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ABSTRACT

Equity Vesting and Managerial Myopia*

This paper links the CEO's concerns for the current stock price to reductions in real investment. These concerns depend on the amount of equity he intends to sell in the short-term, but actual equity sales are an endogenous decision. We use the amount of stock and options scheduled to vest in a given year as an instrument for equity sales. Such vesting is determined by equity grants made several years prior, and thus unlikely driven by current investment opportunities. An interquartile increase in instrumented equity sales is associated with a decline of 0.25% in the growth of R&D/assets, 4.6% of the average R&D/assets ratio. Vesting-induced equity sales also increase the likelihood of meeting or marginally beating analyst earnings forecasts, and are associated with higher returns to earnings announcements. More broadly, by introducing a measure of incentives that is not driven by the current contracting environment – vesting-induced equity sales – our paper suggests that CEO contracts affect real outcomes.

JEL Classification: G31, G34, M12 and M52
Keywords: CEO incentives, managerial myopia, short-termism and vesting

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1. Introduction

This paper studies the link between real investment decisions and the CEO's short-term incentives. We find that CEOs who are likely to sell more equity in the short term, due to the imminent vesting[1] of their stock or options, cut research and development ("R&D"), advertising, and capital expenditure. Such CEOs are also more likely to meet or marginally beat analyst earnings forecasts. These results provide empirical support for managerial myopia theories and, more broadly, evidence that CEO contracts affect real decisions.

Many academics and practitioners believe that managerial myopia is a first-order problem faced by the modern firm. While the 20th century firm emphasized cost efficiency, Porter (1992) argues that "the nature of competition has changed, placing a premium on investment in increasingly complex and intangible forms", such as innovation, employee training, and organizational development. However, the myopia theories of Stein (1988, 1989) show that managers may fail to invest due to concerns with the firm's short-term stock price. Since the benefits of intangible investment are only visible in the long run, its immediate effect is to depress earnings and thus the current stock price. Therefore, a manager aligned with the short-term stock price may turn down valuable investment opportunities.

Despite its importance, myopia is very difficult to test for empirically. Standard measures of CEO incentives (e.g., Hall and Liebman (1998)) quantify the sensitivity of the manager's stock and options to the share price. However, in myopia models such as Stein (1989), the driver of short-termism is not the overall level of equity holdings, but the amount of equity that the CEO expects to sell in the short-term. Equity that does not vest (or the CEO does not plan to sell) until the long-term may deter rather than induce myopia (Edmans, Gabaix, Sadzik, and Sannikov

[1] Strictly speaking, options do not vest; they become exercisable. For brevity, we use the word "vest" to refer to options that change status from being unexercisable to exercisable.

(2012)). However, operationalizing the concept of short-term equity sales empirically is tricky. Actual sales are an endogenous choice of the CEO, and likely correlated with omitted variables that also drive investment. For example, negative private information on firm prospects may cause the manager to sell equity and also cut investment.

To address this challenge, we identify increases in equity sales that arise from scheduled vesting of the CEO's existing stock and option holdings. Vesting equity has three attractive features as an instrument for equity sales. First, it satisfies the relevance criterion. An undiversified, risk-averse CEO optimally sells some equity upon vesting (e.g. Hall and Murphy (2002), Kahl, Liu, and Longstaff (2003)). Indeed, we find that a $1 increase in vesting equity is associated with a 33c increase in equity sales; vesting equity also strongly passes the weak instrument test. Second, turning to the exclusion restriction, the amount of newly-vesting equity depends on the magnitude and vesting schedule of equity grants made several years prior and is thus unrelated to current shocks to investment opportunities.[2] Third, scheduled vesting is predictable by the CEO, and so he is able to change investment in anticipation. We identify the amount of equity scheduled to vest in a given year using a recently-available dataset from Equilar that takes advantage of the SEC's compensation disclosure requirements, implemented in 2006.

We measure investment using the growth in R&D, advertising, and capital expenditure, scaled by total assets, and also study individual components of this measure. We control for determinants of investment opportunities and the firm's ability to fund investment, firm and year fixed effects, and other components of CEO compensation – the CEO's unvested equity, already-

[2] Gopalan, Milbourn, Song, and Thakor (2014) show that most equity grants do not fully vest for three to five years, and vesting schedules are largely predetermined at the time of grant. However, in some cases, vesting is triggered by accounting or stock performance. Performance-based vesting may be correlated with current investment opportunities –we address this concern in Section 3.2.

vested equity, salary, and bonus. We find a negative and significant relationship between nearly all measures of investment growth and instrumented equity sales. An interquartile increase in vesting-induced equity sales is associated with a 0.25 percentage point decline in the growth of R&D scaled by lagged total assets, which corresponds to 4.6% of the average R&D/assets ratio, and an average decline of $2.2 million per year. To our knowledge, these are the first results to link short-term equity incentives to real investment.

The negative association between investment and vesting-induced equity sales can arise from two channels. First, as in Stein (1989) and other myopia models, planned equity sales could cause managers to reduce investment in an attempt to boost the stock price. Second, boards may schedule vesting dates to coincide with declines in investment opportunities, which our controls fail to capture. This explanation requires that boards forecast declines in investment opportunities several years in advance. Note that it is still consistent with myopia theories, if boards believe that vesting equity exacerbates myopia and so try to ensure that equity does not vest while investment opportunities are strong.

To provide further evidence of the first channel, we show that vesting-induced equity sales are associated with a higher likelihood of meeting or marginally beating analyst earnings forecasts: an interquartile increase in vesting-induced equity sales is associated with a 0.81 percentage point increase in the likelihood of beating the forecast by up to one cent, compared to the unconditional likelihood of 12.2%. They are unrelated to the likelihood of beating the forecast by a wide margin, consistent with manipulation being more likely when close to the forecast. These results support the explanation that vesting equity increases the CEO's stock price concerns, but not that it is correlated with investment opportunities. Similarly, we find that

the magnitude of the investment cuts, discussed earlier, is large enough to allow the firm to meet its earnings target.

Finally, we study whether managers with high stock price concerns indeed succeed in boosting the stock price at earnings announcements. An interquartile increase in vesting-induced equity sales is associated with a statistically significant 0.26% higher announcement return. When controlling for the earnings realization itself, the coefficient on vesting-induced equity sales becomes insignificant – the superior announcement return enjoyed by managers with short-term concerns can be fully explained by their greater propensity to beat the target. These higher stock returns suggest that the market does not fully incorporate such managers' myopic incentives, consistent with the earlier result that analysts under-predict their earnings announcements. They are also consistent with prior evidence that the market does not fully incorporate managerial incentives. von Lilienfeld-Toal and Ruenzi (2014) document significant long-run returns to portfolios formed using the manager's overall level of equity holdings, a simpler incentive measure to calculate that does not require data on vesting schedules.

This paper is related to a long literature on managerial myopia. In addition to the theories already cited, other models include Miller and Rock (1985), Narayanan (1985), Bebchuk and Stole (1993), Bizjak, Brickley, and Coles (1993), Goldman and Slezak (2006), Edmans (2009), and Benmelech, Kandel, and Veronesi (2010). Empirically, McConnell and Muscarella (1985) document positive returns to the announcements of capital investments. This result may arise from selection: managers only announce projects whose value is immediately visible to the market. Graham, Harvey, and Rajgopal (2005) provide survey evidence that 78% of executives would sacrifice long-term value to meet earnings targets. Using standard measures of incentives that capture the CEO's overall sensitivity to the stock price, Cheng and Warfield (2005),

Bergstresser and Philippon (2006), and Peng and Roell (2008) find a positive association with earnings management, but Erickson, Hanlon, and Maydew (2006) find no association with accounting fraud. These conflicting results may arise because, theoretically, it is the sensitivity to the *short-term* stock price that induces myopia.

Our study is also related to papers that analyze the vesting horizon of the CEO's equity. Kole (1997) is the first to describe vesting horizons, but does not relate them to firm behavior.[3] Gopalan, Milbourn, Song, and Thakor (2014) analyze the "duration" of CEO pay – the weighted average of the vesting periods of his different pay components. They document how duration varies across firms and its correlation with accruals, but do not examine real outcomes. This may be because duration – unlike newly-vesting equity – depends on current equity grants and thus is likely correlated with current shocks to investment opportunities.

A contemporaneous paper by Ladika and Sautner (2014) shows that, in response to the adoption of FAS 123R, some firms chose to accelerate option vesting, and that such accelerated vesting was associated with a reduction in capital expenditure. Our papers are complementary in that they employ different empirical strategies to analyze the relation between vesting and investment, and find consistent results. While Ladika and Sautner (2014) focus on a one-time shock, we study a panel of firms. This broader setting allows us to quantify the responsiveness of investment to expected equity sales, rather than the more specific question of how investment responded to an accounting change that may have induced vesting acceleration. Our identification using vesting equity is also usable in wider contexts. Building on our work, Gopalan, Huang, and Maharjan (2014) use newly-vesting equity as an instrument for duration

[3] Some papers do not consider the horizon of equity incentives but do differentiate between unvested and vested equity. Johnson, Ryan, and Tian (2009) show that vested stock is related to corporate fraud. Burns and Kedia (2006) and Efendi, Srivastava and Swanson (2007) find that large holdings of vested options, particularly those in-the-money, are positively related to managers' propensity to misreport.

and examine its association with CEO turnover; Edmans, Goncalves-Pinto, Wang, and Xu (2014) show that CEOs strategically release news in months in which their equity vests, to boost the stock price and stock liquidity.

Our paper also contributes to the broader literature on CEO compensation, beyond the specific topic of short-termism. Even though this literature is substantial, very few papers show that incentive contracts affect managers' behavior, i.e., that CEO pay actually matters. The survey of Frydman and Jenter (2010) notes that "compensation arrangements are the endogenous outcome of a complex process … this makes it extremely difficult to interpret any observed correlation between executive pay and firm outcomes as evidence of a causal relationship." This paper takes a step towards addressing the identification challenge, by introducing a measure of CEO incentives – vesting-induced equity sales – that is unlikely to be driven by the current contracting environment. Thus, our results suggest that executive compensation has real effects.[4]

This paper is organized as follows. Section 2 describes the data and our identification of vesting equity. Section 3 presents the investment results and Section 4 analyzes earnings announcements. Section 5 concludes.

2. Data and Empirical Specification

This section describes our empirical approach and the calculation of the variables used in the empirical analysis; a detailed description is in Appendix A.

2.1 Empirical approach

Our empirical approach is motivated by standard models of managerial myopia. In such models, the CEO's wealth in year *t* is typically given by:

[4] Shue and Townsend (2013) also aim to show a causal effect of incentives. They use features of multi-year grant cycles as an instrument for option grants, to study the different question of whether options induce risk-taking.

$$W_t = S_t + \alpha_t[\omega_t P_t + \sum_{s=1}^{T} \omega_{t+s} E(P_{t+s})], \quad (1)$$

where W_t is the manager's wealth, S_t is cash salary, P_t is the stock price in year t, and α_t is the manager's total number of shares, of which a fraction ω_t is sold in year t. We have $\sum_{s=0}^{T} \omega_{t+s} = 1$. For example, the objective function in Stein (1989) is similar to a two-period version of equation (1). The manager's myopic incentives – his incentives to increase P_t – are given by the dollar change in wealth W for a 100% increase in P_t. This quantity equals $\alpha_t \omega_t P_t$ in equation (1), i.e. the value of shares that the manager plans to sell in year t. It is analogous to the Hall and Liebman (1998) measure of equity incentives, but focuses on the equity that the CEO intends to sell in year t rather than his entire equity portfolio.

Our goal is to test whether a CEO's intention to sell more equity in the short term leads him to reduce long-term investment. Implementing this test poses a number of challenges. The ideal experiment would be for the CEO to be forced to sell some equity for exogenous reasons, and to be aware of this forced sale ahead of time so that this expectation can affect his actions. However, identifying sales that are both exogenous and predictable by the CEO is difficult. Unexpected forced sales (e.g., due to sudden liquidity needs) are likely exogenous, but typically unobservable to researchers and, importantly, unpredictable by the CEO so that he would be unable to cut investment in anticipation. Actual equity sales are observable but likely endogenous for two reasons. First, omitted variables can drive both equity sales and investment. For example, the manager's negative private information on firm prospects may cause him both to sell equity and to reduce investment. Second, they include unexpected sales (which will not affect investment) and so are subject to measurement error.

We address these challenges using vesting equity as an instrument for equity sales. This instrument has three attractive features. First, it satisfies the relevance criterion. Risk-averse,

undiversified executives should sell some equity upon vesting, to reduce their risk exposure (we expand on this idea below). Indeed, we show empirically that equity sales are highly correlated with vesting equity.[5] Second, the amount of vesting equity depends on the magnitude and vesting horizon of equity grants made several years prior, and is thus uncorrelated with current shocks to investment opportunities. Third, for the same reason, it is known to the CEO in advance, so he is able to change investment in anticipation of upcoming vesting.

Equity sales may stem not only from newly-vesting equity, but also previously-vested equity that the CEO has held onto; we control for these holdings in all regressions. Indeed, Burns and Kedia (2006), Efendi, Srivastava and Swanson (2007), and Johnson, Ryan, and Tian (2009) relate vested equity to misreporting and corporate fraud. However, the association between vested holdings and investment is difficult to interpret because the CEO's decision to hold onto vested equity is endogenous. For example, if the CEO has private information that investment opportunities are good, he may choose to retain vested equity and also increase investment.

