100. "Small sale [t-1]" is the change from year t-2 to t-1 in an indicator variable equal to 1 if the dollar value of annual equity sales equals less than 10 percent of total equity holdings. For "Medium sale [t-1]" and "Large sale [t-1]", the indicator equals 1 if the executive sells equity worth 10 to 25 percent of total holdings, or more than 25 percent of total holdings. For "Purchase [t-1]", the indicator equals 1 if the executive buys equity on the open market. "Junior Executive" is an indicator equal to 1 if the executive has been in the firm's top management for less than five years. "Promoted to CEO", "Stepped Down CEO", "Promoted to Chair", and "Promoted to C-Suite" are indicators equal to 1 if the given event occurred in year t. Other variables included in some of the regressions, but not shown, are indicators for "C-Suite", "Non-exec. Chairman", "Senior V.P.", and "Specialized Exec." See the Data Appendix for complete details on variable construction.

The null hypothesis is that the coefficient on the sale indicators is zero. An alternative hypothesis, that selling executives receive 5 percent more equity pay than non-selling executives, is rejected in all regressions with 99 percent confidence.

| Dependent Variable | Pct. Chg. New Incentives [t] | | Chg. Pay Ratio [t] | |
|---------------------|------------------------------|---------------------|--------------------|---------------------|
| | [st. dev. = 95.7] | | [st. dev. = 29.8] | |
| Small Sale [t-1] | -0.43 (0.75) | -0.86 (0.77) | -0.30 (0.24) | -0.38 (0.24) |
| Medium Sale [t-1] | -0.45 (0.84) | -0.61 (0.87) | -0.29 (0.27) | -0.35 (0.28) |
| Large Sale [t-1] | -1.64 (1.06) | -1.33 (1.09) | -0.41 (0.35) | -0.48 (0.37) |
| Purchase [t-1] | -1.12 (1.12) | -0.32 (1.16) | -0.07 (0.34) | 0.03 (0.35) |
| Junior Executive | | 4.65*** (0.76) | | 0.44** (0.22) |
| Promoted to CEO | | 47.90*** (3.26) | | 8.39*** (0.84) |
| Stepped down CEO | | -45.04*** (4.00) | | -14.29*** (1.42) |
| Promoted to Chair | | 13.87*** (3.57) | | 3.88*** (1.17) |
| Promoted to C-Suite | | 15.58*** (2.18) | | 1.91*** (0.59) |
| Other Controls | | + | | + |
| Observations | 58,038 | 53,128 | 59,141 | 53,999 |
| R-squared | 0.00 | 0.04 | 0.00 | 0.02 |

Takeaway: Executives who sell larger dollar amounts of equity do not subsequently receive larger increases in equity pay than executives at the same firm who do not sell equity.

Table 6. Decrease in total incentives and pay changes within firms

This table examines whether executives whose total incentives decrease more due to equity sales subsequently receive larger increases in equity pay than executives at the same firm who do not sell. All regressions include firm-year fixed effects. My sample is all firms in the Execucomp and Thomson Insiders databases, and covers the year 1996 to 2007. Standard errors are reported in parentheses, and *, **, *** denote statistical significance at the 1, 5, and 10 percent levels. In all regressions, standard errors are adjusted for heteroskedasticity and clustering at the firm level. For the dependent variables, "Pct. Chg. New Incentives" is the percentage change in new incentives from year t-1 to t. "Chg. Pay Ratio" is the change in the ratio of equity to total pay from year t-1 to t, multiplied by 100. "Pct. Drop Incentives" is the total incentives from equity holdings that the executive would have had at year end if he did not sell equity minus actual total incentives at year end, divided by total incentives at the start of the year, multiplied by 100. "Junior Executive" is an indicator equal to 1 if the executive has been in the firm's top management for less than five years. "Promoted to CEO", "Stepped Down CEO", "Promoted to Chair", and "Promoted to C-Suite" are indicators equal to 1 if the given event occurred in year t. "C-Suite" is an indicator equal to 1 if the executive is a member of the C-Suite in year t. Other variables included in some of the regressions, but not shown, are indicators for "Non-exec. Chairman", "Senior V.P.", and "Specialized Exec." See the Data Appendix for complete details on variable construction.

