Equity Vesting and Managerial Myopia*

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Abstract

This paper links the impending vesting of CEO equity to reductions in real investment. Existing studies measure the manager's short-term concerns using the sensitivity of his equity to the stock price. However, in myopia theories, the driver of short-termism is not the magnitude of incentives but their horizon. We use recent changes in compensation disclosure to introduce a new empirical measure that is tightly linked to theory - the sensitivity of equity vesting over the upcoming year. This sensitivity is determined by equity grants made several years prior, and thus unlikely to be driven by current investment opportunities. An interquartile increase is associated with a decline of 0.11% in the growth of R&D (scaled by total assets), 37% of the average R&D growth rate. Similar results hold when including advertising and capital expenditure. Newly-vesting equity increases the likelihood of meeting or beating analyst earnings forecasts by a narrow margin. However, the market's reaction to doing so is lower, suggesting that it recognizes CEOs' myopic incentives.

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This paper studies the link between real investment decisions and the vesting horizon of a CEO's equity incentives. We find that research and development ("R&D") is negatively associated with the stock price sensitivity of stock and options that vest over the course of the same year. This association continues to hold when including advertising and capital expenditure in the investment measure. Moreover, CEOs with significant newly-vesting equity are more likely to meet or beat analyst consensus forecasts by a narrow margin. Overall, these results provide empirical support for managerial myopia theories.

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, the immediate effect of such investment 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 perceived importance, myopia is very difficult to test for empirically. Standard measures of CEO incentives (e.g., Hall and Liebman (1998)) quantify the sensitivity of managerial wealth to the stock price stemming from his stock and option compensation. However, in myopia models, the driver of short-termism is not the overall level of equity compensation, but the weighting of this compensation towards the short-term as opposed to long-term stock price (Stein (1988, 1989)). Equity that does not vest until the long term will deter rather than induce myopia (Edmans, Gabaix, Sadzik, and Sannikov (2012)).

However, operationalizing this theoretical concept empirically is tricky. 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. (This is indeed how short-term concerns arise in the Stein (1989) model). 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 by researchers and unpredictable by the CEO. Actual discretionary sales are observable to researchers, but likely endogenous for two reasons. First, omitted variables may drive both actual 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, some actual sales (e.g., due to sudden liquidity needs) may have been unpredictable by the CEO. Thus, actual sales are a poor proxy for the ideal explanatory variable, predicted sales, leading to measurement error.

We measure a manager's myopic incentives using the share price sensitivity of his stock and options that are scheduled to vest over the upcoming year. We show that this sensitivity is highly correlated with actual sales: in the absence of private information, a risk-averse manager should sell his equity upon vesting. However, while a CEO's actual sales are an endogenous decision, the amount of newly-vesting equity is largely driven by the magnitude and vesting horizon of equity grants made several years prior.[1] For the same reason, it is known to the CEO in advance. We identify the equity that is scheduled to vest in a given year using a recently-available dataset from Equilar. This dataset contains grant-by-grant information on an executive's options, including whether they are vested or unvested. We can thus identify at an

[1] Gopalan, Milbourn, Song, and Thakor (2013) show that most equity grants do not fully vest for three to five years.

individual grant level the number of options that switch from unvested to vested in a given year.[2] This grant-level information allows us to calculate the delta of the vesting options, which captures the manager's incentive to inflate the stock price. We add this to the number of vesting shares to give the total delta of a CEO's vesting equity.

We use the sensitivity of newly-vesting equity in two ways. First, we employ it as the explanatory variable of interest, relating it to changes in several measures of long-term investment. Our primary measure is R&D scaled by total assets, but we also include advertising and two measures of capital expenditure. We control for determinants of investment opportunities and the firm's ability to finance investment, firm and year fixed effects, and other components of CEO compensation – for example, the CEO's unvested equity, his already-vested equity, and the standard components of salary and bonus.

We find a negative and significant relationship between nearly all measures of investment and the sensitivity of newly-vesting equity. An interquartile increase in this sensitivity is associated with a 0.11 percentage point decline in the growth of R&D scaled by total assets, which corresponds to 37% of the average growth in R&D scaled by total assets, 2% of the average R&D-to-assets ratio, and an average decline in R&D of approximately $1 million per year. Our results suggest that CEOs reduce investment in years in which significant equity vests. The results are robust to using the intrinsic values of options rather than their deltas, i.e. treating in-the-money options the same as shares, since the CEO may exercise them immediately upon vesting, and ignoring out-of-the-money options. We also find that newly-vesting equity is positively associated with a measure of real earnings management developed by Roychowdury

[2] 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.

(2006), which corresponds to abnormal discretionary expenditure (R&D, advertising, and selling, general, and administrative ("SG&A") expenses) relative to industry peers.

Newly-vesting equity is of interest as an explanatory variable, since boards may wish to take into account its link with investment when designing the optimal contract. Similarly, since boards know the amount of newly-vesting equity at the start of a year, they can predict the CEO's incentives to cut investment, and if needed, counteract them. A broader question is how investment responds to expected equity sales in general. Such sales can stem from channels other than vesting equity – a CEO may voluntarily hold already-vested equity as a long-term investment (e.g., in a family firm), subsequently sell equity to rebalance his portfolio, and anticipate such sales beforehand. Since actual equity sales are endogenous, our second use of newly-vesting equity is as an instrument for actual sales. The two properties of newly-vesting equity discussed earlier – its high correlation with equity sales and its determination by equity grants several years prior – are analogous to the relevance criterion and the exclusion restriction. We find a negative relationship between instrumented equity sales and investment. An interquartile increase in equity sales is associated with a 0.25 percentage point decline in the growth of R&D scaled by total assets, 4.6% of the average R&D-to-assets ratio.

The negative association between investment and vesting equity (or instrumented equity sales) can arise from two channels. First, vesting equity could cause a decline in investment. Managers intending to sell equity reduce investment, to inflate earnings and thus the stock price. Second, there is no causal relationship but instead the link arises from an omitted variable – current investment opportunities – that our controls fail to capture. It may be that boards believe that vesting equity reduces the manager's investment incentives, and thus schedule equity to vest precisely when they forecast that investment opportunities will decline. This explanation requires boards to be able to forecast investment opportunities several years in advance. Note that it is still consistent with myopia theories: boards ensure that options do not vest while investment opportunities are strong because they believe that vesting equity induces myopia.

To provide further evidence of the first channel, we show that newly-vesting equity is associated with a higher likelihood that a firm meets or narrowly beats the analyst consensus earnings forecast. In contrast, vesting is unrelated to the likelihood of beating the forecasts by a wide margin, consistent with earnings manipulation being more likely when earnings are close to the forecast. These results support the idea that vesting equity increases the CEO's stock price concerns, but not that equity vesting is correlated with changes in investment opportunities. Similarly, we find that firms with newly-vesting equity are more likely to cut R&D in order to beat an earnings forecast, using an analysis similar in spirit to Bushee (1998).

Finally, we study the market's reaction to earnings announcements. While CEOs with high vesting equity are more likely to meet the earnings forecast, the market reaction to doing so is significantly lower for such CEOs. Thus, CEOs with myopic incentives do not succeed in achieving higher announcement returns. These findings are consistent with the Stein (1989) "signal-jamming" equilibrium, where the market is efficient and recognizes managers' myopic behavior, but managers are still trapped into acting myopically.