In addition, the CEO may be holding a significant fraction of his vested equity for the long-term, as sales of vested equity may be subject to various explicit or implicit constraints. The same constraints also support our identifying assumption that CEOs increase equity sales when more of their equity vests, because vesting relaxes these constraints. One such constraint results from ownership guidelines, i.e. requirements to hold equity in excess of a given multiple of salary or percentage of shares outstanding. These guidelines are typically satisfied only by vested equity (Core and Larcker (2002)), and so vesting allows the CEO to sell equity without violating the guidelines. Second, the CEO may hold vested equity voluntarily for control reasons

[5] While we study equity vesting and equity sales on an annual frequency (consistent with investment being recorded on an annual basis), a subsequent paper by Edmans, Goncalves-Pinto, Wang, and Xu (2014) finds that vesting equity is highly correlated with equity sales on a monthly frequency, providing further evidence of the relevance of vesting.

– he wishes to maintain voting rights in excess of a particular threshold. Since unvested equity does not provide voting rights, vesting allows additional sales without falling below the threshold. Similarly, the CEO may hold a threshold level of vested equity for signaling reasons: even though he has the option to sell vested equity, he chooses to retain it to signal confidence in the firm. Consistent with these points, we show in Section 3 that equity sales are strongly related to vesting equity even after controlling for already-vested holdings. Note that our identification does not require the CEO to sell his entire equity upon vesting, only that vesting equity is a significant determinant of equity sales.

2.2 Data and Sample

The SEC's compensation disclosure requirements, implemented in 2006, require companies to disclose grant-level (rather than merely aggregate-level) information on each stock and option award held by a top executive in their proxy statements, including whether the award is vested or unvested. We can thus track option vesting by studying changes in the numbers of vested and unvested options with the same exercise price and expiration date. Separately, firms directly report the number of shares that vest in a given year.

Given the short time series over which the grant-level vesting status is available, we require a wide cross-section to maximize power. While the data is available in Execucomp for the S&P 1500, we use Equilar as it covers all firms in the Russell 3000. The initial sample consists of 9,385 firm-CEO-years from 2006-2010. After merging with financial statement data from Compustat and stock return data from the Center for Research in Security Prices (CRSP), and removing financial and utilities firms, we obtain the final sample of 2,047 firms and 6,730 firm-

CEO-years (see Table 1, Panel A).[6] The analysis of earnings forecasts uses the Institutional Brokers' Estimate System (I/B/E/S) database and covers 1,498 firms and 17,173 firm-quarters.

2.3 Measurement of equity sales and vesting equity

We calculate the number of shares sold by the CEO in a given year using Form 4 filed with the SEC and compiled by the Thomson Financial Insider Trading database. This database covers both standard sales of stock and sales of shares acquired after option exercises. We multiply the number of shares sold during year t by P_{t-1} to form $EQUITYSOLD_t$, the dollar value of equity sold.

Information on vesting equity comes from Equilar. The variable "Shares Acquired on Vesting of Stock" contains the number of shares that vest in a given year, either from previously restricted stock or Long-Term Incentive Plans ("LTIPs"). To calculate the number of vesting options, we use information, grant-by-grant, on the exercise price (*EXERPRC*), expiration date (*EXPDATE*), and number of securities (*NUM*) for a given CEO's newly-awarded options in year t, and his unvested options at the end of years t-1 and t. We group these options by *EXERPRC* and *EXPDATE* and infer the number of newly-vesting options using:

$$NEWLYVESTINGOPTIONNUM\ (EXERPRC_p,\ EXPDATE_d)_t = UNVESTEDOPTIONNUM\ (EXERPRC_p,\ EXPDATE_d)_{t-1} + NEWOPTIONNUM\ (EXERPRC_p,\ EXPDATE_d)_t - UNVESTEDOPTIONNUM\ (EXERPRC_p, EXPDATE_d)_t, \quad (2)$$

[6] In the final sample, we have 28 firm-years with more than one CEO, due either to dual CEOs or a change of CEO. In these cases, the firm-year observation appears once for each CEO. The results are robust to deleting these observations or keeping the CEO with higher newly-vesting equity.

where *p* and *d* denote an exercise price-expiration date pair, *NEWLYVESTINGOPTIONNUM* is the number of newly-vesting options for this pair, *UNVESTEDOPTIONNUM* is the number of unvested options, and *NEWOPTIONNUM* is the number of newly-awarded options.

Having identified the number of vesting securities, we then calculate their delta: the dollar change in value for a $1 change in the stock price. The delta equals the number of shares a security is equivalent to, from an incentive standpoint. The delta of a share is 1; we calculate the delta of an option using the Black-Scholes formula.[7] We then sum across the deltas of all of the CEO's vesting stock and options. The aggregate delta measures the dollar change in vesting equity for a $1 change in the stock price, and reflects the effective *number* of vesting shares. To calculate the effective *value* of vesting equity in *t*, we multiply the aggregate delta by P_{t-1}. We call the resulting measure *NEWLYVESTING*, and it represents the dollar change in vesting equity for a 100% change in the stock price. Appendix B gives a sample calculation for one CEO-year.[8]

2.4 Measurement of investment

Theoretically, myopia comprises any actions that increase current earnings at the expense of long-term value, but this cost cannot be observed immediately by the market. Our first measure

[7] For options that vest in year *t*, we use Black-Scholes inputs from Equilar, as of the end of year *t-1*. The rationale is that, when making his investment decisions at the start of year *t*, the CEO will take into account the delta of his options at the start of the year. If these are unavailable, we use the inputs associated with a firm's newly-awarded options in year *t* from Equilar, followed by year *t-1*'s inputs from ExecuComp, and year *t-1*'s inputs from Compustat, in that order. If the inputs cannot be located directly in the three databases, we fill in the volatility by calculating past three-year price volatility using the CRSP daily files, the risk-free rate with the Treasury Constant Maturity Rate with the closest term to a given option, and the dividend yield by calculating past five-year average dividend yield using the Compustat annual files. If the expiration date is missing from Equilar, we delete the option.

[8] Besides Equilar, information on vesting schedules (by year in which equity grants are awarded) can be obtained from footnotes to the Form 4 filings with the Securities and Exchange Commission (SEC). Unlike Equilar, using this source to construct *NEWLYVESTING* for a given year would require accurate vesting schedule data on a full history of previously awarded grants that are still held by the CEO. If one filing is missing, then *NEWLYVESTING* will be incorrectly calculated. Indeed, prior research reports that information collected from form 4 contains significant data errors, missing filings, and in particular inconsistencies with Execucomp (see, for example, van Bekkum and Zhu (2013)).

is the change in R&D (*ΔRD*), scaled by lagged total assets. R&D is generally expensed and thus immediately reduces earnings. However, the cash flows created by R&D typically only arise in the long-term, and so it is difficult for even a forward-looking market to assess them immediately and incorporate them into the stock price. While many firms expense R&D separately on the income statement, and so the market can identify if an earnings increase was caused by a cut in R&D, the income statement can only report the level of R&D and not its quality.[9] Thus, the market may interpret an R&D cut as efficient rather than myopic. Consistent with this view, prior literature finds that managers use R&D cuts as a way to increase short-run earnings.[10]

In our final sample, 2,531 firm-CEO-years (37.6% of our sample) have missing R&D, because R&D is either included within Selling, General, and Administrative expenses ("SG&A") or indeed zero. Following Himmelberg, Hubbard, and Palia (1999), we set missing R&D values to zero. The results are slightly stronger if we remove observations with missing R&D.

Based on similar reasoning, we also calculate *ΔRDAD*, the change in the sum of R&D and advertising expenditures, scaled by lagged total assets, setting missing advertising expenditures to zero. Chan, Lakonishok, and Sougiannis (2001) provide evidence that both advertising and R&D are underpriced by the market, suggesting that a cut in these expenditures could boost the short-term stock price.

[9] Cohen, Diether, and Malloy (2013) find that "the stock market appears unable to distinguish between "good" and "bad" R&D investment".

[10] Graham, Harvey, and Rajgopal (2005) report that 80% of managers would cut discretionary expenditure on R&D, advertising, and maintenance to meet an earnings target. Bushee (1998) finds that investors who trade on earnings induce managers to cut R&D to meet earnings targets. Roychowdhury (2006) shows that firms manipulate earnings through real activities, including cuts in discretionary spending, to avoid reporting losses. Bhojraj, Hribar, Picconi, and McInnis (2009) find that firms that beat analyst forecasts by reducing discretionary spending enjoy a short-term stock price gain that is reversed in the long-run. These results are inconsistent with the hypothesis that a cut in R&D signals poor investment opportunities (Bebchuk and Stole (1993)). Any such effect would work against finding a negative association between R&D and vesting-induced equity sales.

We also calculate the change in capital expenditure (*ΔCAPEX*) and total tangible investment (*ΔCAPEXALL*), scaled by lagged total assets. While *CAPEX* is taken directly from the cash flow statement, *CAPEXALL* is the increase in gross fixed assets from the balance sheet. The latter is more comprehensive as it captures investment not fully reflected on the cash flow statement, such as capitalized leases. While capital expenditure is not directly expensed, it does depress earnings through raising depreciation. In addition, it is typically financed by reducing cash or increasing debt. This increases a firm's net interest expense, reducing earnings, and also worsens the firm's solvency ratios which may enter into market valuations. As two additional measures, we consider the change in the sum of scaled R&D, advertising, and capital expenditure (*ΔRDADCAPEX* and *ΔRDADCAPEXALL*), which aggregates all of these discretionary expenditures. We use "investment" as an umbrella term to encapsulate the six different measures of long-term behavior: *RD*, *RDAD*, *CAPEX*, *CAPEXALL*, *RDADCAPEX*, and *RDADCAPEXALL*.

2.5 Control variables

We control for potential incentive effects created by the other components of CEO pay. We include $VESTED_{t-1}$, the sensitivity of all stock and options that had vested by the end of year *t-1*, and $UNVESTEDADJ_{t-1}$, the sensitivity of unvested equity at the end of year *t-1* not scheduled to vest in year *t*.[11] The direction and strength of any correlation between these two variables and investment are unclear. While already-vested equity could deter investment if the CEO intends to sell it in the short run, his decision to hold onto vested equity is endogenous and could be

[11] $UNVESTEDADJ_{t-1}$ equals $UNVESTED_{t-1}$ - $NEWLYVESTING_t$, where $UNVESTED_{t-1}$ is the sensitivity of all unvested equity at the end of year *t-1*. We set $UNVESTEDADJ_{t-1}$ to zero if it is negative: in rare cases, $NEWLYVESTING_t$ can exceed $UNVESTED_{t-1}$ because some unvested options have been canceled during the year, rather than having vested. Equilar does not record such cancelations, but they are very rare.

positively correlated with investment opportunities as discussed in Section 2.1. While unvested equity may decrease myopia if it is scheduled to vest far in the future, it may exacerbate myopia if scheduled to vest shortly after *t*. Separately, Laux (2012) shows theoretically that unvested equity may exacerbate myopia because the CEO takes short-term actions to avoid being fired and forfeiting his unvested equity.

We also include $SALARY_{t-1}$ and $BONUS_{t-1}$, two other elements of compensation contracts, the control variables used in the investment regressions of Asker, Farre-Mensa, and Ljungqvist (2014), and some additional controls. The first five proxy for investment opportunities: Tobin's Q at the end of year *t-1* and *t* (Q_{t-1}, Q_t), the compounded monthly market-adjusted stock return over year *t-1* ($MOMENTUM_{t-1}$), the log of market equity (MV_{t-1}), and firm age (AGE_{t-1}).[12] The remainder measure profitability and financial strength: cash and short-term investments ($CASH_{t-1}$), book leverage ($BOOKLEV_{t-1}$), retained earnings ($RETEARN_{t-1}$), and the return-on-assets ratio (ROA_{t-1}).

2.6 Descriptive statistics

Summary statistics for our sample firms are in Table 1, Panel B. Our key dependent variables are changes in investment scaled by lagged total assets. An average firm exhibits a 0.3% year-on-year change in R&D. This figure becomes 0.4% when adding advertising and 1% when further adding capital expenditure inferred from the balance sheet.

Vesting equity, *NEWLYVESTING*, has a mean (median) of $3.6 million ($1.3 million), with a mean of $2.5 million ($1 million) coming from newly-vesting options (shares). The coefficient of variation (standard deviation divided by the mean) of *NEWLYVESTING* is 0.7 when computed

[12] As in Asker et al. (2014), our results are robust to using sales growth rates between year *t-1* and *t*, and *t-2* and *t-1*, as an alternative proxy for growth opportunities to Q_{t-1} and Q_t.

separately for each CEO and then averaged, suggesting significant within-firm variation in the *NEWLYVESTING* measure.[13] The average CEO sells $4.1 million of equity in a year.

3. Investment

3.1 Investment and equity sales: main tests

This section describes the core results of the paper. Table 2 regresses changes in investment on equity sales, instrumented using newly-vesting equity. We conduct the following two-staged least squares ("2SLS") analysis on a panel of firm-years, omitting the firm subscript for brevity:

$$EQUITYSOLD_t = \alpha_1 + \beta_1 NEWLYVESTING_t + \gamma_1 CONTROLS + \varepsilon_{1t}, \qquad (3)$$

$$\Delta INVESTMENT_t = \alpha_2 + \beta_2 FIT\_EQUITYSOLD_t + \gamma_2 CONTROLS + \varepsilon_{2t}, \qquad (4)$$

where $\Delta INVESTMENT_t$ is the change in one of the six investment variables from year *t-1* to *t* and $FIT\_EQUITYSOLD_t$ is a fitted value from the regression in equation (3). We measure *EQUITYSOLD* and *NEWLYVESTING* over year *t*, the same time period as $\Delta INVESTMENT$, because a CEO who plans to sell equity in *t* has an incentive to boost the stock price during the same period. Our hypothesis is that $\beta_2 < 0$.