The null hypothesis is that the coefficient on "Pct. Drop Incentives [t-1]" is zero. An alternative hypothesis, that boards grant 1 percent more incentives for each 1 percent decrease in incentives due to sales, is rejected in all regressions with 99 percent confidence.

| Dependent Variable | Pct. Chg. New Incentives [t] | | Chg. Pay Ratio [t] | |
|----------------------------|------------------------------|-----------|--------------------|-----------|
| | [st. dev. = 95.7] | | [st. dev. = 29.8] | |
| Pct. Drop Incentives [t-1] | 0.04* | 0.04 | 0.01** | 0.01** |
| | (0.02) | (0.03) | (0.01) | (0.01) |
| Junior Executive | | 4.58*** | | 0.43* |
| | | (0.77) | | (0.22) |
| Promoted to CEO | | 48.08*** | | 8.55*** |
| | | (3.32) | | (0.87) |
| Stepped down CEO | | -42.91*** | | -13.20*** |
| | | (4.08) | | (1.46) |
| Promoted to Chair | | 11.02*** | | 2.47** |
| | | (3.63) | | (1.19) |
| Promoted to C-Suite | | 15.16*** | | 1.86*** |
| | | (2.21) | | (0.60) |
| C-Suite | | 2.26*** | | -0.00 |
| | | (0.60) | | (0.16) |
| Other Controls | | + | | + |
| Observations | 57,236 | 51,428 | 56,278 | 51,600 |
| R-squared | 0.00 | 0.04 | 0.00 | 0.02 |

Takeaway: Executives whose incentives decrease more due to equity sales receive slightly higher increases in equity pay than executives at the same firm who do not sell.

Table 7. Equity sales and changes in total incentives within firms

This table examines whether boards replenish executives' total equity holdings following equity sales. All regressions include firm-year fixed effects. My sample is all firms in the Execucomp and Thomson Insiders databases, and covers the year 1996 to 2007. Standard errors are reported in parentheses, and *, **, *** denote statistical significance at the 1, 5, and 10 percent levels. In all regressions, standard errors are adjusted for heteroskedasticity and clustering at the firm level. "Chg. Total Incentives" is new incentives in year t divided by total incentives from the start of year t-1, multiplied by 100. It is winsorized at the 5-95 level. "Small sale [t-1]" is the change from year t-2 to t-1 in an indicator variable equal to 1 if the dollar value of annual equity sales equals less than 10 percent of total equity holdings. For "Medium sale [t-1]" and "Large sale [t-1]", the indicator equals 1 if the executive sells equity worth 10 to 25 percent of total holdings, or more than 25 percent of total holdings. For "Purchase [t-1]", the indicator equals 1 if the executive purchases equity on the open market. "Pct. Drop Incentives" is the total incentives from equity holdings that the executive would have had at year end if he did not sell equity minus actual total incentives at year end, divided by total incentives at the start of the year, multiplied by 100. "Junior Executive" is an indicator equal to 1 if the executive has been in the firm's top management for less than five years. "Promoted to CEO" and "Promoted to C-Suite" are indicators equal to 1 if the given event occurred in year t. Other variables included in some of the regressions, but not shown, are "Stepped Down CEO", "Promoted to Chair" and indicators for "C-Suite", "Non-exec. Chairman", "Senior V.P.", and "Specialized Exec." See the Data Appendix for complete details on variable construction.

The null hypothesis is that the coefficient on all sale variables is zero. The first two regressions reject the alternative hypotheses that selling executives receive 5 percent more equity pay than non-selling executives. The next two regressions reject the alternative that boards grant 1 percent more incentives for each 1 percent decrease in incentives due to sales.