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). As previously noted, testing these theories is difficult. McConnell and Muscarella (1985) document positive stock price reactions to the announcements of capital investments. This result may arise from selection: managers only pursue projects whose value can be clearly communicated to the market in the short-term and they know will enjoy a positive reaction. 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 sensitivity to the stock price but not his horizon, Cheng and Warfield (2005), Bergstresser and Philippon (2006), and Peng and Roell (2008) find a positive link with earnings management, but Erickson, Hanlon, and Maydew (2006) find no link with accounting fraud. These conflicting results may arise because, theoretically, it is the horizon rather than the level of incentives that induces myopia. Bushee (1998) relates R&D to the horizon of a firm's shareholders rather than managers.

A small number of papers do consider the horizons of CEO equity incentives. Kole (1997) is the first to describe vesting horizons, but does not relate them to firm behavior. Johnson, Ryan, and Tian (2009) show that vested stock is related to corporate fraud, but do not study upcoming vesting. Cadman and Sunder (2011), Cadman, Rusticus, and Sunder (2013), and Gopalan, Milbourn, Song, and Thakor (2013) analyze the "duration" of equity incentives - the weighted average of the vesting periods of all equity awarded to or held by a CEO in a given year. Cadman and Sunder (2011) and Cadman, Rusticus, and Sunder (2013) analyze the determinants of duration rather than its effects on firms' real decisions. The former show that duration is positively associated with institutional investors' investment horizons; the latter study how duration responded to the adoption of FAS 123R. Gopalan et al. (2013) document how duration varies across firms and show that it is associated with earnings management, but do not examine real outcomes such as investment.

In contrast, our goal is to investigate whether CEOs' myopic incentives affect investment. In this context, our incentive measure has two attractive features compared to duration. First, it is designed to minimize its correlation with current investment opportunities. While duration is affected by current equity grants, which may be correlated with current investment opportunities, newly-vesting equity depends primarily on grants made several years prior. Second, measuring the extent to which equity vests over the short term (rather than the average vesting horizon of all equity holdings) captures more directly the CEO's incentives to inflate the short-term price.[3]

A contemporaneous working paper by Ladika and Sautner (2013) shows that FAS 123R induced firms to accelerate the vesting periods of options, and that such accelerated vesting led to 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 focus on a one-time shock, we study vesting (or instrumented equity sales) within a panel of firms. This broader setting allows us to quantify the responsiveness of investment to expected equity sales, rather than answer the more specific question of how investment responded to accelerating vesting. We also analyze the relation between vesting and the firms' propensity to beat earnings forecasts (as well as the market's response), thus providing complementary evidence on the link between vesting and myopia.

This paper is organized as follows. Section 1 describes the data, in particular our measure of myopic incentives. Section 2 presents the investment results, and Section 3 analyzes earnings announcements. Section 4 concludes.

1 Data and Empirical Specification

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

[3] While we use vesting equity as an instrument for equity sales, Shue and Townsend (2013) use features of multi-year grant cycles as an instrument for option grants. They study the different question of whether options induce risk-taking.

1.1 *Data and Sample*

Since the implementation of FAS 123R in 2006, companies are required 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. For an option grant, firms disclose not only the exercise price and expiration date, but also how many options are vested or unvested. We can thus track the vesting of a CEO's options by studying changes in the numbers of vested and unvested options with the same exercise price and expiration date. Separately, Equilar directly reports the number of shares that vest in a given year.

Given the short time series over which 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.[4] 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). 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.

1.2 *Measurement of vesting equity*

We obtain the number of shares that vest in a given year directly using the variable "Shares Acquired on Vesting of Stock" for each year-CEO. Such vesting may come from previously restricted stock or Long-Term Incentive Plans ("LTIPs"). To calculate the number of newly-vesting options, we first collect information, grant-by-grant, on the exercise price (*EXERPRC*),

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[4] We have 53 firm-years in which we have 2 CEOs, due either to dual CEOs or a change of CEO during the year. In these cases, the firm-year observation appears twice, once for each CEO. The results are robust to deleting these observations or keeping the CEO with the higher incentives from newly-vesting equity.

expiration date (*EXPDATE*), and number of securities (*NUM*) for a given CEO's newly-awarded options in year *t+1* and his unvested options at the end of year *t* and year *t+1*. We group these options by *EXERPRC* and *EXPDATE* and infer the number of newly-vesting options from the following relationship:

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

where *p* and *d* index the exercise price and expiration date for a given option grant, *NEWLYVESTINGOPTIONNUM* is the number of newly-vesting options for this exercise price-expiration date pair, *UNVESTEDOPTIONNUM* is the number of unvested options for this pair, and *NEWLYAWARDEDOPTIONNUM* is the number of newly-awarded options for this pair.

Having identified the number of vesting securities, we then calculate their delta. The delta measures the dollar change in the value of a security for a $1 change in the stock price, and thus the manager's incentive to inflate the stock price. It equals the number of shares it 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.[5] [6]

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[5] For options that vest in year *t+1*, we use the risk-free rate, volatility, expiration date, and dividend yield from Equilar, as of the end of year *t*. The rationale is that, when making his investment decisions at the start of year *t+1,* the CEO will take into account the delta of his options at the start of this year. If these are unavailable, we use the inputs associated with a firm's newly-awarded options in year *t+1* from Equilar, followed by year *t*'s inputs from ExecuComp (or year *t+1*'s if year *t*'s are missing), and by year *t*'s inputs from Compustat (or year *t+1*'s if year *t*'s are missing), in that order. As a robustness check, we use Equilar inputs in year *t*, followed by Execucomp inputs in year *t*, followed by Compustat inputs in year *t*, followed by Equilar inputs in year *t+1*, followed by Execucomp inputs in year *t+1*, followed by Compustat inputs in year *t+1*, in that order. The results are barely affected.

[6] If the Black-Scholes inputs cannot be located directly in any of the three databases, we fill in the missing volatility by calculating past three-year stock price volatility using the CRSP daily files, the missing risk-free rate with the

After summing across the deltas of all of the CEO's vesting stock and options, we multiply the aggregate delta by the stock price at the end of year *t*. We call the resulting measure "sensitivity", and it represents the dollar change in the value of a CEO's equity for a 1% change in the stock price (it is equivalent to the Hall and Liebman (1998) measure of incentives). While the delta represents the effective number of vesting shares, the sensitivity represents their effective value. Thus, in contrast to delta, sensitivity is comparable across firms with different stock price levels, and immune to stock splits.[7]

We sum the sensitivities of newly-vesting stock ($NEWLYVESTINGSTOCK_{t+1}$) and options ($NEWLYVESTINGOPTION_{t+1}$) to create $NEWLYVESTING_{t+1}$, the total sensitivity of all newly-vesting securities in year $t+1$. We analogously calculate $ALREADYVESTED_t$, the sensitivity of all stock and options that had vested by the end of year *t*, and $UNVESTED_t$ for unvested equity. We then create $UNVESTEDADJ_t$, which equals $UNVESTED_t$ - $NEWLYVESTING_{t+1}$ and thus excludes securities that vest in year $t+1$; we set this variable to zero if it is negative.[8] Appendix B gives a sample calculation for one CEO-year.