We use firm fixed effects to control for both firm-level heterogeneity in investment opportunities and CEO preferences towards investment, use year fixed effects to control for common shocks to investment opportunities, and cluster standard errors at the firm level. The inclusion of firm fixed effects means that our identification is based on the time-series variation

[13] To obtain another estimate of the within-firm variation of *NEWLYVESTING*, we run a regression of *NEWLYVESTING* on firm fixed effects. The standard deviation of the residuals from this regression – our measure of within-firm variation – is $3.3 million compared to the sample standard deviation of $6.4 million.

in *NEWLYVESTING* within a firm, which is sizable as discussed in Section 2.6. The control variables *CONTROLS* are as discussed in Section 2.5.

The first column in Table 2 presents the first-stage regression of *EQUITYSOLD* on *NEWLYVESTING*. It shows that a $1 increase in *NEWLYVESTING* is associated with a 33c increase in *EQUITYSOLD*, significant at the 1% level. The underidentification test strongly rejects the null of no correlation between our instrument and equity sales – the Cragg-Donald F-statistic is 300, significantly higher than the Stock and Yogo (2005) critical value of 16 for a 10% maximal bias of the instrumental variable estimator relative to ordinary least squares. The remaining columns show the second-stage results. The coefficients on predicted equity sales (*FIT_EQUITYSOLD*) are negative in all six regressions and significant at the 5% or 10% level in five – all except *ΔCAPEX*. An interquartile increase in vesting-induced equity sales is associated with a 0.25 percentage point decline in *ΔRD* (the growth of R&D/assets), which corresponds to a 4.6% of the average R&D/assets ratio and an average decline in R&D of $2.2 million per year based on the median total assets of $882 million. These magnitudes are economically significant but also plausible – too large a decline may prompt the board to step in and block it. In addition, as we will show later, they are of the correct magnitude to allow a firm to meet or beat analyst earnings forecasts.

Turning to the other coefficients on compensation, the coefficients on *SALARY*, *BONUS*, and *UNVESTEDADJ* are insignificant in all specifications. The coefficient on already-vested equity (*VESTED*) is either insignificant or significantly positive. As previously discussed, a positive coefficient could arise because the decision to hold onto already-vested equity is driven by favorable investment opportunities.

Other control variables mostly load with the expected signs. Investment growth is positively related to investment opportunities, as measured by Tobin's Q and momentum, and negatively related to market equity and age. It is positively related to measures of the firm's ability to fund investment, as measured by cash holdings, retained earnings, the negative of book leverage, and the return-on-assets ratio.

Table 2 quantifies how investment responds to anticipated equity sales in general. Such sales can stem from channels other than vesting equity – for example, the CEO could voluntarily hold already-vested equity as a long-term investment, but later decide to sell it to rebalance his portfolio or meet an anticipated liquidity need. A more specific question is how investment responds to newly-vesting equity in particular. This effect can be estimated from a reduced form regression of investment on *NEWLYVESTING* directly. The coefficient on *NEWLYVESTING* in this regression may be of independent interest because boards can use it to estimate CEOs' incentives to cut investment created by vesting equity and, if needed, counteract them. Separately, they can take this response into account when designing the contract.

Table 3, Panel A shows that the reduced-form regression is consistent with the 2SLS analysis: the same five regressions show negative coefficients on *NEWLYVESTING* that are significant at either the 1% or 5% level. For example, an interquartile increase in *NEWLYVESTING* is associated with a 0.11 percentage point decline in *ΔRD* (the growth in R&D/assets), which corresponds to 2% of the average R&D/assets ratio. To our knowledge, the results of this section are the first to link a measure of the CEO's short-term incentives to real investment decisions.

3.2 Equity vesting: robustness tests

Our use of newly-vesting equity is motivated by the idea that it is determined by equity grants made several years prior. While true for equity grants with time-based vesting,

performance-based vesting provisions have become increasingly popular recently (Bettis, Bizjak, Coles, and Kalpathy (2010)), and performance that triggers vesting may be correlated with current investment opportunities. Bettis et al. (2010) find that 46% of performance-based vesting provisions are based on stock price thresholds, twice as frequent as the second-most popular category. Since high stock returns likely indicate good investment opportunities, vesting provisions triggered by meeting stock price thresholds would yield a positive relationship between vesting equity and investment, contrary to the results of Tables 2-3. In addition, all regressions control for past stock returns. However, if the provision is based on accounting thresholds (which arise in 23% of cases), reverse causality might be a concern: reductions in investment may increase earnings and thus trigger vesting. Gopalan et al. (2014) report that 35.3% of stock in the Equilar dataset exhibits performance-based vesting, compared with only 1.9% of options, and so the concern is significant for stock but not options. The summary statistics of Table 1, Panel B show that the mean and median values of newly-vesting options are over 2.5 and 5 times larger than those of newly-vesting stock. Thus, *NEWLYVESTING* is predominantly comprised of options, for which performance-based vesting is rare. As an additional robustness check, in Table 3, Panel B, we replace *NEWLYVESTING* in Table 3 with the separate variables *NEWLYVESTINGSTOCK* and *NEWLYVESTINGOPTION*. The latter is significantly negative in all six regressions, while the former is significant in only three. Thus, the results are stronger for newly-vesting options, for which performance-based vesting is less of a concern.[14]

[14] We perform the decomposition into vesting stock and vesting options for the reduced-form, rather than 2SLS analysis, because there is no reliable way to identify equity sales that stem from sold stock rather than exercised options. The insider trading data from Form 4 is noisy. The transaction codes to indicate the nature of the stock transactions are often incomplete; even when present, they are not always sufficient to identify the source of the sale – for example, code "7" supposedly indicates disposition of exercised securities, but it could either indicate an open

We now turn to robustness tests on the calculation of our *NEWLYVESTING* measure. Our main specifications convert options to share equivalents using their deltas. The delta depends on the options' time-to-maturity. However, if CEOs exercise their options shortly after they vest, the options' time-to-maturity may overestimate their effective horizons. In Table OA1, Panel A, we repeat the main tests using intrinsic values rather than deltas to calculate the sensitivities of newly-vesting options. We assign a delta of one to all in-the-money options and zero to all out-of-the-money options, because only the former would be exercised immediately upon vesting. The results are unchanged. We use deltas in our main specification as, even if an option is out of the money at the start of the year (when we calculate our deltas), it may become in the money later in the year when it vests, and the delta captures this likelihood. In Panel B, we repeat the main tests using option deltas but assume that all options have the same (short) time to maturity of one year, and again obtain consistent results.

Another concern is that $NEWLYVESTING_t$ is correlated with P_{t-1} and thus investment opportunities at the start of year *t*. Such correlation could stem from two sources. First, *NEWLYVESTING* is the delta of the CEO's vesting equity multiplied by P_{t-1}. The multiplication is necessary to obtain an incentive measure that reflects the CEO's wealth gain from increasing the stock price by a percentage (rather than dollar) amount; without it, our results become stronger.[15] Second, the delta of vesting options is itself increasing in the stock price. Increases in the stock price may both augment *NEWLYVESTING* and reflect superior investment

market sale or return of securities to the issuer. Moreover, it need not be that newly-vesting stock instruments for stock sales and newly-vesting options instrument for option exercises – a CEO could exercise an option and sell his previously-vested rather than newly acquired shares, to realize a long-term rather than short-term capital gain.

[15] An alternative measure of incentives that is independent of the stock price would be to divide *NEWLYVESTING* by the firm's market capitalization, to give the CEO's effective equity stake in the firm as a percentage of shares outstanding (rather than as a dollar value), as in the Jensen and Murphy (1990) incentives measure. This measure captures the dollar change in the CEO's wealth for a $1 increase in firm value, and is not comparable across firms of different size: a $1 increase in firm value is much less significant in a large firm than in a small firm.

opportunities. Such a channel will lead to a positive correlation between *NEWLYVESTING* and investment, the opposite of what we find. In addition, the regressions in Tables 2 and 3 already include the price-based controls Q_{t-1}, Q_t, $MOMENTUM_{t-1}$, and MV_{t-1}. In the Online Appendix, we conduct additional robustness checks to address any residual correlation. In Panel C of Table OA1, rather than using an option's actual delta, we assume a delta of 0.7, which is the mean delta in our sample. In Panel D, we assume that all options are at-the-money, which removes the dependence of the estimated delta on the current stock price, but still allows for deltas to vary across firms with other inputs. Both panels show that the results are unchanged.

Gopalan et al. (2014) introduce the "duration" measure, which captures the average vesting horizon of a CEO's pay components. This measure is not appropriate for our setting due to endogeneity concerns: it depends on current equity grants and the CEO's decision to retain or sell vested equity, both of which may be correlated with investment opportunities. Nevertheless, Table OA2 adds duration as an additional control, to test whether vesting-induced equity sales captures myopic incentives over and above those measured by duration. *DURATION* is the weighted average of the vesting periods of a CEO's total equity holdings, with each equity grant's weight being the ratio of its delta to the aggregate delta.[16] The coefficient on *NEWLYVESTING* remains significantly negative in the same five out of six regressions, while the coefficient on *DURATION* is negative and sometimes significant – contrary to the idea that CEOs with shorter-duration equity are more likely to cut investment.

Finally, while we are using investment as a measure of long-term behavior, it may also be considered risk-taking behavior. In Table OA3 of the Online Appendix, we add as an additional

[16] The results are similar when using three other calculations of duration featured in Gopalan et al. (2014). One takes into account all components of compensation (salary, bonus, and equity), weighting each tranche by its dollar value. The two other calculations are analogous to the first two but excluding pre-2006 grants, as these grants require additional assumptions. We thank Radha Gopalan for kindly providing this data.

control *VEGA*, the dollar change in the CEO's wealth for a 100% change in stock return volatility. The coefficients on instrumented equity sales are very similar. The positively significant coefficients on *VEGA* in the first two columns suggest that a higher vega increases the CEO's incentives to invest in R&D and advertising, although interpretation is difficult since *VEGA* is endogenous.

4. Earnings Announcements

4.1 Meeting or beating analyst forecasts

If vesting equity increases the CEO's stock price concerns, he may engage in myopic actions (such as cutting investment) to avoid announcing earnings per share ("EPS") below analyst expectations, since missing earnings targets typically leads to a large price decline (Bartov, Givoly, and Hayn (2002)). This section therefore investigates the relationship between newly-vesting equity and the likelihood that a firm beats the analyst consensus earnings forecast. (For brevity, we use the verb "beat" to refer to weakly beating analyst consensus.)

Finding a positive relationship would provide further evidence – separate to that in Section 3 – that vesting equity is associated with myopic actions. Moreover, it would help distinguish between the two potential explanations for the results of Section 3. A positive relationship would be consistent with vesting equity causing managers to inflate earnings, potentially through reductions in investment, but it could not be explained by boards designing contracts so that equity vests when investment opportunities decline.

We run the following two-stage probit model on a panel of quarterly earnings announcements:

$$EQUITYSOLD_t = \alpha_1 + \beta_1 NEWLYVESTING_t + \gamma_1 CONTROLS2 + \varepsilon_{1q}, \qquad (5)$$

$$BEAT_q = \alpha_2 + \beta_2 FIT\_EQUITYSOLD_t + \gamma_2 CONTROLS2 + \varepsilon_{2q}. \qquad (6)$$

Subscript q refers to a fiscal quarter. We match *EQUITYSOLD* and *NEWLYVESTING* to quarter q if the earnings announcement of that quarter takes place during year t over which these variables are measured. $BEAT_q$ is one for quarters in which the firm's reported EPS beats the analyst consensus and zero otherwise. Analyst forecasts and reported EPS are taken from I/B/E/S. To calculate analyst consensus, we delete stale forecasts made at least 90 days prior to the fiscal quarter end, as is standard, and require a firm to have at least three analysts after this deletion. For each analyst, we take the latest forecast before the announcement.

$FIT\_EQUITYSOLD_t$ is the fitted value from equation (5). We also rerun the analysis using the dependent variables $BEATBELOW1_q$ in the second-stage regression, which equals one if the firm beats the consensus forecast by 1 cent or less, and $BEATABOVE1_q$, which equals one if the firm beats the consensus forecast by more than 1 cent. We predict that the coefficient on *FIT_EQUITYSOLD* is especially strong for $BEATBELOW1_q$, since the manager's incentives to inflate earnings are strongest when earnings are close to the forecast.

CONTROLS2 contains the same compensation controls as earlier (*UNVESTEDADJ*, *VESTED*, *SALARY*, and *BONUS*) and additional controls previously shown to affect the likelihood of beating earnings forecasts (e.g., Matsumoto (2002), Davis, Soo, and Trompeter (2009)). We use *Q*, *MV*, *ROA*, and *AGE*, as in the investment regressions. We also include *INSTIPCT*, percentage institutional ownership from Thomson's CDA/Spectrum database (form 13F); *ALY_N*, the log of one plus the number of analysts covering the firm; *HORIZON*, the log of one plus the mean average forecasting horizon (the number of days between an analyst forecast date and the earnings announcement date), to measure forecast staleness; *ALY_DISP*, analyst

forecast dispersion, the standard deviation of analyst forecasts scaled by the absolute value of the mean consensus forecast; and *POSUE* (positive seasonal unexpected earnings), a dummy variable that equals one if the reported EPS exceeds that of the same quarter in the prior fiscal year, and zero otherwise. We also include Fama-French 12-industry fixed effects.