| Dependent Variable: | Chg. Total Incentives [t] | | | |
|----------------------------|---------------------------|--------------------|-------------------|--------------------|
| Pct. Drop Incentives [t-1] | | | 0.10*** (0.01) | 0.11*** (0.01) |
| Small Sale [t-1] | 0.50*** (0.17) | -0.03 (0.17) | | |
| Medium Sale [t-1] | 0.08 (0.20) | -0.40** (0.20) | | |
| Large Sale [t-1] | -1.40*** (0.26) | -1.72*** (0.26) | | |
| Purchase [t-1] | 0.03 (0.29) | 0.29 (0.30) | | |
| Junior Executive | | 9.91*** (0.26) | | 10.42*** (0.27) |
| Promoted to CEO | | 11.77*** (0.79) | | 11.86*** (0.80) |
| Promoted to C-Suite | | 6.39*** (0.55) | | 6.37*** (0.57) |
| Other Controls | | + | | + |
| Observations | 57,623 | 52,825 | 57,236 | 51,428 |
| R-squared | 0.00 | 0.11 | 0.01 | 0.12 |

Takeaway: Boards replenish about 10 percent of incentives lost from equity sales. However, executives who sell large dollar amounts of equity receive smaller increases in total incentives.

Table 8. Equity sales and pay changes within firms, C-Suite executives only

This table tests whether my main results change when I restrict analysis to only C-Suite executives, who may be more similar than all top executives at a firm. A C-Suite executive has "Chief" in his title. All regressions include firm-year fixed effects. My sample is all firms in the Execucomp and Thomson Insiders databases, and covers the year 1996 to 2007. Standard errors are reported in parentheses, and *, **, *** denote statistical significance at the 1, 5, and 10 percent levels. In all regressions, standard errors are adjusted for heteroskedasticity and clustering at the firm level. For the dependent variables, "Pct. Chg. New Incentives" is the percentage change in new incentives from year t-1 to t. "Chg. Pay Ratio" is the change in the ratio of equity to total pay from year t-1 to t, multiplied by 100. "Chg. Total Incentives" is new incentives in year t divided by total incentives from the start of year t-1, multiplied by 100. All dependent variables are winsorized at the 5-95 level. "Small sale [t-1]" is the change from year t-2 to t-1 in an indicator variable equal to 1 if the dollar value of annual equity sales equals less than 10 percent of total equity holdings. For "Medium sale [t-1]" and "Large sale [t-1]", the indicator equals 1 if the executive sells equity worth 10 to 25 percent of total holdings, or more than 25 percent of total holdings. For "Purchase [t-1]", the indicator equals 1 if the executive purchases equity on the open market. "Pct. Drop Incentives" is the total incentives from equity holdings that the executive would have had at year end if he did not sell equity minus actual total incentives at year end, divided by total incentives at the start of the year, multiplied by 100. "Junior Executive" is an indicator equal to 1 if the executive has been in the firm's top management for less than five years. "Promoted to CEO" and "Promoted to C-Suite" are indicators equal to 1 if the given event occurred in year t. "C-Suite" is an indicator equal to 1 if the executive is a member of the C-Suite in year t. Other variables included, but not shown, are indicators for "CEO", "CFO", and "COO". See the Data Appendix for complete details on variable construction.

| Type of Executive: | C-Suite Only | | | | | |
|----------------------------|------------------------------|--------------------|---------------------------|------------------------------|--------------------|---------------------------|
| Dependent Variable: | Pct. Chg. New Incentives [t] | Chg. Pay Ratio [t] | Chg. Total Incentives [t] | Pct. Chg. New Incentives [t] | Chg. Pay Ratio [t] | Chg. Total Incentives [t] |
| Pct. Drop Incentives [t-1] | | | | 0.05 (0.05) | 0.01 (0.02) | 0.13*** (0.02) |
| Small Sale [t-1] | -1.76 (1.76) | -0.82 (0.56) | -0.44 (0.43) | | | |
| Medium Sale [t-1] | 0.71 (2.13) | -0.80 (0.63) | -0.81* (0.48) | | | |
| Large Sale [t-1] | -2.07 (2.45) | -1.06 (0.89) | -2.90*** (0.65) | | | |
| Purchase [t-1] | 1.71 (2.50) | 0.35 (0.75) | 1.02 (0.64) | | | |
| Junior Executive | 3.71* (1.98) | 0.45 (0.54) | 9.28*** (0.66) | 3.48* (2.00) | 0.36 (0.54) | 9.74*** (0.67) |
| Promoted to CEO | 45.27*** (9.17) | 10.52*** (2.31) | 8.49*** (2.03) | 40.60*** (9.49) | 9.90*** (2.40) | 7.61*** (2.11) |
| Promoted to C-Suite | 13.33*** (3.11) | 1.98** (0.90) | 4.64*** (0.86) | 14.36*** (3.23) | 2.15** (0.94) | 5.17*** (0.91) |
| Other Controls | + | + | + | + | + | + |
| Observations | 9,513 | 9,723 | 9,424 | 9,086 | 9,136 | 9,086 |
| R-squared | 0.01 | 0.01 | 0.12 | 0.01 | 0.01 | 0.13 |