An advantage of our *NEWLYVESTING* measure is that it directly estimates the number of shares and options that actually vest each year, based only on information that is available in the current and the previous proxy statements. In contrast to duration, it does not require additional data or assumptions about the vesting schedules of previously awarded grants. Depending on the source, such historical data is often incomplete or inaccurate. For example, Equilar provides

Treasury Constant Maturity Rate with the closest term to a given option, and the missing dividend yield by calculating the past five-year average dividend yield using the Compustat annual files, whenever data permits. If the expiration date is missing from Equilar, we delete the option.

[7] Several empirical studies of CEO incentives call this sensitivity measure "delta". In option pricing, delta refers to the dollar change in the value of an option for a $1 change in the value of the underlying share, so we use "sensitivity" to refer to the dollar change in the value of an option for a 1% change in the underlying share.

[8] In rare cases, $NEWLYVESTING_{t+1}$ can exceed $UNVESTED_t$ 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.

information from proxy statements on the vesting period of a particular equity grant in the year in which it is awarded, and whether the grant exhibits cliff or graded vesting. However, the designation of "graded vesting" could refer to straight-line vesting (e.g., a grant of 100 shares with a 5-year horizon vests at a rate of 20 shares per year), backloaded vesting (e.g., 20 shares vest in year 4 and 80 shares in year 5), or frontloaded vesting. In addition, the data on vesting schedules on Equilar is available only starting in 2006, so additional assumptions must be made for grants awarded prior to this period (see Gopalan et al. for a possible methodology).[9]

As an alternative measure of myopic incentives, we construct the ratio of *NEWLYVESTING* to the sum of *NEWLYVESTING* and *UNVESTEDADJ* (*RATIO*). This ratio measures the CEO's concerns for the stock price over the upcoming year relative to future years. One drawback of this measure is that it does not account for the dollar amount of vesting equity and thus the magnitude of myopic incentives. For example, if the CEO has little unvested equity, then even a small dollar value of newly-vesting equity will lead to a large *RATIO* even though the CEO will gain little from myopia in dollar terms. Nevertheless, we include tests based on *RATIO* as a robustness check. Similarly, we calculate *RATIOALL*, which equals *NEWLYVESTING* divided by the sum of *NEWLYVESTING*, *UNVESTEDADJ*, and *ALREADYVESTED*, i.e., the total sensitivity across all equity holdings.

1.3 Measurement of investment

Having described our measure of managerial incentives, we next turn to measuring myopic actions. Theoretically, myopia comprises any actions that increase current earnings at the

[9] 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 this dataset contains significant data errors, missing filings, and in particular inconsistencies with Execucomp (see, for example, Bekkum and Zhu (2013)).

expense of long-term value, but this cost cannot be observed immediately by the market. Our first measure is the change in R&D (*ΔRD*), scaled by total assets. R&D is generally expensed and thus immediately reduces earnings.[10] However, the cash flows created by R&D typically arise in the long-term, and it is difficult for even a forward-looking market to assess them immediately and incorporate them in 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 expenditure and not its quality (i.e., its impact on future cash flows). For example, it is not clear whether a cut in R&D is due to an increase in efficiency or myopia.[11] For these reasons, prior literature finds that managers view R&D cuts as a way to increase short-run earnings. 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 (such as R&D and advertising), 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.[12]

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")

[10] The general rule for R&D costs under the Statement of Financial Accounting Standards Rule 2 is that they are expensed because their future economic benefits are uncertain. However, exceptions exist. Tangible assets acquired for R&D activities that have alternative future uses can be capitalized, as can the costs of computer software that is to be sold, leased, or otherwise marketed, after the technological feasibility for the product is established.

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

[12] 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 bias our tests against finding a positive association between R&D cuts and vesting equity.

or indeed zero. Following Himmelberg, Hubbard, and Palia (1999), we set missing R&D values to zero. As a robustness check, we remove an observation if R&D is missing and the results are slightly stronger.

Based on a similar reasoning, we also include the increase in advertising expenditure in the dependent variable, if available. Chan, Lakonishok, and Sougiannis (2001) provide evidence that both advertising and R&D might be underpriced by the market, suggesting that a cut in these expenditures could boost the short-term stock price. We thus form *ΔRDAD*, the change in the sum of R&D and advertising expenditures, scaled by total assets. We set missing advertising expenditures to zero.

We also include the change in capital expenditure (*ΔCAPEX*) and total investment (*ΔCAPEXALL*), scaled by 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 represents a more comprehensive measure as it captures investment not fully reflected on the cash flow statement, such as capitalized leases.[13]

While capital expenditure is not directly expensed, and thus has a lower effect on earnings than R&D or advertising, it does depress earnings through raising depreciation. In addition, it is typically financed by reducing cash or taking on additional 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 R&D, advertising, and capital expenditure (*ΔRDADCAPEX* and *ΔRDADCAPEXALL*), which aggregates all of these "discretionary" expenditures.

[13] For example, consider a firm that sells capital and then leases it back to raise cash. *CAPEXALL* calculated from the balance sheet will correctly reflect the fact that no disinvestment has occurred, since the capitalized lease will be reflected in gross fixed assets. However, *CAPEX* taken from the cash flow statement will reflect large disinvestment.

We use "investment" as an umbrella term to encapsulate the six different measures of long-term behavior: *RD*, *RDAD*, *CAPEX*, *CAPEXALL*, *RDADCAPEX*, or *RDADCAPEXALL*. Since R&D and advertising have a more negative effect on current earnings, due to being fully expensed, the first two are our primary measures of investment.

1.4 Control variables

In addition to the measures of CEO incentives, we also include additional control variables that may drive investment in year *t+1*. We use the controls in Asker, Farre-Mensa, and Ljungqvist (2013), plus some additional controls. The first five proxy for investment opportunities: Tobin's Q at the end of year *t* and *t+1*, the compounded monthly market-adjusted stock return over year *t* ($MOMENTUM_t$), the log of market equity at the end of year *t* (MV_t), and firm age (AGE_t).[14] The next set of controls measure firm profitability and financial strength: cash and short-term investments ($CASH_t$), book leverage ($BOOKLEV_t$), retained earnings ($RETEARN_t$), and the return-on-assets ratio (ROA_t). Finally, we add $SALARY_t$ and $BONUS_t$, two other components of CEO compensation. All variables are defined in Appendix A.

1.5 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.

The sensitivity of newly-vesting securities, *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

[14] As in Asker et al. (2013), our results are robust to using sales growth rates between year *t* and *t+1*, and *t-1* and *t*, as an alternative proxy for growth opportunities to Q_t and Q_{t+1}.

options (shares). The sample means for *RATIO* and *RATIOALL* are 0.43 and 0.12, respectively, and the medians are 0.39 and 0.09. The standard deviation of *NEWLYVESTING* is $6.4 million and the coefficient of variation (standard deviation divided by the mean) is 1.8. For comparison, the coefficient of variation is 0.7 when computed separately for each CEO and then averaged, suggesting significant within-firm variation in the *NEWLYVESTING* measure.[15]

2 Investment

2.1 Equity vesting: main tests

To test our hypothesis that newly-vesting equity is associated with managerial myopia, we run the following panel regression (omitting the firm subscript for brevity):

$$\Delta INVESTMENT_{t+1} = \alpha + \beta_1 NEWLYVESTING_{t+1} + \beta_2 UNVESTEDADJ_t + \beta_3 ALREADYVESTED_t + \gamma OTHER\_CONTROLS_t + \varepsilon_t, \qquad (2)$$

where $\Delta INVESTMENT_{t+1}$ is the change in one of the six investment variables from year t to $t+1$, scaled by total assets. We measure *NEWLYVESTING* over year $t+1$, the same time period over which *ΔINVESTMENT* is measured. The rationale is that, at the start of year $t+1$, the CEO knows (from his contract) the amount of equity that will vest over that year, and so may cut investment accordingly. Our hypothesis is that $\beta_1 < 0$: newly-vesting equity is associated with a fall in investment. As control variables, we include $UNVESTEDADJ_t$, $ALREADYVESTED_t$, and $OTHER\_CONTROLS_t$, a vector of the additional controls described in Section 1.4.