Table 4 presents the results. Column (2.1) shows that instrumented equity sales are positively associated with the likelihood of beating analyst forecasts, and significant at the 5% level. The significance increases to 1% in column (2.2) for *BEATBELOW1*, the likelihood of beating the analyst forecast by up to one cent. In contrast, *BEATABOVE1* is unrelated to vesting. An interquartile increase in vesting-induced equity sales is associated with a 0.8 percentage point increase in the likelihood of beating the analyst forecast by up to one cent, compared to the unconditional likelihood of 12.2%.

Columns (1)-(3) of Table 5 present consistent results for the reduced form regression: *NEWLYVESTING* is significantly related to the frequency of beating the forecast by up to one cent, but unrelated to the frequency of beating it by more than one cent. Figure 1 illustrates these results in a univariate setting. It plots the frequency of the earnings surprise – the difference between reported earnings and the mean analyst consensus forecast – separately for firms with *NEWLYVESTING* in the top and the bottom tercile of the sample. The number of quarters in which the reported EPS beats (misses) the analyst consensus is markedly higher (lower) for firms in the top *NEWLYVESTING* tercile than the bottom tercile. The difference is greatest for earnings announcements that beat the forecast by up to one cent. For the bottom tercile of *NEWLYVESTING*, 9.5% of announcements beat the forecast by less than one cent. This figure is 12.0% for the top tercile, an increase of 25.8%. Overall, the above results suggest that vesting equity is positively associated with marginally beating earnings forecasts, supporting the

hypothesis that vesting causes managers to act myopically, but inconsistent with the idea that boards of directors set vesting periods to coincide with investment opportunity cycles.

A potential alternative explanation for the above results is reverse causality, since positive earnings announcements may trigger accounting performance-based vesting provisions. We investigate this concern by again replacing *NEWLYVESTING* with the separate variables *NEWLYVESTINGSTOCK* and *NEWLYVESTINGOPTION* in columns (4) and (5) of Table 5. Column (4) shows that in the regression with *BEATBELOW1* as the dependent variable, the coefficient on *NEWLYVESTINGOPTION* is significant at the 1% level but the coefficient on *NEWLYVESTINGSTOCK* is not. Thus, our results are not driven by performance-vesting stock, for which reverse causality is more of a concern. Column (5) shows that *BEATABOVE1* is unrelated to both components of vesting equity.

4.2 Linking R&D cuts to meeting or beating analyst forecasts

So far we show in two separate tests that vesting-induced equity sales are associated with reductions in investment (Section 3) and a higher likelihood that a firm marginally beats analyst forecasts (Section 4.1). In this section, we explore the extent to which the two pieces of evidence are related: whether CEOs with vesting equity are more likely to engage in R&D cuts that allow them to beat the forecast.

We define *CUTANDBEAT* as a firm-quarter in which the firm beats the forecast, but would have missed it if its R&D expense were the same as in the same quarter of the previous year.[17] We start by computing a hypothetical EPS (*HEPS*) for each quarter defined as:

$$HEPS_q = EPS_q + (R\&D_q(1-\tau) - R\&D_{q-4}(1-\tau))/Shares\ Outstanding_q. \quad (7)$$

[17] We benchmark R&D in the current quarter against that from the same quarter last year to adjust for seasonality.

Subscripts q and $q\text{-}4$ denote quarters, and τ is the firm's after-interest marginal tax rate in the fiscal year of quarter q from Blouin, Core, and Guay (2010). A firm-quarter is defined as *CUTANDBEAT*=1 if $HEPS_q < Forecast_q$ *and* $EPS_q \geq Forecast_q$, and 0 otherwise. We run the following two-stage probit model on a panel of firm-quarters:

$$EQUITYSOLD_t = \alpha_1 + \beta_1 NEWLYVESTING_t + \gamma_1 CONTROLS3 + \varepsilon_{1q}, \qquad (8)$$

$$CUTANDBEAT_q = \alpha + \beta\, FIT\_EQUITYSOLD_t + \gamma\, CONTROLS3 + \varepsilon_{2q}, \qquad (9)$$

The regression is estimated on three different panels for robustness: the full panel of 15,665 firm-quarters with non-missing I/B/E/S data and the full set of controls, a subset of 6,695 firm-quarters in which the firm has positive R&D in the previous year ($R\&D_{q\text{-}4} > 0$), and a subset of 2,435 firm-quarters in which the firm has positive R&D in the previous year and cuts R&D relative to quarter $q\text{-}4$ ($R\&D_{q\text{-}4} > 0$ and $\Delta R\&D_q < 0$ with $\Delta R\&D_q = (R\&D_q - R\&D_{q\text{-}4})/AT_{q\text{-}4}$). In each panel, 615 firm-quarters have *CUTANDBEAT*=1. The controls are similar to those in the main tests in Table 2. We also include $R\&D_{q\text{-}4}$, since a higher level may provide greater scope to cut.

Table 6 shows that *FIT_EQUITYSOLD* is significantly positively associated with the probability of *CUTANDBEAT* at the 1% or 5% level in all three panels. For example, column (2.3) shows that, within firm-quarters with R&D cuts, an interquartile increase in vesting-induced equity sales is associated with a 3.8% increase in *CUTANDBEAT*, compared to the unconditional likelihood of 23.7%. These results, combined with the earlier analyses on investment and beating earnings forecasts, paint a consistent picture: they suggest that CEOs

who plan to sell equity in the short term reduce investment, and these investment cuts help the firm to beat the earnings forecast.

4.3 Market reaction to earnings announcements

The previous analyses suggest that managers with stock price concerns, stemming from predicted equity sales, are more likely to cut investment in order to beat earnings targets. This section studies whether doing so indeed achieves the intended stock price increases, by relating the earnings announcement return to vesting-induced equity sales. We run the following 2SLS regression:

$$EQUITYSOLD_t = \alpha_1 + \beta_1 NEWLYVESTING_t + \gamma_1 CONTROLS4 + \varepsilon_{1q}, \qquad (10)$$

$$CAR_q = \alpha_2 + \beta_2 FIT\_EQUITYSOLD_t + \gamma_2 CONTROLS4 + \varepsilon_{2q}. \qquad (11)$$

CAR_q is the (-1, +1) market-adjusted return to the earnings announcement in fiscal quarter *q*, which takes place in year *t* during which we also measure *EQUITYSOLD* and *NEWLYVESTING*. *CONTROLS4* includes the standard compensation controls (*UNVESTEDADJ*, *VESTED*, *SALARY*, and *BONUS*) as well as vector of control variables previously shown to be correlated with announcement returns, taken predominantly from Savor and Wilson (2013). *LEVERAGE* is the ratio of total debt to the sum of total debt and book equity. *PASTRET(1Y)* is the cumulative monthly industry-adjusted return over the year prior to the announcement and *PASTRET(1M)* is the industry-adjusted return in the month prior to the announcement. We include *Q4*, a dummy variable indicating the last quarter of a fiscal year, because the Q4 announcement sometimes coincides with the release of a proxy statement. $ANNRET_{q-1}$ – $ANNRET_{q-4}$ are earnings announcement returns for quarters -1 to -4 (relative to quarter *q*), to control for serial correlation

in announcement returns (Abarbanell and Bernard (1992)). We include industry fixed effects and cluster standard errors by announcement day.

Table 7 presents the results. Column (2.1) finds that vesting-induced equity sales are positively related to earnings announcement returns, and significant at the 5% level. An interquartile increase in vesting-induced equity sales is associated with a 0.26% higher announcement return. Column (2.2) includes additional controls on $BEAT_q$ and DIF_q, to take into account the earnings surprise. While the coefficient on *BEAT* is highly significant, that on predicted equity sales is now insignificant. Taken together, the results in Table 7 suggest that managers with high stock price concerns indeed succeed in achieving higher earnings announcement returns, which can be fully explained by their greater propensity to beat the earnings target.

These higher announcement returns suggest that the market does not fully take into account the manager's stock price concerns, in contrast to the Stein (1989) model where the market is efficient. Instead, they are consistent with our prior findings on the likelihood of beating earnings targets, which suggest that analysts do not fully incorporate short-term incentives when making their earnings forecasts. They are also consistent with previous evidence that measures of CEO incentives are not fully priced. von Lilienfeld-Toal and Ruenzi (2014) find significant long-run returns to portfolios formed using the manager's overall level of equity holdings, a simpler incentive measure to calculate that does not require data on vesting schedules. Edmans, Goncalves-Pinto, Wang, and Xu (2014) find that managers with short-term concerns release more favorable news, and enjoy higher announcement returns to such news releases.

5. Conclusion

This paper studies the link between real investment decisions and the CEO's short-term concerns. Myopia theories suggest that executives who plan to sell their shares in the short run have incentives to boost the short-term price, possibly at the expense of long-term value. This relationship is difficult to investigate empirically because equity sales are an endogenous decision by the CEO. We introduce a new measure of the CEO's short-term concerns that is motivated by both myopia theories and the above empirical challenge: equity sales induced by the vesting of previously-granted stock and options.

We show that vesting-induced equity sales are significantly negatively related to various measures of investment. They are also positively related to the likelihood that a firm marginally beats the analysts' earnings forecast, the likelihood of the manager cutting R&D to meet earnings targets, and earnings announcements returns. In addition to the literature on myopia, our paper contributes to the broader literature on executive compensation by suggesting that CEO contracts can have real effects.

While we have shown that investment is negatively related to vesting, the reduction in investment need not be inefficient. For example, if managers tend to overinvest due to empire-building, a fall in investment would bring it closer to the optimal level. Even if the reduction in investment induced by the CEO's contract is inefficient, this does not mean that his contract is inefficient overall. Boards of directors may recognize that short-vesting equity leads to underinvestment, but trade this off against the costs of longer-term contracts. Such contracts may expose the manager to risks outside his control, and cause him to demand a risk premium. Moreover, even if long-vesting equity encourages investment today, it may deter investment in future years. Brisley (2006) shows that long-vesting options may become deep in the money

before the manager can exercise them, and the resulting large equity position may make the manager more risk-averse and lead him to reduce investment.

More broadly, our measure of myopic incentives – vesting-induced equity sales – is relatively easy to construct, and potentially usable in wider contexts than investment decisions. Building on our work, Gopalan, Huang, and Maharjan (2014) use newly-vesting equity as an instrument for duration and examine its effect on CEO turnover, and Edmans, Goncalves-Pinto, Wang, and Xu (2014) show that CEOs strategically release news in months in which their equity vests. In future research, it would be interesting to study whether it is related to other outcomes.

Appendix A: Definition of variables

This appendix describes the calculation of variables used in the core analysis. Underlined variables refer to variable names within Compustat.

Variable	Definition
CEO incentives from equity holdings	
$NEWLYVESTING_t$	The dollar change in the value of newly-vesting equity in year *t* for a 100% change in the stock price, calculated as *NEWLYVESTINGSTOCK* (the number of newly-vesting shares in year *t* × stock price at the end of year *t-1*) plus *NEWLYVESTINGOPTION* (aggregated delta of newly-vesting options in year *t* × stock price at the end of year *t-1*). The delta of an option is calculated using the Black-Scholes formula. The inputs (i.e., dividend yield, risk-free interest rate, and volatility) to the Black-Scholes formula are those associated with a firm's newly-awarded options in year *t-1* from Equilar, and if unavailable, replaced with those associated with a firm's newly-awarded options in year *t* from Equilar, followed by year *t-1*'s inputs from ExecuComp (or year *t*'s if year *t-1*'s are missing), and by year *t-1*'s inputs from Compustat (or year *t*'s if year *t-1*'s are missing), in that order;
$UNVESTED_{t-1}$	The dollar change in the value of unvested equity in year *t-1* for a 100% change in the stock price, calculated as *UNVESTEDSTOCK* (the total number of unvested share including unvested LTIP shares × stock price, both at the end of year *t-1*) plus *UNVESTEDOPTION* (aggregated delta of unvested options × stock price, both at the end of year *t-1*). Delta is calculated similarly as above;
$UNVESTEDADJ_{t-1}$	The sum of max ($UNVESTEDSTOCK_{t-1}$ - $NEWLYVESTINGSTOCK_t$, 0) and max ($UNVESTEDOPTION_{t-1}$ - $NEWLYVESTINGOPTION_t$, 0);
$VESTED_{t-1}$	The dollar change in the value of already-vested equity in year *t-1* for a 100% change in the stock price, calculated as *VESTEDSTOCK* (the number of already-vested shares × stock price, both at the end of year *t-1*) plus *VESTEDOPTION* (aggregated delta of already-vested options × stock price, both at the end of year *t-1*). Delta is calculated similarly as above;
Equity sold	
$EQUITYSOLD_t$	The number of shares sold in year *t* × stock price at the end of year *t-1*;
Change in investment	
ΔRD_t	Change in R&D expenditures (*XRD*) from year *t-1* to *t*, scaled by total assets (*AT*) at the end of year *t-1*. Missing R&D expenditures are set to zero;
$\Delta RDAD_t$	Change in the sum of R&D expenditures (*XRD*) and advertising expenses (*XAD*) from year *t-1* to *t*, scaled by total assets at the end of year *t-1*. Missing R&D expenditures and advertising expenses are set to zero;
$\Delta CAPEX_t$	Change in capital expenditures (*CAPEX*) from year *t-1* to *t*, scaled by total assets at the end of year *t-1*. Missing capital expenditures are set to zero;
$\Delta RDADCAPEX_t$	Change in the sum of R&D expenditures (*XRD*), advertising expenses (*XAD*), and capital expenditures (*CAPEX*) from year *t-1* to *t*, scaled by total assets at the end of year *t-1*. Missing R&D expenditures, advertising expenses, and capital expenditures are set to zero;
$\Delta CAPEXALL_t$	Change in annual increase in gross fixed assets (*PPEGT*) from year *t-1* to *t* (i.e.,($PPEGT_t$- $PPEGT_{t-1}$) - ($PPEGT_{t-1}$- $PPEGT_{t-2}$)), scaled by total assets at the end of year *t-1*. Missing *PPEGT* are replaced with net fixed assets (*PPENT*) if available;