Takeaway: My results do not change when I restrict the sample to C-Suite executives. My identifying assumption more likely holds for these executives than all executives.

Table 9. Equity sales and pay changes, excluding executives with small holdings

This table examines the relationship between equity sales and subsequent changes in pay, excluding executives whose total incentives at the start of year t-1 are in the smallest decile in my sample. All regressions include firm-year fixed effects. My sample is all firms in the Execucomp and Thomson Insiders databases, and covers the year 1996 to 2007. Standard errors are reported in parentheses, and *, **, *** denote statistical significance at the 1, 5, and 10 percent levels. In all regressions, standard errors are adjusted for heteroskedasticity and clustering at the firm level. For the dependent variables, "Pct. Chg. New Incentives" is the percentage change in new incentives from year t-1 to t. "Chg. Pay Ratio" is the change in the ratio of equity to total pay from year t-1 to t, multiplied by 100. "Pct. Drop Incentives" is the total incentives from equity holdings that the executive would have had at year end if he did not sell equity minus actual total incentives at year end, divided by total incentives at the start of the year, multiplied by 100. "Chg. Total Incentives" is new incentives in year t divided by total incentives from the start of year t-1, multiplied by 100. All dependent variables are winsorized at the 5-95 level. "Pct. Drop Incentives" is the total incentives from equity holdings that the executive would have had at year end if he did not sell equity minus actual total incentives at year end, divided by total incentives at the start of the year, multiplied by 100. "Junior Executive" is an indicator equal to 1 if the executive has been in the firm's top management for less than five years. "Promoted to CEO", "Stepped Down CEO", "Promoted to Chair", and "Promoted to C-Suite" are indicators equal to 1 if the given event occurred in year t. "C-Suite" is an indicator equal to 1 if the executive is a member of the C-Suite in year t. Other variables included in some of the regressions, but not shown, are indicators for "Non-exec. Chairman", "Senior V.P.", and "Specialized Exec." See the Data Appendix for complete details on variable construction.

| Type of Executive: | Executives with Total Incentives above 10th percentile | | | | | |
|----------------------------|--|---------------------|--------------------|---------------------|---------------------------|---------------------|
| Dependent Variable: | Pct. Chg. New Incentives [t] | | Chg. Pay Ratio [t] | | Chg. Total Incentives [t] | |
| Pct. Drop Incentives [t-1] | 0.02 (0.03) | 0.04 (0.03) | 0.01 (0.01) | 0.01 (0.01) | 0.05*** (0.01) | 0.06*** (0.01) |
| Junior Executive | | 4.79*** (0.83) | | 0.30 (0.25) | | 9.12*** (0.25) |
| Promoted to CEO | | 49.57*** (3.52) | | 8.63*** (0.94) | | 12.53*** (0.82) |
| Stepped down CEO | | -41.05*** (4.22) | | -13.77*** (1.55) | | -11.72*** (0.98) |
| Promoted to Chair | | 10.07*** (3.66) | | 2.59** (1.24) | | 6.23*** (0.94) |
| Promoted to C-Suite | | 15.05*** (2.40) | | 1.69** (0.66) | | 5.67*** (0.55) |
| C-Suite | | 1.90*** (0.65) | | 0.01 (0.17) | | -0.29 (0.22) |
| Other Controls | + | + | + | + | + | + |
| Observations | 51,106 | 45,908 | 50,267 | 46,075 | 51,106 | 45,908 |
| R-squared | 0.00 | 0.04 | 0.00 | 0.02 | 0.00 | 0.12 |

Takeaway: **The relationship between pay changes and the decrease in total incentives is weaker when executives with small equity holdings are excluded.**

Table 10. Do differences in tenure and board information explain lack of replenishment?