[15] 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.

We include the other components of the CEO's equity incentives, $UNVESTEDADJ_t$ and $ALREADYVESTED_t$, since they could be correlated with both $NEWLYVESTING_t$ and investment, although the direction of any correlation with investment is unclear. While unvested equity that does not vest for several more years should dissuade myopia, equity that vests soon after the upcoming year may have the opposite effect. Laux (2012) shows theoretically that unvested equity may exacerbate myopia: the CEO takes short-term actions to avoid being fired because termination leads to the forfeiture of his unvested equity. While already-vested equity could lead to short-termism since the CEO can often sell it at any time, he may be voluntarily holding a significant portion of the vested holdings for the long-term, e.g. for control, investment, or signaling purposes.

We use firm fixed effects to control for both firm-level heterogeneity in investment opportunities and CEO preferences towards investment (e.g., certain CEOs may be more cautious or more overconfident), 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 in *NEWLYVESTING* within a firm, which is sizable as discussed in Section 1.5.

Table 2, Panel A presents the core result of the paper. It shows that impending vesting of equity is significantly negatively associated with growth in five of the six investment measures – all except *CAPEX*. These results are also economically significant. For example, an interquartile increase in *NEWLYVESTING* is associated with a 0.11 percentage point decline in ΔRD (the growth in R&D scaled by total assets), which corresponds to 37% of the average growth in R&D scaled by total assets, 2% of the average R&D-to-assets ratio, and an average decline in R&D of approximately $1 million per year based on the median total assets of $882 million in our sample. To our knowledge, these results are the first to link equity vesting to real investment decisions.

The coefficient on *UNVESTEDADJ* is insignificant in all specifications, consistent with the ambiguous effect of unvested equity on investment. *ALREADYVESTED* is positive and significant in two specifications, weakly consistent with the idea that at least some of the already-vested equity represents long-term holdings. Other control variables 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, and (the negative of) book leverage, and the return-on-assets ratio.

2.2 Equity vesting: robustness tests

In Table 2, Panel A, we have the level of $NEWLYVESTING_{t+1}$ as the explanatory variable of interest including firm fixed effects. The regression thus tests whether investment falls from the previous year's level when the level of newly-vesting equity is high relative to the firm mean. Alternatively, one could ask whether investment falls when the level of newly-vesting equity is high, relative to the previous year's level. In Table 2, Panel B, we replace the levels of $NEWLYVESTING_{t+1}$, $UNVESTEDADJ_t$, and $ALREADYVESTED_t$ with $\Delta NEWLYVESTING_{t+1}$, $\Delta UNVESTEDADJ_t$, and $\Delta ALREADYVESTED_t$, the changes in these variables from the previous year. The results are very similar, with $\Delta NEWLYVESTING_{t+1}$ being significantly negatively related to the same five investment measures.

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' times-to-maturity overestimate their effective horizons. To address this concern, in Panel C of Table 2, we repeat the main tests using intrinsic values rather than deltas to calculate the sensitivities of newly-vesting options (and treat stock the same as before). Thus, we assign a sensitivity of one to all in-the-money options, and zero to all out-of-the-money options. Panel C shows that the results are barely affected. 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. Similarly, the delta captures the likelihood that an in-the-money option will remain in the money later in the year. In the Online Appendix Table OA1, Panel A, 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.

One potential concern with Table 2, Panel A is that $NEWLYVESTING_{t+1}$ is correlated with the stock price at the start of year $t+1$, and thus investment opportunities in year $t+1$. Such correlation could stem from two sources. First, *NEWLYVESTING* is the delta of the CEO's vesting equity multiplied by the stock price at the end of year *t*. The multiplication by the stock price is necessary to obtain an incentive measure that reflects the CEO's wealth gain from increasing the stock price by a given percentage (rather than dollar) amount. Without the multiplication, our results become stronger.[16] Second, the delta of the CEO's vesting options is itself increasing in the current stock price. As a result, increases in the stock price both reflect improvements in investment opportunities and augment *NEWLYVESTING*. Such a channel will lead to a positive correlation between *NEWLYVESTING* and investment, which is the opposite of

[16] 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 thus 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.

what we find. In addition, Table 2, Panel A already includes the price-based controls Q_t, Q_{t+1}, $MOMENTUM_t$, and MV_t. The intrinsic value analysis in Table 2, Panel C also partly addresses this concern as it does not use deltas, although the current stock price does affect whether an option is classified as in-the-money or out-of-the-money. In the Online Appendix, we conduct additional robustness checks to address any residual correlation. In Table OA1, Panel B, rather than using an option's actual delta (which depends on the stock price), we assume a delta of 0.7, which is the mean delta in our sample. In Panel C, 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 according to volatility and other inputs. Both panels show that the results are barely affected.

In Table 2, we control for *UNVESTEDADJ* and *ALREADYVESTED* by including them as additional regressors. An alternative specification is to use them to scale the *NEWLYVESTING* measure and have *RATIO* or *RATIOALL* as the key explanatory variables. Scaling provides a useful robustness check but has two potential drawbacks: the scaled measures do not account for the dollar amount of vesting equity, and the direction of the relationship between investment and the scaling variables *UNVESTEDADJ* and *ALREADYVESTED* is ambiguous. Nevertheless, we report regressions with the scaled measures as a robustness check in Table 3.

In Panel A, we find that *RATIO*, i.e., the ratio of *NEWLYVESTING* to the sum of *NEWLYVESTING* and *UNVESTEDADJ,* is significantly negatively related to changes in R&D, scaled by total assets. An interquartile increase in *RATIO* is associated with a 0.16% fall in ΔRD, 53% of the sample mean ΔRD and 3% of the sample mean *RD*. This result remains significant when adding changes in advertising but not capital expenditure to the dependent variable, consistent with the idea that cutting R&D and advertising is a more effective way to inflate earnings. Panel B shows similar results using *RATIOALL*, i.e., the ratio of *NEWLYVESTING* to the sum of *NEWLYVESTING*, *UNVESTEDADJ*, and *ALREADYVESTED*. The robustness tests in the Appendix Table OA2 show that the results are similar when using the changes-on-changes specification (Panels A-B), replacing option deltas with intrinsic values (Panels C-D), assuming that all deltas are 0.7 (Panels E-F), and assuming that all options are at-the-money (Panels G-H).