$\Delta RDADCAPEXALL_t$	Change in the sum of R&D expenditures (*XRD*), advertising expenses (*XAD*), and annual increase in gross fixed assets (*PPEGT*) from year *t-1* to *t*, scaled by total assets at the end of year *t-1*. Missing R&D expenditures and advertising expenses are set to zero and missing *PPEGT* replaced with *PPENT* if available;
Control variables	
Q_t	Tobin's Q at the end of year *t*, calculated as [market value of equity (*PRCC_F*×*CSHPRI*) plus liquidating value of preferred stock (*PSTKL*) plus book value of debt (*DLTT*+*DLC*) minus balance sheet deferred taxes and investment tax credit (*TXDITC*)] divided by total assets (*AT*) at the end of year *t-1*.
Q_{t-1}	Tobin's Q at the end of year *t-1*;
MV_{t-1}	Natural logarithm of market value of equity at the end of year *t-1* (*PRCC_F*× *CSHPRI*);
$MOMENTUM_{t-1}$	A firm's compounded market-adjusted monthly stock returns over the twelve months in year *t-1*, with market-adjusted monthly stock return calculated as the firm's monthly raw stock return minus the corresponding monthly return on the CRSP value-weighted index;
AGE_{t-1}	Natural logarithm of one plus a firm's age, approximated by the number of years listed on Compustat, as the end of year *t-1*;
$CASH_{t-1}$	Cash and short-term investments *(CHE)* at the end of year *t-1* divided by total assets at the end of year *t-1*;
$BOOKLEV_{t-1}$	Book value of debt (*DLTT*+*DLC*) at the end of year *t-1* divided by total assets at the end of year *t-1*;
$RETEARN_{t-1}$	Balance sheet retained earnings (*RE*) at the end of year *t-1* divided by total assets at the end of year *t-1*;
ROA_{t-1}	Return-on-assets ratio, calculated as net income (*NI*) during year *t-1* divided by the average total assets of year *t-1*;
$SALARY_{t-1}$	CEO's salary in year *t-1*;
$BONUS_{t-1}$	CEO's cash bonus in year *t-1*;
Additional variables used in the earnings forecast analysis	
$BEAT_q$	A dummy variable that equals one if the reported EPS is more than or equal to mean analyst consensus forecast in a given quarter and zero otherwise;
$BEATBELOW1_q$	A dummy variable that equals one if the reported EPS falls between mean analyst consensus forecast and that plus one cent in a given quarter;
$BEATABOVE1_q$	A dummy variable that equals one if the reported EPS exceeds mean analyst consensus forecast plus one cent in a given quarter;
$INSTIPCT_{t-1}$	The total percentage of shares owned by institutional investors at the end of the 4th quarter of year *t-1*;
ALY_N_q	Natural logarithm of one plus the number of analysts;
$HORIZON_q$	Natural logarithm of one plus the mean average forecasting horizon, with forecasting horizon being the number of days between an analyst forecast date and earnings announcement date;
ALY_DISP_q	Analyst forecast dispersion, calculated as the standard deviation of analyst forecasts scaled by the absolute value of the mean analyst consensus forecast;
$POSUE_q$	A dummy variable that equals one if the reported EPS in a given quarter exceeds that of the same quarter last fiscal year and zero otherwise;
Additional variables used in the analysis linking R&D cuts to beating earnings forecast	
$CUTANDBEAT_q$	A dummy variable that equals one for fiscal quarters in which a firm (1) meets or

	beats the analysts' consensus earnings forecast, and (2) the firm would have missed the forecast if its R&D expense remained at the same level as in the same quarter of the prior fiscal year. To construct the dummy, we first compute a hypothetical EPS (*HEPS*) for each quarter defined as: $HEPS_q = EPS_q + (R\&D_q(1-\tau) - R\&D_{q-4}(1-\tau))/Shares\ Outstanding_q$. Subscripts q and $q-4$ denote quarters, and τ is the firm's after-interest marginal tax rate in the fiscal year of quarter q from Blouin, Core, and Guay (2010). A firm-quarter is classified as *CUTANDBEAT* if $HEPS_q < Forecast_q$ *and* $EPS_q \geq Forecast_q$;
$R\&D_{q-4}$	R&D expense (<u>*XRDQ*</u>) in quarter $q-4$ divided by assets at the end of quarter $q-4$;
Additional variables used in the earnings announcement analysis	
CAR_q	Cumulative market adjusted return from day -1 to +1 around the quarterly earnings announcement in quarter q, in percentage points. Market adjusted daily returns are computed by subtracting from the stock' raw return the return on the CRSP value-weighted NYSE/AMEX/NASDAQ index;
DIF_q	Difference between the reported EPS and the mean analyst consensus forecast;
$LEVERAGE_{t-1}$	Sum of long-term and short-term debt divided by the sum of the short-term and long term debt, and the book value of equity;
PASTRET(1Y)	Cumulative monthly industry adjusted return over the twelve month prior to the earnings announcement in percentage points;
PASTRET(1M)	Monthly industry adjusted return for the month prior to the earnings announcement in percentage points;
Q4	A dummy variable that equals one if quarter q is the 4th quarter of a fiscal year and zero otherwise;
$ANNRET_{q-n(n=1,2,3,4)}$	Cumulative market adjusted returns from day -1 to +1 around the quarterly earnings announcements in the quarters -1 to -4 relative to quarter q. The computation is the same as for quarter q.

Appendix B: A numerical example

This appendix illustrates the calculation steps to derive equity incentives for one CEO in our sample, along with the company's disclosure tables retrieved from Equilar for the two fiscal years on which the calculations are based. As an example, we use James McCann, CEO of 1-800 Flowers.com, Inc. and calculate the stock price sensitivity of his newly-vesting equity for the fiscal year ended on June 30th, 2009 (*NEWLYVESTING*), that of his unvested equity for the fiscal year ended on June 30th, 2008 (*UNVESTED*), and that of his already-vested equity for the fiscal year ended on June 30th, 2008 (*VESTED*).

First, we obtain option data from Equilar for James McCann:

B.1 Outstanding options as reported in Equilar				
	Equity Type	**Number of Securities**	**Exercise Price**	**Expiration Date**
	As of June 30th, 2009			
(1)	Unexercisable Options	10,000	$ 8.45	12/2/14
(2)	Unexercisable Options	20,000	$ 6.52	10/13/15
(3)	Unexercisable Options	224,109	$ 3.11	5/5/16
(4)	Exercisable Options	39,810	$ 12.44	12/17/09
(5)	Exercisable Options	82,730	$ 11.58	8/2/11
(6)	Exercisable Options	200,000	$ 12.87	1/11/12
(7)	Exercisable Options	200,000	$ 6.42	9/23/12
(8)	Exercisable Options	170,148	$ 6.70	3/24/13
(9)	Exercisable Options	29,852	$ 6.70	3/24/13
(10)	Exercisable Options	40,000	$ 8.45	12/2/14
(11)	Exercisable Options	30,000	$ 6.52	10/13/15
	As of June 30th, 2008			
(12)	Unexercisable Options	20,000	$ 8.45	12/2/14
(13)	Unexercisable Options	30,000	$ 6.52	10/13/15
(14)	Exercisable Options	39,810	$ 12.44	12/17/09
(15)	Exercisable Options	82,730	$ 11.58	8/2/11
(16)	Exercisable Options	200,000	$ 12.87	1/11/12
(17)	Exercisable Options	200,000	$ 6.42	9/23/12
(18)	Exercisable Options	170,148	$ 6.70	3/24/13
(19)	Exercisable Options	29,852	$ 6.70	3/24/13
(20)	Exercisable Options	30,000	$ 8.45	12/2/14
(21)	Exercisable Options	20,000	$ 6.52	10/13/15

B.2 Newly granted options as reported in Equilar					
	Equity Type	**Grant Date**	**Number of Securities**	**Exercise Price**	**Expiration Date**
(22)	Newly Granted Options	5/5/09	224,109	$ 3.11	5/5/16

To calculate the number of newly-vesting options for fiscal year 2009 and unvested/already-vested options at the end of fiscal year 2008, we match and group the outstanding options by exercise price (*EXERPRC*) and expiration date (*EXPDATE*). We then infer the number of newly-vesting options from the following relationship:

$NEWLYVESTINGOPTIONNUM\ (EXERPRC_p,\ EXPDATE_d)_t = UNVESTEDOPTIONNUM\ (EXERPRC_p,\ EXPDATE_d)_{t-1} + NEWOPTIONNUM\ (EXERPRC_p,\ EXPDATE_d)_t - UNVESTEDOPTIONNUM\ (EXERPRC_p,\ EXPDATE_d)_t$

After identifying the number of newly-vesting, unvested, and already-vested securities, we then input into the Black-Scholes formula the risk-free rate, volatility, and dividend yield from Equilar and calculate each option's delta, grant-by-grant. The risk-free rate is not available for fiscal year 2008, so we replace it with the risk-free rate of 0.027 from fiscal year 2009. Similarly, we replace the missing volatility and dividend yield for fiscal year 2008 with the volatility of 0.7237 and the dividend yield of 0 from fiscal year 2009.

B.3 Calculated number and delta of newly-vesting, unvested, and already-vested options

Calculated number of options	Equity Type	Number of Securities	Exercise Price	Expiration Date	Term as of 6/30/08	Z	Delta
As of June 30th, 2009							
(12) - (1)	Newly-vesting Options	10,000	$ 8.45	12/2/14	6.4275	0.865	8,064
(13) - (2)	Newly-vesting Options	10,000	$ 6.52	10/13/15	7.2904	1.072	8,582
(22) - (3)	Newly-vesting Options	0	$ 3.11	5/5/16			
							∑Delta=16,646
As of June 30th, 2008							
(12)	Unvested Options	20,000	$ 8.45	12/2/14	6.4275	0.865	16,128
(13)	Unvested Options	30,000	$ 6.52	10/13/15	7.2904	1.072	25,746
							∑Delta=41,874
(14)	Already-vested Options	39,810	$ 12.44	12/17/09	1.4659	-0.266	15,724
(15)	Already-vested Options	82,730	$ 11.58	8/2/11	3.0904	0.242	49,266
(16)	Already-vested Options	200,000	$ 12.87	1/11/12	3.5344	0.243	119,174
(17)	Already-vested Options	200,000	$ 6.42	9/23/12	4.2356	0.825	159,041
(18)+(19)	Already-vested Options	200,000	$ 6.70	3/24/13	4.7342	0.844	160,152
(20)	Already-vested Options	30,000	$ 8.45	12/2/14	6.4275	0.865	24,192
(21)	Already-vested Options	20,000	$ 6.52	10/13/15	7.2904	1.072	17,164
							∑Delta=544,714

To calculate the price-sensitivity measures of options, we multiply the deltas calculated above by the closing stock price of $6.45 at the end of fiscal year 2008. James McCann's *NEWLYVESTINGOPTION* during fiscal year 2009 is therefore calculated as 16,646 × 6.45 = 107,366.7, and his *UNVESTEDOPTION* and *VESTEDOPTION* at the end of fiscal year 2008 as 41,874 × 6.45 = 270,087.3 and 544,714 × 6.45 = 3,513,405.3, respectively.

Second, we obtain share data from Equilar for James McCann:

B.4 Shares held as reported in Equilar						
Shares Acquired on Vesting of Stock for the year ended on June 30th 2009 (a)	**Total Unvested Shares for the year ended on June 30th 2008 (b)**	**Total Unvested IP Shares for the year ended on June 30th 2008 (c)**	**Unvested Shares for the year ended on June 30th 2008 = (b) + (c)**	**Shares Held for the year ended on June 30th 2008 (d)**	**Options Exercisable Within 60 Days of Proxy Date for the year ended on June 30th 2008 (e)**	**Already-vested Shares for the year ended on June 30th 2008 = (d) – (e)**
67,434	33,000	277,677	310,677	36,775,359	792,540	35,982,819

To calculate the price-sensitivity measures of shares, we multiply the number of shares above by the closing stock price of $6.45 at the fiscal year end of 2008. James McCann's *NEWLYVESTINGSTOCK* during fiscal year 2009 is therefore calculated as 67,434 × 6.45 = 434,949.3, and his *UNVESTEDSTOCK* and *VESTEDSTOCK* at the end of fiscal year 2008 as 310,677 × 6.45 = 2,003,866.65 and 35,982,819 × 6.45 = 232,089,182.55, respectively.