This table tests whether my main results change when I restrict analysis to groups of three or more executives who joined the firm's top management in the same year, or who have worked together for at least four years. These results should not be affected by differences in executive tenure or board information. All regressions include firm-year fixed effects. My sample is all firms in the Execucomp and Thomson Insiders databases, and covers the year 1996 to 2007. Standard errors are reported in parentheses, and *, **, *** denote statistical significance at the 1, 5, and 10 percent levels. In all regressions, standard errors are adjusted for heteroskedasticity and clustering at the firm level. For the dependent variables, "Pct. Chg. New Incentives" is the percentage change in new incentives from year t-1 to t. "Chg. Pay Ratio" is the change in the ratio of equity to total pay from year t-1 to t, multiplied by 100. "Chg. Total Incentives" is new incentives in year t divided by total incentives from the start of year t-1, multiplied by 100. All dependent variables are winsorized at the 5-95 level. "Small sale [t-1]" is the change from year t-2 to t-1 in an indicator variable equal to 1 if the dollar value of annual equity sales equals less than 10 percent of total equity holdings. For "Medium sale [t-1]" and "Large sale [t-1]", the indicator equals 1 if the executive sells equity worth 10 to 25 percent of total holdings, or more than 25 percent of total holdings. For "Purchase [t-1]", the indicator equals 1 if the executive purchases equity on the open market. "Pct. Drop Incentives" is the total incentives from equity holdings that the executive would have had at year end if he did not sell equity minus actual total incentives at year end, divided by total incentives at the start of the year, multiplied by 100. "Junior Executive" is an indicator equal to 1 if the executive has been in the firm's top management for less than five years. "Promoted to CEO", "Stepped Down CEO", "Promoted to Chair", and "Promoted to C-Suite" are indicators equal to 1 if the given event occurred in year t. Other variables included in some of the regressions, but not shown, are indicators for "C-Suite", "Non-exec. Chairman", "Senior V.P.", and "Specialized Exec." See the Data Appendix for complete details on variable construction.

| Type of Executive: Dependent Variable: | Executives belonging to same cohort | | | | | |
|---|-------------------------------------|---------------------|---------------------------|------------------------------|---------------------|---------------------------|
| | Pct. Chg. New Incentives [t] | Chg. Pay Ratio [t] | Chg. Total Incentives [t] | Pct. Chg. New Incentives [t] | Chg. Pay Ratio [t] | Chg. Total Incentives [t] |
| Pct. Drop Incentives [t-1] | | | | 0.08 (0.05) | 0.02 (0.01) | 0.10*** (0.02) |
| Small Sale [t-1] | -1.46 (1.33) | -0.61 (0.40) | -0.24 (0.28) | | | |
| Medium Sale [t-1] | -0.88 (1.52) | -0.32 (0.48) | -0.75** (0.32) | | | |
| Large Sale [t-1] | -1.24 (1.80) | -0.11 (0.60) | -2.26*** (0.42) | | | |
| Purchase [t-1] | -3.54* (1.96) | -0.43 (0.59) | 0.05 (0.52) | | | |
| Junior Executive | -1.62 (4.46) | 0.12 (1.19) | 7.10*** (1.31) | -2.75 (4.83) | -0.52 (1.19) | 7.11*** (1.36) |
| Promoted to CEO | 47.83*** (5.39) | 7.18*** (1.40) | 10.47*** (1.35) | 48.42*** (5.62) | 7.06*** (1.47) | 10.55*** (1.38) |
| Stepped down CEO | -47.32*** (7.33) | -12.37*** (2.00) | -12.53*** (1.73) | -44.35*** (7.39) | -11.61*** (2.09) | -12.49*** (1.80) |
| Promoted to Chair | 16.70*** (5.66) | 3.99** (1.61) | 6.56*** (1.55) | 14.08** (5.58) | 3.84** (1.69) | 6.88*** (1.60) |
| Promoted to C-Suite | 20.11*** (3.74) | 3.55*** (0.95) | 7.48*** (0.93) | 21.06*** (3.83) | 4.17*** (0.99) | 7.62*** (0.96) |
| Other Controls | + | + | + | + | + | + |
| Observations | 17,295 | 17,803 | 17,135 | 16,369 | 16,437 | 16,369 |
| R-squared | 0.04 | 0.02 | 0.06 | 0.03 | 0.01 | 0.06 |