The regressions in Tables 2 and 3 use investment changes as the dependent variables. Table 4 uses a measure of abnormal discretionary expense developed in Roychowdhury (2006). To construct this measure, we regress discretionary expenses (the sum of R&D, advertising, and SG&A) on the lagged sales-to-assets ratio and the inverse of lagged assets for each fiscal year and 2-digit SIC industry. The abnormal expense *ABDISEXP* – a measure of a firm's "real earnings management" – is the residual from this regression. Unlike *ΔINVESTMENT*, the dependent variable in our baseline specifications (which measures the change in investment from the previous year), *ABDISEXP* is a deviation of a firm's expenditures from an industry benchmark. Table 4 reports results consistent with those in Tables 2 and 3. The coefficients on all three vesting measures – *NEWLYVESTING*, *RATIO*, and *RATIOALL* – are negative, and are statistically significant for the first two measures. An inter-quartile increase in *NEWLYVESTING* is associated with a 0.3% decline in abnormal discretionary expenses, as a percent of lagged total assets.

2.3 Equity sales

The analysis in Section 2.1 studies the responsiveness of investment to newly-vesting equity. A broader question is how investment responds to the CEO's anticipated equity sales, which can stem from channels other than vesting. In Stein (1989), the manager's myopic incentives arise because he expects to sell equity soon, but the model is ambivalent about the cause of such sales.

Anticipated sales could arise when a CEO voluntarily holds already-vested equity as a long-term investment, but later decides to sell it to rebalance his portfolio or meet an anticipated liquidity need. Since such sales are endogenous, we estimate the effect of sales on investment using a two-stage least squares ("2SLS") procedure with *NEWLYVESTING* as an instrument for sales.

The two properties of *NEWLYVESTING* discussed in Section 2.1, which justify its use as an independent variable, are analogous to the exogeneity and relevance criteria for a valid instrument. First, the amount of newly-vesting equity is determined by equity grants made several years prior, and thus is unlikely to be correlated with current investment opportunities. Second, newly-vesting equity is likely correlated with actual sales because a risk-averse CEO should sell a significant proportion of his equity when it vests.

We calculate *STOCKSOLD*, the dollar value of the actual equity sold by the CEO, from the Thomson Financial Insider Trading database, which is compiled from Form 4 filed with the SEC. We classify an insider trade as "sale" if the transaction is flagged as "Disposition" in Table 1 of Form 4. We multiply the number of shares sold during year $t+1$ by the firm's stock price at the end of year t.

Table 5, Panel A shows that the sensitivity of newly-vesting equity is indeed highly correlated with the value of equity sales. *STOCKSOLD* has a Pearson (Spearman) correlation of 0.377 (0.393) with *NEWLYVESTING*, both significant at the 1% level. Panel B presents the results of the 2SLS regression. The left-hand side of the panel gives the first-stage results and, consistent with Panel A, shows that our instrument satisfies the relevance criterion: *NEWLYVESTING* is significantly related to *STOCKSOLD* at the 1% level. The right-hand side presents the second-stage results. Consistent with the results of Tables 2 and 3, the fitted value for equity sales (*FIT_STOCKSOLD*) is positively and significantly associated with reductions in the same five measures of investment as in Table 2, Panel A – all except *ΔCAPEX*. An interquartile increase in *STOCKSOLD* is associated with a 0.25 percentage point decline in the growth of R&D scaled by assets, 84% of the average growth of R&D scaled by assets and 4.6% of the average R&D-to-assets ratio.

Overall, the analysis presented so far shows a consistent negative relation between newly-vesting equity and various measures of investment, supporting managerial myopia theories. However, we cannot make strong causal claims. Even though newly-vesting equity is determined by equity granted several years prior, we cannot rule out the hypothesis that boards are able to forecast declines in investment opportunities several years in advance and schedule vesting periods to coincide with these declines, so that the CEO cannot sell equity while investment opportunities are strong. Under this alternative explanation, there is no direct causality from *NEWLYVESTING* to a decline in investment growth, but an omitted variable (expected future investment opportunities) causes both. This explanation requires boards to be able to forecast investment opportunities several years in advance. We try to address this hypothesis by including several controls for observable time-variation in both investment opportunities and the ability to finance investment, firm fixed effects to control for firm-specific time-invariant unobservable drivers of these factors, and year fixed effects to control for aggregate time-varying unobservable drivers. However, we cannot control perfectly for factors that are both firm-specific and time-varying. Thus, the next section performs additional tests to help distinguish between the different hypotheses. Note that the alternative explanation outlined above is also consistent with myopia theories. If the board is deliberately timing the vesting period of equity to coincide with a decline in investment opportunities, such behavior is consistent with the board recognizing that newly-vesting equity deters investment.

3 Earnings Announcements

3.1 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 or managing discretionary accruals) to avoid announcing earnings per share (EPS) below analyst expectations, since doing so 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.[17] (For brevity, we use the verb "beat" to refer to weakly beating analyst consensus, i.e., delivering earnings at or above the forecast.)

Finding a positive relationship would provide further evidence – separate to that in Section 2 – that vesting equity is correlated with managerial myopia. Moreover, it would help distinguish between the two potential explanations for the results of Section 2. A positive relationship would be consistent with managers with significant vesting equity inflating earnings, potentially through reductions in investment, but could not be explained by boards designing contracts so that equity vests when investment opportunities decline.

Figure 1 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 those in the bottom tercile. The difference is greatest for earnings

[17] Relatedly, Cheng and Warfield (2005) link equity incentives to narrowly beating the analyst forecast, but do not study equity vesting. McVay, Nagar, and Tang (2006) show that managers are more likely to narrowly beat the forecast in advance of share sales. Finally, Matsunaga and Park (2001) find that missing the forecast is associated with a significant reduction in CEO bonuses.

announcements that beat the forecast by a small margin, consistent with the manager's incentives to inflate earnings being strongest when the firm is close to missing the forecast. In contrast, earnings significantly above the forecast are more likely to reflect unexpectedly good performance. For example, for the bottom tercile of *NEWLYVESTING*, 9.5% of earnings announcements beat the forecast by less than one cent. This figure is 12.0% for the top tercile, an increase of 25.8%.

Below, we examine the link between vesting equity and the likelihood of beating consensus forecasts in a multivariate setting, running the following firm-quarter regression on a panel of quarterly earnings announcements:

$$BEAT_{t+1} = \alpha + \beta_1 NEWLYVESTING_{t+1} + \beta_2 UNVESTEDADJ_t + \beta_3 ALREADYVESTED_t + \gamma OTHER\_CONTROLS2_t + \varepsilon_t, \qquad (3)$$

The dependent variable ($BEAT_{t+1}$) 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 in the literature, and require a firm to have at least three analysts after this deletion. For each analyst, we take the most recent forecast before the announcement.

We also rerun equation (3) using the dependent variables $BEATBELOW1_{t+1}$, which equals 1 if the firm beats the consensus forecast by 1 cent or less, and $BEATABOVE1_{t+1}$, which equals 1 if the firm beats the consensus forecast by more than 1 cent. We predict that the link between vesting and the likelihood of beating the forecast is especially strong for $BEATBELOW1_{t+1}$.