Finally, we sum the sensitivity measures of options and shares to construct the variables used in the main specification, *NEWLYVESTING*, *UNVESTEDADJ*, and *VESTED.*

B.5 Variables used in the main specification		
NEWLYVESTING	***UNVESTEDADJ***	***VESTED***
542,316	1,731,637.95	235,602,587

Table 1: Sample selection and summary statistics

Panel A: Sample selection

Firm-CEO-years in Equilar for which we can calculate the price sensitivity of newly-vesting equity in year *t*, and that of unvested and already-vested equity in year *t-1* for the sample period of fiscal year 2007 to 2010	9,385
(-) Observations missing COMPUSTAT data to calculate investment measures and control variables, and observations missing CRSP monthly returns to calculate momentum	(320)
(-) Observations associated with financial firms (SICs between 6000 and 6999)	(2,010)
(-) Observations associated with utility firms (SICs between 4900 and 4949)	(325)
Number of Firm-CEO-years in the final sample	6,730
Number of unique firms in the final sample	2,047

Table 1 (Cont'd)

Panel B: Summary statistics

Variable	N	Mean	SD	5%	25%	Median	75%	95%
CEO incentives from equity holdings								
$NEWLYVESTINGSTOCK_t$	6,730	1,007,672	2,203,651	0	0	127,564	926,250	5,142,500
$NEWLYVESTINGOPTION_t$	6,730	2,539,718	5,062,821	0	173	660,451	2,496,377	11,700,000
$NEWLYVESTING_t$	6,730	3,626,232	6,372,761	0	310,737	1,257,137	3,917,051	15,900,000
$UNVESTEDSTOCK_{t-1}$	6,730	3,746,586	7,785,361	0	0	792,389	3,645,577	17,700,000
$UNVESTEDOPTION_{t-1}$	6,730	5,339,176	10,300,000	0	0	1,370,083	5,440,901	24,500,000
$UNVESTED_{t-1}$	6,730	9,337,752	15,700,000	0	841,833	3,341,484	10,400,000	39,500,000
$UNVESTEDADJ_{t-1}$	6,730	5,656,486	10,200,000	0	346,113	1,835,151	6,132,905	25,000,000
$VESTEDSTOCK_{t-1}$	6,730	55,900,000	191,000,000	72,775	1,629,998	6,123,997	22,800,000	244,000,000
$VESTEDOPTION_{t-1}$	6,730	12,600,000	25,900,000	0	288,680	2,828,472	11,900,000	60,400,000
$VESTED_{t-1}$	6,730	70,400,000	205,000,000	415,985	4,156,739	13,300,000	43,500,000	298,000,000
Equity sold								
$EQUITYSOLD_t$	6,730	4,098,075	11,200,000	0	0	288,069	2,659,125	19,800,000

Table 1(Cont'd)

Panel B (Cont'd)

Variable	N	Mean	SD	5%	25%	Median	75%	95%
Change in investment								
ΔRD_t	6,730	0.003	0.029	-0.017	0.000	0.000	0.002	0.037
$\Delta RDAD_t$	6,730	0.004	0.032	-0.023	0.000	0.000	0.004	0.044
$\Delta CAPEX_t$	6,730	0.002	0.043	-0.056	-0.009	0.000	0.010	0.061
$\Delta RDADCAPEX_t$	6,730	0.006	0.065	-0.080	-0.013	0.002	0.019	0.105
$\Delta CAPEXALL_t$	6,730	0.006	0.106	-0.123	-0.023	0.000	0.024	0.153
$\Delta RDADCAPEXALL_t$	6,730	0.010	0.123	-0.146	-0.027	0.002	0.034	0.188
Control variables used in the main specification								
Q_t	6,730	1.848	1.720	0.470	0.835	1.287	2.141	5.358
Q_{t-1}	6,730	2.017	2.024	0.470	0.868	1.372	2.333	5.868
MV_{t-1}	6,730	6.896	1.599	4.510	5.779	6.712	7.901	9.897
$MOMENTUM_{t-1}$	6,730	0.098	0.540	-0.552	-0.220	0.000	0.275	1.072
AGE_{t-1}	6,730	2.841	0.731	1.609	2.398	2.773	3.401	4.060
$CASH_{t-1}$	6,730	0.204	0.219	0.006	0.040	0.120	0.295	0.688
$BOOKLEV_{t-1}$	6,730	0.215	0.218	0.000	0.013	0.173	0.330	0.645
$RETEARN_{t-1}$	6,730	-0.191	1.362	-2.403	-0.144	0.163	0.389	0.724
ROA_{t-1}	6,730	0.005	0.179	-0.374	-0.012	0.046	0.090	0.190
$SALARY_{t-1}$	6,730	670,194	336,489	265,000	429,577	600,000	860,833	1,300,000
$BONUS_{t-1}$	6,730	167,704	483,780	0	0	0	58,000	979,620

This panel reports the summary statistics of the main variables used in our multivariate analysis. All variables are winsorized at 1% and 99% level. Variable definitions are listed in Appendix A.

Table 2: The relationship between the change in investment and equity sales: 2SLS analysis

Dependent Variables	(1) *EQUITY_ SOLD*$_t$	(2.1) *ΔRD*$_t$	(2.2) *ΔRDAD*$_t$	(2.3) *ΔCAPEX*$_t$	(2.4) *ΔRDAD_ CAPEX*$_t$	(2.5) *ΔCAPEX_ ALL*$_t$	(2.6) *ΔRDAD_ CAPEXALL*$_t$
NEWLYVESTING$_t$	**0.328*****						
	(0.034)						
FIT_ EQUITYSOLD$_t$		**-0.942***	**-1.192***	**-0.625**	**-2.154****	**-4.252****	**-6.564****
		(0.553)	(0.635)	(0.585)	(1.083)	(1.918)	(2.631)
UNVESTEDADJ$_{t-1}$	-0.022	-0.054	-0.078	-0.013	-0.139	0.422	0.337
	(0.025)	(0.073)	(0.089)	(0.123)	(0.193)	(0.492)	(0.593)
VESTED$_{t-1}$	0.018***	0.013	0.020	0.050**	0.074**	0.098*	0.136*
	(0.002)	(0.014)	(0.016)	(0.023)	(0.033)	(0.059)	(0.078)
SALARY$_{t-1}$	0.073***	0.076	0.073	-0.038	0.024	0.321	0.430
	(0.016)	(0.078)	(0.097)	(0.133)	(0.199)	(0.326)	(0.417)
BONUS$_{t-1}$	0.002	0.000	0.002	0.002	0.009	0.041	0.058
	(0.004)	(0.009)	(0.010)	(0.020)	(0.026)	(0.058)	(0.068)
Q_t	0.001***	0.004***	0.005***	0.006***	0.012***	0.024***	0.031***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)	(0.004)	(0.005)
Q_{t-1}	0.000*	0.003***	0.004***	0.000	0.005***	-0.007***	-0.001
	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)
MV_{t-1}	0.000	-0.006**	-0.005*	0.004	-0.004	-0.007	-0.017*
	(0.000)	(0.003)	(0.003)	(0.003)	(0.005)	(0.008)	(0.010)
MOMENTUM$_{t-1}$	0.001**	0.005***	0.005***	0.010***	0.018***	0.022***	0.031***
	(0.000)	(0.002)	(0.002)	(0.002)	(0.003)	(0.005)	(0.006)
AGE_{t-1}	-0.002	-0.019*	-0.019*	-0.010	-0.034*	0.002	-0.017
	(0.002)	(0.010)	(0.011)	(0.012)	(0.019)	(0.037)	(0.044)
$CASH_{t-1}$	0.000	0.024**	0.027**	0.089***	0.123***	0.274***	0.315***
	(0.002)	(0.011)	(0.011)	(0.014)	(0.022)	(0.034)	(0.043)
BOOKLEV$_{t-1}$	0.001	-0.003	-0.005	-0.044***	-0.058***	-0.118***	-0.129**
	(0.002)	(0.010)	(0.011)	(0.014)	(0.022)	(0.044)	(0.050)
RETEARN$_{t-1}$	0.001**	0.009**	0.009**	0.000	0.011**	-0.004	0.012
	(0.000)	(0.004)	(0.004)	(0.002)	(0.006)	(0.007)	(0.010)
ROA$_{t-1}$	-0.001	0.026**	0.034**	0.009	0.048**	0.002	0.052
	(0.001)	(0.013)	(0.014)	(0.011)	(0.022)	(0.027)	(0.036)
Intercept	0.003	0.037**	0.035**	-0.020	0.027	-0.009	0.044
	(0.009)	(0.014)	(0.015)	(0.016)	(0.026)	(0.049)	(0.058)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,730	6,730	6,730	6,730	6,730	6,730	6,730
Adjusted R^2 (R^2)	0.421	0.354	0.359	0.304	0.343	0.159	0.138

This table reports the two-stage least squares ("2SLS") regression results on the relationship between the change in investment and the CEO's equity sales, using *NEWLYVESTING* as an instrument for *EQUITYSOLD*. Column (1) presents the first-stage regression results associated with column (2.1), and columns (2.1)-(2.6) present the second-stage regression results for the six different investment measures. Variable definitions are listed in Appendix A. *FIT_EQUITYSOLD* is the fitted value of *EQUITYSOLD* from the first-stage regressions. *EQUITYSOLD*, *NEWLYVESTING*, *UNVESTEDADJ*, and *VESTED* are in billions, and *SALARY* and *BONUS* are in ten millions. Standard errors are in parentheses, clustered by firm. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

Table 3: The relationship between the change in investment and vesting equity: reduced form regressions

Panel A: Reduced form with *NEWLYVESTING*

Dependent Variables	(1) ΔRD_t	(2) $\Delta RDAD_t$	(3) $\Delta CAPEX_t$	(4) $\Delta RDAD\_CAPEX_t$	(5) $\Delta CAPEX\_ALL_t$	(6) $\Delta RDAD\_CAPEXALL_t$
$NEWLYVESTING_t$	**-0.309****	**-0.391****	**-0.205**	**-0.707****	**-1.395*****	**-2.154*****
	(0.148)	(0.165)	(0.183)	(0.285)	(0.513)	(0.616)
$UNVESTEDADJ_{t-1}$	-0.034	-0.053	0.000	-0.093	0.514	0.478
	(0.055)	(0.068)	(0.123)	(0.168)	(0.447)	(0.496)
$VESTED_{t-1}$	-0.004	-0.002	0.039**	0.035*	0.020	0.016
	(0.005)	(0.006)	(0.017)	(0.018)	(0.037)	(0.042)
$SALARY_{t-1}$	0.007	-0.014	-0.084	-0.134	0.011	-0.049
	(0.052)	(0.069)	(0.119)	(0.150)	(0.250)	(0.280)
$BONUS_{t-1}$	-0.001	-0.000	0.001	0.005	0.034	0.047
	(0.007)	(0.008)	(0.020)	(0.023)	(0.052)	(0.057)
Q_t	0.004***	0.004***	0.006***	0.011***	0.021***	0.026***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.004)
Q_{t-1}	0.003***	0.004***	0.000	0.005***	-0.007***	-0.002
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)
MV_{t-1}	-0.005*	-0.005*	0.004	-0.003	-0.005	-0.014
	(0.003)	(0.003)	(0.003)	(0.005)	(0.008)	(0.010)
$MOMENTUM_{t-1}$	0.004***	0.004***	0.010***	0.016***	0.020***	0.027***
	(0.001)	(0.002)	(0.002)	(0.003)	(0.005)	(0.006)
AGE_{t-1}	-0.017*	-0.017	-0.008	-0.030	0.011	-0.004
	(0.010)	(0.010)	(0.012)	(0.019)	(0.036)	(0.041)
$CASH_{t-1}$	0.024**	0.027**	0.089***	0.123***	0.274***	0.315***
	(0.010)	(0.011)	(0.014)	(0.022)	(0.033)	(0.041)
$BOOKLEV_{t-1}$	-0.004	-0.006	-0.045***	-0.060***	-0.123***	-0.137***
	(0.010)	(0.011)	(0.014)	(0.021)	(0.043)	(0.049)
$RETEARN_{t-1}$	0.008**	0.008**	-0.000	0.009*	-0.007	0.007
	(0.004)	(0.004)	(0.002)	(0.006)	(0.007)	(0.009)
ROA_{t-1}	0.027**	0.036***	0.010	0.051**	0.007	0.059*
	(0.013)	(0.014)	(0.011)	(0.022)	(0.027)	(0.035)
Intercept	0.073**	0.071**	-0.017	0.078	-0.038	0.051
	(0.030)	(0.032)	(0.036)	(0.055)	(0.109)	(0.126)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,730	6,730	6,730	6,730	6,730	6,730
Adjusted R^2	0.403	0.425	0.320	0.406	0.233	0.273

This panel reports the ordinary least squares ("OLS") regression results on the relationship between the change in investment and the CEO's vesting equity. Variable definitions are listed in Appendix A. *NEWLYVESTING*, *UNVESTEDADJ*, and *VESTED* are in billions, and *SALARY* and *BONUS* are in ten millions. Standard errors are in parentheses, clustered by firm. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

Table 3 (Cont'd)

Panel B: Separating *NEWLYVESTING* into *NEWLYVESTINGSTOCK* and *NEWLYVESTING OPTION*