Takeaway:

My main results do not change when I restrict the sample to executives in the same cohort, for whom differences in tenure and board information are small.

Table 11. Do shocks to outside wealth explain lack of replenishment?

This table tests whether my main results change when I restrict analysis to executives who likely did not experience wealth shocks. Panel A tests shows pay changes from 2006 to 2007 for executives who deferred a portion of compensation in 2006. Panel B shows pay changes from 2005 to 2006 and 2006 to 2007, for executives whose deferred compensation accounts in 2006 or 2007 are equal to at least 10 percent of the value of firm equity holdings. All regressions include firm-year fixed effects. My sample is all firms in the Execucomp and Thomson Insiders databases, and covers the year 1996 to 2007. Standard errors are reported in parentheses, and *, **, *** denote statistical significance at the 1, 5, and 10 percent levels. In all regressions, standard errors are adjusted for heteroskedasticity and clustering at the firm level. For the dependent variables, "Pct. Chg. New Incentives" is the percentage change in new incentives from year t-1 to t. "Chg. Pay Ratio" is the change in the ratio of equity to total pay from year t-1 to t, multiplied by 100. "Chg. Total Incentives" is new incentives in year t divided by total incentives from the start of year t-1, multiplied by 100. All dependent variables are winsorized year t-2 to t-1 in an indicator variable equal to 1 if the dollar value of annual equity sales equals less than 10 percent of total equity holdings. For "Medium sale [t-1]" and "Large sale [t-1]", the indicator equals 1 if the executive sells equity worth 10 to 25 percent of total holdings, or more than 25 percent of total holdings. "Pct. Drop Incentives" is the total incentives from equity holdings that the executive would have had at year end if he did not sell equity minus actual total incentives at year end, divided by total incentives at the start of the year, multiplied by 100. Other variables included in the regressions, but not shown, are "Purchase [t-1]", "Junior Executive", "Promoted to CEO", "Stepped Down CEO", "Promoted to Chair", "Promoted to C-Suite", and executive role indicators. See the Data Appendix for complete details on variable construction.

Panel A. Executives who contribute to deferred compensation account in 2006

| Dependent Variable: | Pct. Chg. New Incentives [t] | Chg. Pay Ratio [t] | Chg. Total Incentives [t] | Pct. Chg. New Incentives [t] | Chg. Pay Ratio [t] | Chg. Total Incentives [t] |
|----------------------------|------------------------------|--------------------|---------------------------|------------------------------|--------------------|---------------------------|
| Pct. Drop Incentives [t-1] | | | | -0.05 (0.16) | -0.02 (0.04) | -0.03 (0.06) |
| Small Sale [t-1] | 0.45 (3.76) | 0.53 (1.36) | 2.34** (1.14) | | | |
| Medium Sale [t-1] | -3.46 (4.57) | 0.44 (1.27) | 0.34 (1.20) | | | |
| Large Sale [t-1] | -0.90 (4.46) | 0.93 (1.67) | -1.89 (1.73) | | | |
| Other Controls | + | + | + | + | + | + |
| Observations | 1,170 | 1,201 | 1,158 | 1,008 | 1,020 | 1,008 |
| R-squared | 0.06 | 0.07 | 0.18 | 0.07 | 0.08 | 0.18 |