The key independent variable remains $NEWLYVESTING_{t+1}$. We control for the two additional incentive measures $UNVESTEDADJ_t$ and $ALREADYVESTED_t$, plus $OTHER\_CONTROLS2_t$, a vector of additional controls previously shown to affect the likelihood of beating earnings forecasts (e.g., Matsumoto (2002), Davis, Soo, and Trompeter (2009)). We use Tobin's Q (*Q*), the log of the market value of equity (*MV*), return on assets (*ROA*), and firm age (*AGE*), as in the investment regressions. We also include *INSTIPCT*, institutional ownership as a percentage of total shares outstanding, 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 6 presents the results. Column (1) shows that newly-vesting equity is positively associated with the likelihood of beating analyst forecasts, with the coefficient on *NEWLYVESTING* significant at the 10% level. The significance increases to 5% level in column (2) for *BEATBELOW1*, the likelihood of beating the analyst forecast by up to one cent. In contrast, *BEATABOVE1* is unrelated to vesting: the coefficient on *NEWLYVESTING* in column (3) is negative and close to zero. Table OA3 in the Online Appendix repeats the analyses of columns (2) and (3) using 2 cents and 3 cents as the cutoff, and finds similar results. Thus, the finding that vesting equity is correlated with the likelihood of beating earnings forecasts by a narrow margin but not by a wide margin is not sensitive to our margin definition.

A potential alternative explanation for the results in Table 6 is reverse causality. Some of the manager's equity may exhibit performance-based vesting, and good earnings announcements may cause the stock price to rise and trigger vesting conditions.[18] This explanation would suggest a particularly strong relationship between vesting equity and the likelihood of beating earnings forecasts by a wide margin, which is inconsistent with what we find.

We conduct further analyses to address this alternative explanation. Gopalan et al. (2013) 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. The tests in columns (4) and (5) of Table 6 provide further evidence against this alternative explanation. These regressions replace *NEWLYVESTING* with the separate variables *NEWLYVESTINGSTOCK* and *NEWLYVESTINGOPTION*. Column (4) shows that in the regression with *BEATBELOW1* as the dependent variable, the coefficients on both variables are positive, but only that on *NEWLYVESTINGOPTION* remains statistically significant. Thus, the positive relationship between vesting equity and narrowly beating earnings targets is not driven by performance-vesting stock. Finally, consistent with earlier results, column (5) shows that *BEATABOVE1* is unrelated to both components of vesting equity.

[18] Note that performance-based vesting is not a plausible explanation for the investment results in Tables 2-5 because it suggests a positive relation between vesting and investment, contrary to our findings. Performance-based vesting is triggered after high stock returns, when investment opportunities are also likely to be high. Moreover, all regressions in Tables 2-5 control for stock returns directly. See Bettis, Bizjak, Coles, and Kalpathy (2010) for a study of equity with performance-based vesting.

Overall, the results of Table 6 show that vesting equity is positively associated with narrowly beating earnings forecasts, supporting the hypothesis that vesting causes managers to act myopically. While the tests do not prove that this causal effect drives the results in Section 2, they do narrow the range of admissible alternative explanations. Any one non-causal explanation would also have to explain why vesting equity is correlated not only with falls in investment but also with narrowly beating earnings forecasts.

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

So far we show in two separate tests that vesting equity is associated with reductions in R&D and other discretionary expenses (Sections 2.1 and 2.2) and a higher likelihood that a firm narrowly beats the consensus forecast (Section 3.1). The two tests could reflect different types of myopic actions aimed at inflating the short-term price. For example, firms might attempt to beat the forecast by managing earnings in ways other than through R&D cuts (such as accelerating sales); R&D cuts could be used to increase earnings (and thus the stock price) in general, not necessarily in the neighborhood of the forecast. In this section, we explore the extent to which the two pieces of evidence are related. Specifically, we examine whether CEOs with vesting equity are more likely to cut R&D if it allows them to meet 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. We start by computing a hypothetical EPS (HEPS) for each quarter defined as:

$$HEPS_t = EPS_t + (R\&D_t(1-\tau) - R\&D_{t-4}(1-\tau))/Shares\ Outstanding_t. \quad (4)$$

Subscripts t and $t-4$ denote quarters, and τ is the firm's after-interest marginal tax rate in the fiscal year of quarter t from Blouin, Core, and Guay (2010). A firm-quarter is defined as *CUTANDBEAT*=1 if $HEPS_t < Forecast_t$ *and* $EPS_t \geq Forecast_t$, and 0 otherwise.

The tests in Table 7 are logistic regressions estimated on a panel of firm-quarters with the dependent variable equal to one for quarters classified as *CUTANDBEAT*. The key independent variable is newly-vesting equity in the fiscal year that quarter t belongs to ($NEWLYVESTING_y$):

$$Prob(CUTANDBEAT_t) = \alpha + \beta_1 NEWLYVESTING_y + \beta_2 UNVESTEDADJ_{y-1} + \beta_3 ALREADYVESTED_{y-1} + \gamma OTHER\_CONTROLS3_t + \varepsilon_t, \quad (5)$$

The regression is estimated on three different panels for robustness: the full panel of 15,667 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 ($R\&D_{t-4} > 0$), 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 $t-4$ ($R\&D_{t-4} > 0$ and $\Delta R\&D_t < 0$ with $\Delta R\&D_t = (R\&D_t - R\&D_{t-4})/AT_{t-4}$). In each panel, 582 firm-quarters are classified as the *CUTANDBEAT*=1. The control variables are similar to those in the main tests in Table 2, except that the variables with a subscript $t-1$ are computed for the prior fiscal quarter using Compustat quarterly files, and those with a subscript y are computed for the fiscal year of quarter t using Compustat annual files. We also include the level of R&D expenditure in quarter $t-4$, since a higher level may provide greater scope to cut.

The regressions in Table 7 show that *NEWLYVESTING* is significantly positively associated with the probability of *CUTANDBEAT*. This result is consistent with firms with high vesting equity cutting R&D to beat analyst forecasts. The coefficients on *NEWLYVESTING* are significant at the 1% level in all three regressions. For example, based on column (3), we find that within firm-quarters with R&D cuts, the frequency of *CUTANDBEAT* increases from 20.8% to 25.1% (21% increase in odds) when *NEWLYVESTING* increases by one standard deviation around its mean. Interestingly, the coefficients on *ALREADYVESTED* and *UNVESTEDADJ* are negative, and significant for *ALREADYVESTED*. The negative coefficient on *ALREADYVESTED* is consistent with our discussion in Section 2.1: already-vested equity may partly capture the CEO's long-term holdings (e.g., for control reasons).

As a final robustness check, we conduct a slightly modified test which restricts the sample to firm-quarters in which (1) the firm would have missed the analyst forecast if its R&D expense remained at the same level as in the same quarter of the prior year (*t-4*), and (2) it would have been possible for the firm to beat the forecast by cutting its R&D expense relative to that quarter.[19] Table OA4 in the Online Appendix shows that, within this sample, R&D cuts are significantly more likely for firms with high levels of newly-vesting equity. In contrast, the relation between R&D cuts and *NEWLYVESTING* is negative and is insignificant within a subsample of firms for which an R&D cut would have no impact on beating the forecast.

In sum, the results in this section provide further support for the hypothesis that vesting induces CEOs to behave myopically. They also reinforce the interpretation of our main findings in Table 2 that the R&D cuts associated with vesting are motivated, at least in part, by CEOs' attempts to inflate reported earnings to beat short-term earnings targets and thus the stock price.