Dependent Variables	(1) ΔRD_t	(2) $\Delta RDAD_t$	(3) $\Delta CAPEX_t$	(4) $\Delta RDAD\_CAPEX_t$	(5) $\Delta CAPEX\_ALL_t$	(6) $\Delta RDAD\_CAPEXALL_t$
$NEWLYVESTINGSTOCK_t$	**-0.338*****	**-0.473*****	**0.459**	**-0.098**	**-1.004**	**-1.768***
	(0.121)	(0.159)	(0.338)	(0.428)	(0.978)	(1.054)
$NEWLYVESTINGOPTION_t$	**-0.259***	**-0.337****	**-0.415****	**-0.874*****	**-1.716*****	**-2.441*****
	(0.151)	(0.166)	(0.193)	(0.296)	(0.552)	(0.655)
$UNVESTEDADJ_{t-1}$	-0.036	-0.053	0.017	-0.075	0.564	0.533
	(0.046)	(0.057)	(0.106)	(0.144)	(0.378)	(0.419)
$VESTED_{t-1}$	-0.005	-0.003	0.039***	0.035**	0.020	0.015
	(0.004)	(0.005)	(0.014)	(0.015)	(0.031)	(0.035)
$SALARY_{t-1}$	0.006	-0.015	-0.088	-0.139	0.009	-0.053
	(0.043)	(0.058)	(0.099)	(0.125)	(0.207)	(0.232)
$BONUS_{t-1}$	-0.001	0.000	0.001	0.005	0.033	0.047
	(0.006)	(0.006)	(0.017)	(0.019)	(0.043)	(0.047)
Q_t	0.004***	0.004***	0.005***	0.011***	0.021***	0.026***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.003)
Q_{t-1}	0.003***	0.004***	0.000	0.005***	-0.007***	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)
MV_{t-1}	-0.005**	-0.005**	0.004*	-0.003	-0.005	-0.014*
	(0.002)	(0.002)	(0.002)	(0.004)	(0.007)	(0.008)
$MOMENTUM_{t-1}$	0.004***	0.004***	0.010***	0.016***	0.020***	0.027***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.004)	(0.005)
AGE_{t-1}	-0.017**	-0.017**	-0.008	-0.030*	0.011	-0.004
	(0.008)	(0.009)	(0.010)	(0.016)	(0.030)	(0.034)
$CASH_{t-1}$	0.024***	0.027***	0.089***	0.123***	0.274***	0.315***
	(0.009)	(0.009)	(0.011)	(0.018)	(0.028)	(0.035)
$BOOKLEV_{t-1}$	-0.004	-0.006	-0.045***	-0.060***	-0.124***	-0.137***
	(0.009)	(0.009)	(0.011)	(0.017)	(0.036)	(0.041)
$RETEARN_{t-1}$	0.008***	0.008**	-0.000	0.009**	-0.007	0.007
	(0.003)	(0.003)	(0.002)	(0.005)	(0.006)	(0.008)
ROA_{t-1}	0.027**	0.036***	0.010	0.051***	0.007	0.059**
	(0.011)	(0.011)	(0.009)	(0.018)	(0.022)	(0.029)
Intercept	0.074***	0.071***	-0.015	0.081*	-0.038	0.053
	(0.026)	(0.027)	(0.030)	(0.046)	(0.091)	(0.105)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,730	6,730	6,730	6,730	6,730	6,730
Adjusted R^2	0.403	0.425	0.320	0.406	0.234	0.273

This panel reports the OLS regression results on the relationship between the change in investment and the CEO's vesting equity. Variable definitions are listed in Appendix A. *NEWLYVESTINGSTOCK*, *NEWLYVESTINGOPTION*, *UNVESTEDADJ*, and *VESTED* are in billions, and *SALARY* and *BONUS* are in ten millions. Standard errors are in parentheses, clustered by firm. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

Table 4: The relationship between the likelihood of beating analyst consensus forecast and equity sales: two-stage probit model

Dependent Variables	(1) *EQUITY_ SOLD$_t$*	(2.1) *BEAT$_q$*	(2.2) *BEAT_ BELOW1$_q$*	(2.3) *BEAT_ ABOVE1$_q$*
NEWLYVESTING$_t$	**0.451*****			
	(0.015)			
FIT_ EQUITYSOLD$_t$		**10.829****	**14.596*****	**-1.760**
		(4.863)	(5.576)	(4.541)
		[3.293**]	[2.849***]	[-0.621]
UNVESTEDADJ$_{t-1}$	0.021	1.895	2.895*	-0.811
	(0.015)	(1.911)	(1.754)	(1.191)
VESTED$_{t-1}$	0.020***	-0.305**	-0.468***	0.051
	(0.001)	(0.127)	(0.132)	(0.109)
SALARY$_{t-1}$	0.009*	1.192**	-0.194	1.189**
	(0.004)	(0.532)	(0.512)	(0.509)
BONUS$_{t-1}$	0.000	-0.206	-0.088	-0.092
	(0.002)	(0.285)	(0.186)	(0.239)
MV$_{t-1}$	0.000**	0.009	-0.042***	0.035**
	(0.000)	(0.017)	(0.015)	(0.017)
Q$_{t-1}$	0.001***	-0.033***	0.023**	-0.044***
	(0.000)	(0.008)	(0.009)	(0.009)
ROA$_{t-1}$	0.001***	0.496***	0.371***	0.273***
	(0.000)	(0.058)	(0.088)	(0.065)
AGE$_{t-1}$	-0.000***	-0.026*	0.008	-0.027
	(0.000)	(0.016)	(0.021)	(0.018)
INSTIPCT$_{t-1}$	0.001***	0.179***	-0.135**	0.237***
	(0.000)	(0.048)	(0.054)	(0.043)
ALY_N$_q$	0.000*	0.141***	0.036	0.103***
	(0.000)	(0.025)	(0.034)	(0.026)
HORIZON$_q$	-0.000	0.019	-0.115***	0.086***
	(0.000)	(0.030)	(0.033)	(0.028)
ALY_DISP$_q$	0.000	-0.000***	-0.000***	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
POSUE$_q$	0.001***	0.928***	0.041	0.815***
	(0.000)	(0.038)	(0.045)	(0.034)
Intercept	-0.001	-0.505***	-0.369**	-1.243***
	(0.001)	(0.184)	(0.155)	(0.172)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Observations	17,173	17,173	17,173	17,173
Wald-statistics		2.70	11.60	2.52
p-value		0.10	<0.01	0.11

This table reports the ivprobit regression results on the relationship between the likelihood of beating the quarterly analyst consensus forecast and the CEO's equity sales, using *NEWLYVESTING* as an instrument for *EQUITYSOLD*. Earnings announcement of fiscal quarter *q* takes place during fiscal year *t*. Column (1) presents the first-stage regression results associated with column (2.1), and columns (2.1)-(2.3) present the second-stage regression results for the three different measures of beating the forecast. Variable definitions are listed in Appendix A. *FIT_EQUITYSOLD* is the fitted value of *EQUITYSOLD* from the first-stage regressions. *EQUITYSOLD*, *NEWLYVESTING*, *UNVESTEDADJ*, and *VESTED* are in billions, and *SALARY* and *BONUS* are in ten millions. Standard errors are in parentheses, clustered by fiscal quarter end. For *NEWLYVESTING*, the marginal effects are displayed below the standard errors. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

Table 5: The relationship between the likelihood of beating analyst consensus forecast and vesting equity: reduced form regressions

Dependent Variables	(1) $BEAT_q$	(2) $BEAT\_BELOW1_q$	(3) $BEAT\_ABOVE1_q$	(4) $BEAT\_BELOW1_q$	(5) $BEAT\_ABOVE1_q$
$NEWLYVESTING_t$	**4.759****	**6.787*****	**-0.899**		
	(2.211)	(2.629)	(2.055)		
	[6.730**]	[9.599***]	[1.272]		
$NEWLYVESTINGSTOCK_t$				**8.850**	**1.189**
				(5.757)	(5.280)
				[12.52]	[1.681]
$NEWLYVESTINGOPTION_t$				**7.053*****	**-1.566**
				(2.668)	(2.139)
				[9.975***]	[-2.215]
$UNVESTEDADJ_{t-1}$	2.161	3.240**	-0.841	3.238**	-0.817
	(1.803)	(1.554)	(1.164)	(1.545)	(1.162)
$VESTED_{t-1}$	-0.092*	-0.171**	0.012	-0.164*	0.013
	(0.056)	(0.084)	(0.061)	(0.084)	(0.062)
$SALARY_{t-1}$	1.268**	-0.071	1.167**	-0.094	1.141**
	(0.509)	(0.478)	(0.500)	(0.463)	(0.521)
$BONUS_{t-1}$	-0.206	-0.084	-0.094	-0.082	-0.094
	(0.287)	(0.183)	(0.238)	(0.181)	(0.238)
MV_{t-1}	0.011	-0.040***	0.035**	-0.041***	0.035**
	(0.017)	(0.015)	(0.017)	(0.015)	(0.017)
Q_{t-1}	-0.027***	0.031***	-0.045***	0.032***	-0.045***
	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
ROA_{t-1}	0.511***	0.396***	0.271***	0.396***	0.272***
	(0.054)	(0.089)	(0.064)	(0.089)	(0.064)
AGE_{t-1}	-0.031*	0.001	-0.026	0.001	-0.027
	(0.017)	(0.022)	(0.019)	(0.022)	(0.019)
$INSTIPCT_{t-1}$	0.187***	-0.125**	0.236***	-0.125**	0.236***
	(0.047)	(0.054)	(0.044)	(0.055)	(0.044)
ALY_N_q	0.144***	0.040	0.103***	0.040	0.102***
	(0.025)	(0.034)	(0.026)	(0.034)	(0.026)
$HORIZON_q$	0.017	-0.120***	0.087***	-0.119***	0.087***
	(0.030)	(0.033)	(0.028)	(0.033)	(0.027)
ALY_DISP_q	-0.000***	-0.000***	-0.000**	-0.000***	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$POSUE_q$	0.940***	0.057	0.814***	0.057	0.814***
	(0.036)	(0.045)	(0.035)	(0.045)	(0.035)
Intercept	-0.515***	-0.387***	-1.244***	-0.381***	-1.245***
	(0.185)	(0.147)	(0.172)	(0.148)	(0.173)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	17,173	17,173	17,173	17,173	17,173
Pseudo R^2	0.125	0.025	0.091	0.025	0.091

This table reports the probit regression results on the relationship between the likelihood of beating the quarterly analyst consensus forecast and the CEO's vesting equity. Earnings announcement of fiscal quarter *q* takes place during fiscal year *t*. Variable definitions are listed in Appendix A. *NEWLYVESTING*, *NEWLYVESTINGSTOCK*, *NEWLYVESTINGOPTION*, *UNVESTEDADJ*, and *VESTED* are in billions, and *SALARY* and *BONUS* are in ten millions. Standard errors are in parentheses, clustered by fiscal quarter end. For *NEWLYVESTING*, *NEWLYVESTINGSTOCK*, and *NEWLYVESTING_OPTION*, the marginal effects are displayed below the standard errors. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

Table 6: The relationship between the likelihood of cutting R&D to beat analyst consensus forecast and equity sales: two-stage probit model

	(1)	(2.1)	(2.2)	(2.3)
	All firms	All firms	Firms with $R\&D_{q-4} > 0$	Firms with R&D cuts
Dependent Variables	$EQUITYSOLD_t$		$CUTANDBEAT_q$	
$NEWLYVESTING_t$	**0.488*****			
	(0.029)			
$FIT\_EQUITYSOLD_t$		**31.553*****	**28.938*****	**38.753****
		(10.635)	(11.025)	(15.394)
		[2.682**]	[4.544***]	[11.384***]
$UNVESTEDADJ_{t-1}$	0.019	-4.192	-4.735	-2.489
	(0.019)	(2.782)	(3.319)	(3.845)
$VESTED_{t-1}$	0.019***	-1.351***	-1.010***	-0.762***
	(0.001)	(0.301)	(0.290)	(0.255)
$SALARY_{t-1}$	0.018***	-1.448	1.761	-0.097
	(0.005)	(1.051)	(1.238)	(1.645)
$BONUS_{t-1}$	0.001	-0.401	0.429	0.527
	(0.001)	(0.556)	(0.587)	(0.638)
Q_q	0.001***	-0.069***	-0.048***	-0.054**
	(0.000)	(0.018)	(0.019)	(0.023)
Q_{t-1}	0.000**	-0.129***	-0.133***	-0.047**
	(0.000)	(0.026)	(0.023)	(0.021)
MV_{q-1}	0.000	0.059***	-0.010	0.027
	(0.000)	(0.022)	(0.030)	(0.034)
$MOMENTUM_{q-1}$	0.001**	-0.093	-0.074	-0.032
	(0.000)	(0.058)	(0.063)	(0.073)
AGE_{t-1}	-0.001***	0.091***	0.068**	-0.005
	(0.000)	(0.028)	(0.033)	(0.036)
$CASH_{q-1}$	-0.000	0.070	-0.280	-0.200
	(0.000)	(0.175)	(0.176)	(0.197)
$BOOKLEV_{q-1}$	-0.002***	-0.212	0.062	-0.110
	(0.000)	(0.173)	(0.171)	(0.202)
$RETEARN_{q-1}$	0.000***	0.008	0.006	0.018
	(0.000)	(0.026)	(0.022)	(0.021)
ROA_{q-1}	0.003**	0.646	0.100	0.361
	(0.001)	(0.732)	(0.660)	(0.606)
$R\&D_{q-4}$	-0.023***	16.491***	11.427***	9.377***
	(0.005)	(0.636)	(0.630)	(0.865)
Intercept	0.000	-2.262***	-1.504***	-0.982***
	(0.001)	(0.176)	(0.203)	(0.232)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Observations	15,665	15,665	6,695	2,435
Wald-statistics		8.97	7.10	6.26
p-value		<0.01	<0.01	0.01