Panel B. Executives with substantial savings in account in 2006 or 2007

| Dependent Variable: | Pct. Chg. New Incentives [t] | Chg. Pay Ratio [t] | Chg. Total Incentives [t] | Pct. Chg. New Incentives [t] | Chg. Pay Ratio [t] | Chg. Total Incentives [t] |
|----------------------------|------------------------------|--------------------|---------------------------|------------------------------|--------------------|---------------------------|
| Pct. Drop Incentives [t-1] | | | | -0.04 (0.11) | 0.00 (0.02) | -0.04 (0.05) |
| Small Sale [t-1] | 0.01 (3.16) | 0.20 (1.08) | -0.27 (0.99) | | | |
| Medium Sale [t-1] | -2.60 (4.06) | 0.75 (0.98) | -1.08 (1.07) | | | |
| Large Sale [t-1] | -5.95 (4.40) | -0.41 (1.11) | -3.16** (1.49) | | | |
| Other Controls | + | + | + | + | + | + |
| Observations | 1,405 | 1,436 | 1,398 | 1,322 | 1,340 | 1,322 |
| R-squared | 0.07 | 0.08 | 0.12 | 0.08 | 0.09 | 0.12 |

Takeaway:

There is no evidence of replenishment on a subsample of executives who are less likely to have recently experienced large shocks to outside wealth or liquidity.

Table 12. Are boards more likely to respond after early option exercises?

This table tests whether boards are more likely to replenish the incentives of executives who sold equity after exercising stock options early. "Early Exercise" is an indicator equal to one if at least half of the dollar value of equity sold by the executive in year t-1 is from shares acquired when the executive exercises a stock option with more than six years left until expiration. All regressions include firm-year fixed effects. My sample is all firms in the Execucomp and Thomson Insiders databases, and covers the year 1996 to 2007. Standard errors are reported in parentheses, and *, **, *** denote statistical significance at the 1, 5, and 10 percent levels. In all regressions, standard errors are adjusted for heteroskedasticity and clustering at the firm level. For the dependent variables, "Pct. Chg. New Incentives" is the percentage change in new incentives from year t-1 to t. "Chg. Pay Ratio" is the change in the ratio of equity to total pay from year t-1 to t, multiplied by 100. "Chg. Total Incentives" is new incentives in year t divided by total incentives from the start of year t-1, multiplied by 100. All dependent variables are winsorized at the 5-95 level. "Small sale [t-1]" is the change from year t-2 to t-1 in an indicator variable equal to 1 if the dollar value of annual equity sales equals less than 10 percent of total equity holdings. For "Medium sale [t-1]" and "Large sale [t-1]", the indicator equals 1 if the executive sells equity worth 10 to 25 percent of total holdings, or more than 25 percent of total holdings. For "Purchase [t-1]", the indicator equals 1 if the executive purchases equity on the open market. "Junior Executive" is an indicator equal to 1 if the executive has been in the firm's top management for less than five years. Other variables included, but not shown, are indicators for "Promoted to CEO", "Stepped Down CEO", "Promoted to C-Suite", "Promoted to Chair", and indicators for various executive roles. See the Data Appendix for complete details on variable construction.

| Dependent Variable: | Pct. Chg. New Incentives [t] | Chg. Pay Ratio [t] | Chg. Total Incentives [t] |
|------------------------------------|------------------------------|--------------------|---------------------------|
| Small Sale [t-1] | 0.81 (1.12) | -0.31 (0.33) | 0.25 (0.27) |
| Medium Sale [t-1] | 0.37 (1.21) | -0.80** (0.38) | -0.21 (0.31) |
| Large Sale [t-1] | -0.41 (1.39) | -1.00** (0.46) | -1.17*** (0.37) |
| Small Sale [t-1] * Early Exercise | -3.83 (3.64) | -1.49 (1.21) | -1.35 (0.86) |
| Medium Sale [t-1] * Early Exercise | 0.52 (3.64) | 0.29 (1.26) | 0.08 (0.87) |
| Large Sale [t-1] * Early Exercise | -0.80 (3.81) | 0.75 (1.24) | -1.00 (0.96) |
| Early Exercise | -0.58 (2.02) | -0.12 (0.61) | -0.08 (0.57) |
| Purchase [t-1] | -3.11 (2.03) | -1.20* (0.68) | 2.59*** (0.53) |
| Junior Executive | 3.69*** (1.11) | 0.27 (0.34) | 8.81*** (0.35) |
| Other Controls | + | + | + |
| Observations | 25,509 | 26,025 | 25,373 |
| R-squared | 0.04 | 0.02 | 0.11 |

Takeaway: Boards may expect executives to sell equity once it fully vests, but may not anticipate earlier sales. However, my results show that boards also do not respond to sales following an early exercise of stock options.