3.3 Market reaction to earnings announcements

The results of the paper thus far show that managers with significant vesting equity are more likely to reduce investment and narrowly beat earnings forecasts. In this section, we study the

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[19] The test is similar to Bushee (1998) except that he investigates whether firms cut R&D to prevent earnings falling below the previous year's level (rather than to beat the analyst forecasts).

separate question of whether the market rationally takes into account the managers' myopic tendencies. In the Stein (1989) "signal-jamming" equilibrium, myopic managers cut investment to increase earnings in an attempt to inflate the stock price, but the market correctly discounts the reported earnings and all firms are efficiently priced. Even though managers do not succeed in misleading the market, they are trapped into inflating earnings as the market discounts whatever earnings they report. Hence, the market is efficient and managers rationally, but inefficiently, underinvest. An alternative scenario is one in which the market does not anticipate the managers' myopic behavior – either because it lacks information on managers' incentives, or because it has information but is inefficient – and thus fails to account for earnings inflation when pricing the firm.

We distinguish between these two scenarios by studying how the market's reaction to earnings announcements depends on the level of vesting equity. The market reaction to an earnings announcement is increasing in the surprise, with a discontinuity at zero: beating the forecast leads to a markedly higher reaction than missing it (Bartov, Givoly, and Hayn (2002)). We test whether, controlling for the earnings surprise, the market's response is less positive for CEOs with significant vesting equity, because vesting equity increases investors' perceived probability that the CEO has inflated earnings. We run the following regression:

$$CAR_{t+1} = \alpha + \beta_1 NEWLYVESTING_{t+1} + \beta_2 UNVESTEDADJ_t + \beta_3 ALREADYVESTED_t + \gamma_1 BEAT_{t+1} + \gamma_2 NEWLYVESTING_{t+1} \times BEAT_{t+1} + \gamma_3 DIF_{t+1} + \delta OTHER\_CONTROLS4_t + \varepsilon_t, \quad (6)$$

CAR_{t+1} is the (-1, +1) three-day market-adjusted return to a quarterly earnings announcement in year $t+1$, which is also the year for which we measure vesting equity ($NEWLYVESTING_{t+1}$).

In our previous regressions, the dependent variable was a *t+1* decision affected by the manager, such as investment or earnings, and the manager knows $NEWLYVESTING_{t+1}$ at the time of this decision since he observes his own contract. Here, it is investors who determine the announcement return, and they are typically unable to calculate $NEWLYVESTING_{t+1}$ using our methodology until the year *t+1* proxy statement is disclosed (see equation (1) in Section 1.2). FAS 123R only requires firms to disclose in their proxy statements the amounts of the CEO's vested and unvested equity holdings, but not the vesting schedules of the unvested holdings. However, investors may be able to estimate how much of a CEO's current equity is scheduled to vest in the coming year, for example, using information available in the firm's past proxy statements (see Gopalan et al. (2013) for a possible methodology) and the footnote to Form 4. Also, in some cases, firms voluntarily disclose the precise vesting schedule of each equity grant in their proxy filings – i.e., the filings contain additional information not in Equilar – so that the market can calculate $NEWLYVESTING_{t+1}$ accurately before the beginning of year *t+1*. To account for this, we divide the equity variables $NEWLYVESTING_{t+1}$, $UNVESTEDADJ_t$, and $ALREADYVESTED_t$ into terciles and use the ranks instead of the raw variables in the regressions. This specification assumes that the market can estimate which tercile of vesting equity a firm will fall into, even though it may be unable to predict exactly where within a tercile it will fall. Our results remain robust to using quintiles or deciles.

The regressions also include the same $BEAT_{t+1}$ dummy variable used earlier, and DIF_{t+1}, the earnings surprise (difference between the actual and forecast earnings). *OTHER_CONTROLS4* is a 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 for the last quarter of a fiscal year, because the Q4 earnings announcement sometimes coincides with the release of a proxy statement. *ANNRET(LAG1)*, *ANNRET(LAG2)*, *ANNRET(LAG3)*, and *ANNRET(LAG4)* are earnings announcement returns for quarters -1 to -4 relative to the current quarter, 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 8 presents the results. Column (1) omits the explanatory variables involving *BEAT* and *DIF*, i.e., does not control for the magnitude of the earnings announcement. *NEWLYVESTING* is insignificant, suggesting that the market does not respond more positively to earnings announcements from CEOs with more vesting equity. In combination with Table 6, column (1) suggests that, while such CEOs are more likely to report earnings at or above analyst expectations, the market does not respond any more favorably to such reports, potentially because it expects that they have been inflated. Column (2) adds *BEAT* and *DIF* as additional regressors, to control for the actual announcement. Consistent with the literature, *BEAT* is positive and highly significant. Interestingly, *NEWLYVESTING* is now significantly negative: holding constant the earnings surprise, the market responds less positively to the earnings announcement if the CEO has significant newly-vesting equity, suggesting a higher perceived probability that the earnings have been inflated. Increasing the *NEWLYVESTING* tercile rank by one lowers the announcement return by 0.28 percentage points.

Column (3) adds an interaction term between *BEAT* and *NEWLYVESTING*. This interaction term is significantly negative. Thus, the negative association between *NEWLYVESTING* and announcement returns documented in column (2) is driven by quarters in which earnings exceed the analyst forecast, consistent with the market expecting more earnings inflation when earnings surprises are positive. Increasing the *NEWLYVESTING* tercile rank by one lowers the market response to beating a forecast by 1.22 percentage points, versus the average response of 2.46%.

It is interesting to note that the coefficient on *NEWLYVESTING* is now positive. It implies that increasing the *NEWLYVESTING* tercile by one mitigates the negative reaction to missing an earnings forecast by 0.5 percentage points compared to the baseline of -3.6%. One potential interpretation is that the market infers that the manager has not inflated earnings, despite his myopic incentives, mitigating the negative response to missing the forecast.

In sum, we find that, although managers with more vesting equity are more likely to beat earnings forecasts, doing so does not lead to a more positive market response on average. Controlling for the earnings surprise, the announcement returns are lower for higher newly-vesting equity, especially in quarters in which earnings exceed the forecast. These findings suggest that the stock market recognizes managers' incentives to inflate earnings when a significant amount of their equity vests.

4 Conclusion

This paper studies the link between equity vesting and real investment decisions. We construct a new empirical measure of a CEO's myopic incentives that corresponds closely to theories of managerial myopia: the stock price sensitivity of equity vesting over the next year. This measure contrasts standard measures of CEO incentives which gauge the manager's sensitivity to the stock price, but do not consider the horizon. We show that newly-vesting equity is significantly negatively related to R&D, and the relationship remains significant after including other types of investment spending such as advertising and capital expenditure. We find similar results using measures of real earnings management. Using newly-vesting equity as an instrument for equity sales, we find that CEOs reduce R&D when they plan to sell their stock in the near term.

Vesting equity is positively related to the likelihood that a firm beats the analysts' earnings forecast by a narrow margin. This result is consistent with vesting equity causing managers to inflate earnings, possibly through investment cuts. We indeed find that vesting equity increases the likelihood of the manager cutting R&D to meet earnings targets. Interestingly, the market responds less positively to beating earnings forecasts when a significant amount of the CEO's equity vests, suggesting that investors rationally discount good earnings news when they expect earnings to be inflated. This result supports the Stein (1989) myopia theory and suggests that earnings manipulation can persist in equilibrium even if investors and managers are rational, and managers do not succeed in misleading the market.