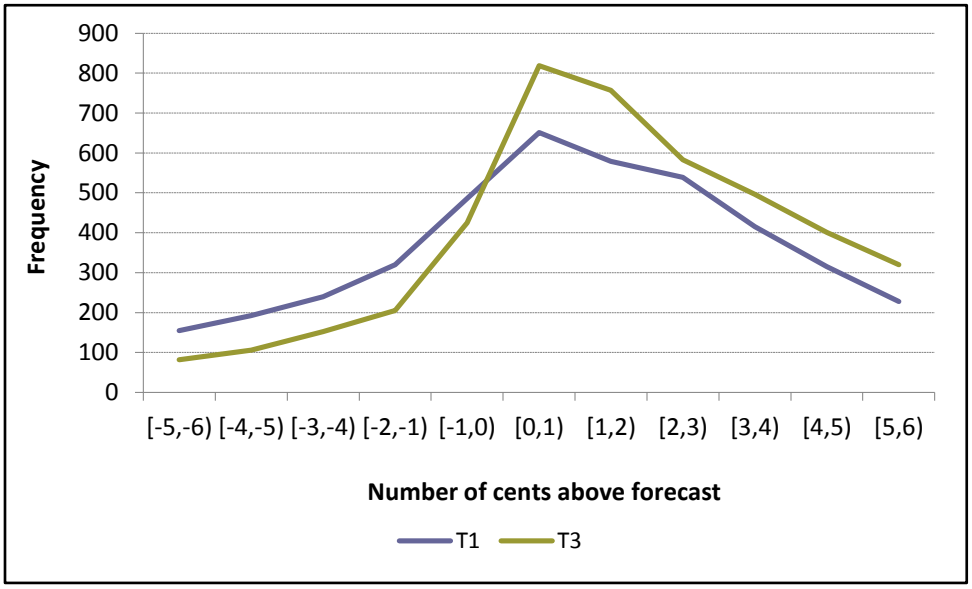
This table reports the ivprobit regression results on the relationship between the likelihood of cutting R&D to beat the earnings forecast and the CEO's equity sales, using *NEWLYVESTING* as an instrument for *EQUITYSOLD*. Earnings announcement of fiscal quarter *q* takes place during fiscal year *t*. Variable definitions are listed in Appendix A. Column (1) presents the first-stage regression results associated with column (2.1), and columns (2.1)-(2.3) present the second-stage regression results for three different samples. For *FIT_EQUITYSOLD*, the marginal effects are displayed below the standard errors. *EQUITYSOLD*, *NEWLYVESTING*, *UNVESTEDADJ*, and *VESTED* are in billions, and *SALARY* and *BONUS* are in ten millions. Standard errors are in parentheses, clustered by firm. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

Table 7: The relationship between earnings announcement returns and equity sales: 2SLS analysis

Dependent Variables	(1) $EQUITYSOLD_t$	(2.1)	(2.2)
		CAR_q (-1, +1)	
$NEWLYVESTING_t$	**0.420*****		
	(0.026)		
$FIT\_EQUITYSOLD_t$		**76.350****	**44.418**
		(29.820)	(30.145)
DIF_q			0.329
			(0.290)
$BEAT_q$			6.327***
			(0.200)
$UNVESTEDADJ_{t-1}$	0.008	3.253	0.014
	(0.016)	(7.065)	(7.072)
$VESTED_{t-1}$	0.022***	-0.637	0.330
	(0.001)	(0.830)	(0.816)
$SALARY_{t-1}$	0.014***	-4.384	-3.182
	(0.005)	(4.553)	(4.378)
$BONUS_{t-1}$	0.003	-1.682	-1.266
	(0.002)	(1.259)	(1.216)
MV_{t-1}	0.000***	-0.249**	-0.490***
	(0.000)	(0.126)	(0.126)
Q_{t-1}	0.001***	-0.128**	-0.049
	(0.000)	(0.065)	(0.062)
$LEVERAGE_{t-1}$	-0.001***	1.744***	2.067***
	(0.000)	(0.429)	(0.407)
PASTRET(1Y)	0.000***	-0.004	-0.010***
	(0.000)	(0.003)	(0.003)
PASTRET(1M)	0.000**	0.016	0.001
	(0.000)	(0.011)	(0.010)
Q4	0.000	0.142	0.368*
	(0.000)	(0.208)	(0.205)
$ANNRET_{q-1}$	0.000***	-0.019*	-0.032***
	(0.000)	(0.010)	(0.010)
$ANNRET_{q-2}$	0.000***	-0.019**	-0.026***
	(0.000)	(0.010)	(0.009)
$ANNRET_{q-3}$	0.000***	-0.009	-0.010
	(0.000)	(0.009)	(0.009)
$ANNRET_{q-4}$	0.000**	0.009	0.008
	(0.000)	(0.009)	(0.008)
Intercept	-0.001	0.077	-2.104
	(0.002)	(1.611)	(1.573)
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Observations	18,686	18,686	18,686
Adjusted R^2 (R^2)	0.306	0.007	0.088

This table reports the 2SLS regression results on the relationship between the cumulative market adjusted returns over days -1 to +1 around the quarterly earnings announcements and the CEO's equity sales, using *NEWLYVESTING* as an instrument for *EQUITYSOLD*. Earnings announcement of fiscal quarter *q* takes place during fiscal year *t*. Column (1) presents the first-stage regression results associated with column (2.1), and columns (2.1)-(2.2) present the second-stage regression results with different controls. Variable definitions are listed in Appendix A. *FIT_EQUITYSOLD* is the fitted value of *EQUITYSOLD* from the first-stage regressions. *EQUITYSOLD*, *NEWLYVESTING*, *UNVESTEDADJ*, and *VESTED* are in billions, and *SALARY* and *BONUS* are in ten millions. Standard errors are in parentheses, clustered by announcement day. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

Fig. 1: The frequency of earnings surprises around the analyst forecast for high and low *NEWLYVESTING* firms



This figure illustrates the frequency of earnings surprises of different magnitudes separately for firms with *NEWLYVESTING* in the top tercile of the sample (T3) and firms with *NEWLYVESTING* in the bottom tercile of the sample (T1). The y-axis reports the number of firm-quarters (within T1 and T3) in which the reported EPS exceeds (or falls below) the analyst mean consensus forecast as indicated by the x-axis.

References

Abarbanell, J., Bernard, V., 1992. Tests of analysts' overreaction/underreaction to earnings information as an explanation for anomalous stock price behavior. Journal of Finance 47, 1181–1207.

Asker, J., Farre-Mensa, J., Ljungqvist, A., 2014. Corporate investment and stock market listing: A puzzle? Unpublished working paper, New York University.

Bartov, E., Givoly, D., Hayn, C., 2002. The rewards to meeting or beating earnings expectations. Journal of Accounting and Economics 33, 173–204.

Bebchuk, L., Stole, L., 1993. Do short-term objectives lead to under- or overinvestment in long-term projects? Journal of Finance 48, 719–729.

Benmelech, E., Kandel, E., Veronesi, P., 2010. Stock-based compensation and CEO (dis)incentives. Quarterly Journal of Economics 125, 1769–1820.

Bergstresser, D., Philippon, T., 2006. CEO incentives and earnings management. Journal of Financial Economics 80, 511–529.

Bettis, C., Bizjak, J., Coles, J., Kalpathy, S., 2010. Stock and option grants with performance-based vesting provisions. Review of Financial Studies 23, 3849–3888.

Bhojraj, S., Hribar, P., Picconi, M., McInnis, J., 2009. Making sense of cents: an examination of firms that marginally miss or beat analyst forecasts. Journal of Finance 64, 2361–2388.

Bizjak, J., Brickley, J., Coles J., 1993. Stock-based incentive compensation and investment behavior. Journal of Accounting and Economics 16, 349–372.

Blouin, J., Core, J., Guay, W., 2010. Have the tax benefits of debt been overestimated? Journal of Financial Economics 98, 195–213.

Brisley, N., 2006. Executive stock options: Early exercise provisions and risk-taking incentives. Journal of Finance 61, 2487–2509.

Burns, N., Kedia, S., 1998. The impact of performance-based compensation on misreporting. Journal of Financial Economics 79, 35-67.

Bushee, B., 1998. The influence of institutional investors on myopic R&D investment behavior. Accounting Review 73, 305–333.

Chan, L., Lakonishok, J., Sougiannis, T., 2001. The stock market valuation of research and development expenditures. Journal of Finance 56, 2431–2456.

Cheng, Q., Warfield, T., 2005. Equity incentives and earnings management. Accounting Review 80, 441–476.

Cohen, L., Diether, K., Malloy, C., 2013. Misvaluing innovation. Review of Financial Studies 26, 635–666.

Core, J., Larcker, D., 2002. Performance consequences of mandatory increases in executive stock ownership. Journal of Financial Economics 64, 317–340.

Davis, L., Soo, B., Trompeter, G., 2009. Auditor tenure and the ability to meet or beat earnings forecasts. Contemporary Accounting Research 26, 517–548.

Edmans, A., 2009. Blockholder trading, market efficiency, and managerial myopia. Journal of Finance 64, 2481–2513.

Edmans, A., Gabaix, X., Sadzik, T., Sannikov, Y., 2012. Dynamic CEO compensation. Journal of Finance 67, 1603–1647.

Edmans, A., Goncalves-Pinto, L., Wang, Y., Xu, M. 2014. Strategic news releases in equity vesting months. Unpublished working paper, London Business School.

Efendi, J., Srivastava, A., Swanson, E. 2007. Why do corporate managers misstate financial statements? The role of option compensation and other factors. Journal of Financial Economics 85, 667–708.

Erickson, M., Hanlon, M., Maydew, E., 2006. Is there a link between executive equity incentives and accounting fraud? Journal of Accounting Research 44, 113–143.

Frydman, C., Jenter, D., 2010. CEO compensation. Annual Review of Financial Economics 2, 75–102.

Gopalan, R., Huang, S., Maharjan, J., The role of deferred pay in retaining managerial talent. Unpublished working paper, Washington University in St. Louis.

Gopalan, R., Milbourn, T., Song, F., Thakor, A., Duration of executive compensation. Journal of Finance, forthcoming.

Goldman, E., Slezak, S., 2006. An equilibrium model of incentive contracts in the presence of information manipulation. Journal of Financial Economics 80, 603–626.

Graham, J., Harvey, C., Rajgopal, S., 2005. The economic implications of corporate financial reporting. Journal of Accounting and Economics 40, 3–73.

Hall, B., Liebman, J., 1998. Are CEOs really paid like bureaucrats? Quarterly Journal of Economics 113, 653–691.

Hall, B., Murphy, K., 2002. Stock options for undiversified executives. Journal of Accounting and Economics 33, 3–42.

Himmelberg, C., Hubbard, R., Palia, D., 1999. Understanding the determinants of managerial ownership and the link between ownership and performance. Journal of Financial Economics 53, 353–384.

Jensen, M., Murphy, K., 1990. Performance and top-management incentives. Journal of Political Economy 98, 225–264.

Johnson, S., Ryan, H., Tian, Y., 2009. Managerial incentives and corporate fraud: The source of incentives matter. Review of Finance 13, 115–145.

Kahl, M., Liu, J., Longstaff, F., 2003. Paper millionaires: How valuable is stock to a stockholder who is restricted from selling it? Journal of Financial Economics 67, 385–410.

Kole, S., 1997. The complexity of compensation contracts. Journal of Financial Economics 43, 79–104.

Ladika, T., Sautner, Z., 2014. The effect of managerial short-termism on corporate investment. Unpublished working paper, University of Amsterdam.

Laux, V., 2012. Stock option vesting conditions, CEO turnover, and myopic investment. Journal of Financial Economics 106, 513–526.

Matsumoto, D., 2002. Management's incentives to avoid negative earnings surprises. Accounting Review 77, 483–514.

McConnell, J., Muscarella, C., 1985. Corporate capital expenditure decisions and the market value of the firm. Journal of Financial Economics 14, 399–422.

Miller, M., Rock, K., 1985. Dividend policy under asymmetric information. Journal of Finance 40, 1031–1051.

Narayanan, M., 1985. Managerial incentives for short-term results. Journal of Finance 40, 1469-1484.

Peng, L., Roell, A., 2008. Executive pay, earnings manipulation and shareholder litigation. Review of Finance 12, 141–184.

Porter, M., 1992. Capital disadvantage: America's failing capital investment system. Harvard Business Review 70, 65–82.

Roychowdhury, S., 2006. Earnings management through real activities manipulation. Journal of Accounting and Economics 42, 335–370

Savor, P., Wilson, M., 2013. Earnings announcements and systematic risk. Unpublished working paper, Temple University.

Shue, K., Townsend, R., 2013. Swinging for the fences: Executive reactions to quasi-random option grants. Unpublished working paper, University of Chicago.

Stein, J., 1988. Takeover threats and managerial myopia. Journal of Political Economy 46, 61–80.

Stein, J., 1989. Efficient capital markets, inefficient firms: A model of myopic corporate behavior. Quarterly Journal of Economics 104, 655–669.

Stock, J., Yogo, M., 2005. Testing for weak instruments in linear IV regressions. Identification and inference for econometric models: Essays in honor of Thomas Rothenberg, Chapter 5 (Cambridge University Press), 80–108.

van Bekkum, S., Zhu, G., 2013. Insider information or CEO talent? An analysis of CEO option exercises. Unpublished working paper, Erasmus University Rotterdam.

Von Lilienfeld-Toal, U., Ruenzi, S., CEO ownership, stock market performance, and managerial discretion. Journal of Finance, forthcoming.