Table 13. Do boards respond differently to sales early versus late in year?

This table tests whether boards anticipate equity sales which occur early in the fiscal year, and hence only replenish incentives ex post for sales which occur later in the fiscal year. Early sales are those which occur in the first half of the fiscal year, and late sales are those which occur in the second half. All regressions include firm-year fixed effects. My sample is all firms in the Execucomp and Thomson Insiders databases, and covers the year 1996 to 2007. Standard errors are reported in parentheses, and *, **, *** denote statistical significance at the 1, 5, and 10 percent levels. In all regressions, standard errors are adjusted for heteroskedasticity and clustering at the firm level. For the dependent variables, "Pct. Chg. New Incentives" is the percentage change in new incentives from year t-1 to t. "Chg. Pay Ratio" is the change in the ratio of equity to total pay from year t-1 to t, multiplied by 100. "Chg. Total Incentives" is new incentives in year t divided by total incentives from the start of year t-1, multiplied by 100. All dependent variables are winsorized at the 5-95 level. "Small Sale Early [t-1]" is the change from year t-2 to t-1 in an indicator variable equal to 1 if the equity sales in the first half of the fiscal year equals less than 10 percent of total equity holdings. For "Medium Sale Early [t-1]" and "Large Sale Early [t-1]", the indicator equals 1 if the executive sells equity worth 10 to 25 percent of total holdings, or more than 25 percent of total holdings. For "Purchase Early [t-1]", the indicator equals 1 if the executive purchases equity on the open market in the first half of the fiscal year. "Small Sale Late [t-1]", "Medium Sale Late [t-1]", etc. are similarly defined, but for sales which occur in the second half of the fiscal year. "Junior Executive" is an indicator equal to 1 if the executive has been in the firm's top management for less than five years. Other variables included, but not shown, are indicators for "Promoted to CEO", "Stepped Down CEO", "Promoted to C-Suite", "Promoted to Chair", and indicators for various executive roles. See the Data Appendix for complete details on variable construction.

| Dependent Variable: | Pct. Chg. New Incentives [t] | Chg. Pay Ratio [t] | Chg. Total Incentives [t] |
|-------------------------|------------------------------|--------------------|---------------------------|
| Small Sale Early [t-1] | -0.97 (0.81) | -0.59** (0.25) | 0.21 (0.16) |
| Medium Sale Early [t-1] | -0.91 (1.03) | 0.00 (0.34) | -0.24 (0.23) |
| Large Sale Early [t-1] | -0.85 (1.41) | -0.49 (0.48) | -1.52*** (0.33) |
| Small Sale Late [t-1] | -1.41* (0.82) | -0.15 (0.25) | -0.24 (0.17) |
| Medium Sale Late [t-1] | -1.00 (1.05) | -0.65** (0.32) | -0.50** (0.22) |
| Large Sale Late [t-1] | 0.19 (1.49) | -0.16 (0.45) | -1.55*** (0.33) |
| Purchase Early [t-1] | -0.06 (1.52) | -0.01 (0.43) | 1.09*** (0.39) |
| Purchase Late [t-1] | 2.38 (1.57) | 0.57 (0.46) | -0.23 (0.39) |
| Junior Executive | 4.24*** (0.79) | 0.38* (0.23) | 9.85*** (0.27) |
| Other Controls | + | + | + |
| Observations | 46,989 | 47,838 | 46,728 |
| R-squared | 0.04 | 0.02 | 0.11 |

Takeaway: When boards are setting annual pay, they may anticipate sales which will occur early next year and grant more equity to replenish incentives ex ante. Boards are less likely to anticipate sales which occur later in the year, yet do not replenish incentives after these sales occur.