While we have shown that investment is negatively related to newly-vesting equity, we have not shown that the reduction in investment is inefficient. For example, if managers tend to overinvest, 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.

More generally, our measure of myopic incentives, the sensitivity of stock and options vesting over the upcoming year, is relatively easy to construct, and potentially usable in wider contexts than investment decisions. In future research, it would be interesting to study whether it is linked to other examples of myopic behavior.

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 vesting	
$NEWLYVESTING_{t+1}$	The dollar change in the value of newly-vesting securities in year $t+1$ for a 1% change in the stock price, calculated as *NEWLYVESTINGSTOCK* (the number of newly-vesting shares in year $t+1$ × stock price at the end of year t) plus *NEWLYVESTINGOPTION* (aggregated delta of newly-vesting options in year $t+1$ × stock price at the end of year t). 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 from Equilar, and if unavailable, replaced with those associated with a firm's newly-awarded options in year $t+1$ from Equilar, followed by year t's inputs from ExecuComp (or year $t+1$'s if year t's are missing), and by year t's inputs from Compustat (or year $t+1$'s if year t's are missing), in that order;
$UNVESTED_t$	The dollar change in the value of unvested securities in year t for a 1% 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) plus *UNVESTEDOPTION* (aggregated delta of unvested options × stock price, both at the end of year t). Delta is calculated similarly as above;
$UNVESTEDADJ_t$	The sum of max ($UNVESTEDSTOCK_t$ - $NEWLYVESTINGSTOCK_{t+1}$, 0) and max ($UNVESTEDOPTION_t$ - $NEWLYVESTINGOPTION_{t+1}$, 0);
$ALREADYVESTED_t$	The dollar change in the value of already-vested securities in year t for a 1% change in the stock price, calculated as *ALREADYVESTEDSTOCK* (the number of already-vested shares × stock price, both at the end of year t) plus *ALREADYVESTEDOPTION* (aggregated delta of already-vested options × stock price, both at the end of year t). Delta is calculated similarly as above;
$RATIO_t$	The ratio of $NEWLYVESTING_{t+1}$ to the sum of $NEWLYVESTING_{t+1}$ and $UNVESTEDADJ_t$;
$RATIOALL_t$	The ratio of $NEWLYVESTING_{t+1}$ to the sum of $NEWLYVESTING_{t+1}$, $UNVESTEDADJ_t$, and $ALREADYVESTED_t$;
$NEWLYVESTINGIN_{t+1}$ ($UNVESTEDIN_t$ $UNVESTEDADJIN_t$ $ALREADYVESTEDIN_t$)	Similar to $NEWLYVESTING_{t+1}$, except that options' deltas are replaced with their intrinsic values, i.e., delta is set to 1 for all in-the-money options and is set to zero for all out-of-the-money options (calculations are analogous for all measures with a postfix of *IN*);
Stock sold	
$STOCKSOLD_{t+1}$	The number of shares sold in year $t+1$ × stock price at the end of year t;
Change in investment	
ΔRD_{t+1}	Change in R&D expenditures (XRD) from year t to $t+1$, scaled by total assets (AT) at the end of year t. Missing R&D expenditures are set to zero;
$\Delta RDAD_{t+1}$	Change in the sum of R&D expenditures (XRD) and advertising expenses (XAD) from year t to $t+1$, scaled by total assets at the end of year t. Missing R&D expenditures and advertising expenses are set to zero;
$\Delta CAPEX_{t+1}$	Change in capital expenditures (CAPEX) from year t to $t+1$, scaled by total assets at the end of year t. Missing capital expenditures are set to zero;

$\Delta RDADCAPEX_{t+1}$	Change in the sum of R&D expenditures (*XRD*), advertising expenses (*XAD*), and capital expenditures (*CAPEX*) from year *t* to *t+1*, scaled by total assets at the end of year *t*. Missing R&D expenditures, advertising expenses, and capital expenditures are set to zero;
$\Delta CAPEXALL_{t+1}$	Change in annual increase in gross fixed assets (*PPEGT*) from year *t* to *t+1* (i.e.,($PPEGT_{t+1}$- $PPEGT_t$) - ($PPEGT_t$- $PPEGT_{t-1}$)), scaled by total assets at the end of year *t*. Missing *PPEGT* are replaced with net fixed assets (*PPENT*) if available;
$\Delta RDADCAPEXALL_{t+1}$	Change in the sum of R&D expenditures (*XRD*), advertising expenses (*XAD*), and annual increase in gross fixed assets (*PPEGT*) from year *t* to *t+1*, scaled by total assets at the end of year *t*. Missing R&D expenditures and advertising expenses are set to zero and missing *PPEGT* replaced with *PPENT* if available;
$ABDISEXP_{t+1}$	Abnormal discretionary expenses measure based on Roychowdhury (2006). To compute the measure, we estimate normal discretionary expenses, $NDISEXP_{i,t+1}$ for each firm-year as the fitted values from a cross-sectional regression of : $$\frac{DISEXP_{i,t+1}}{ASSET_{i,t}} = \beta_0 + \beta_1 \frac{1}{ASSET_{i,t}} + \beta_2 \frac{SALE_{i,t}}{ASSET_{i,t}} + \varepsilon_{i,t+1}$$ The regression is estimated separately within each industry-year using all Compustat firms (excluding financial and utilities firms). Industries are classified based on 2-digit SIC codes. *DISEXP* are the sum of R&D expenditures (XRD), advertising expenses (XAD), and selling, general and administrative expenses (XSGA) with missing values set to zero. *SALE* and *ASSET* are the sales revenue and total assets. Abnormal discretionary expenses are then calculated as: $ABDISEXP_{i,t+1} = (DISEXP_{i,t+1} / ASSET_{i,t}) - NDISEXP_{i,t+1}$;
Control variables	
Q_{t+1}	Tobin's Q at the end of year *t+1*, 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*.
Q_t	Tobin's Q at the end of year *t*;
MV_t	Natural logarithm of market value of equity at the end of year *t* (*PRCC_F*× *CSHPRI*);
$MOMENTUM_t$	A firm's compounded market-adjusted monthly stock returns over the twelve months in year *t*, 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	Natural logarithm of one plus a firm's age, approximated by the number of years listed on Compustat, as the end of year *t*;
$CASH_t$	Cash and short-term investments *(CHE)* at the end of year *t* divided by total assets at the end of year *t*;
$BOOKLEV_t$	Book value of debt (*DLTT*+*DLC*) at the end of year *t* divided by total assets at the end of year *t*;
$RETEARN_t$	Balance sheet retained earnings (*RE*) at the end of year *t* divided by total assets at the end of year *t*;
ROA_t	Return-on-assets ratio, calculated as net income (*NI*) during year *t* divided by the average total assets of year *t*;
$SALARY_t$	CEO's salary in year *t*;
$BONUS_t$	CEO's cash bonus in year *t*;

Additional variables used in the earnings forecast analysis

$BEAT_{t+1}$	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;
$BEATBELOW1_{t+1}$	A dummy variable that equals one if the reported EPS falls between mean analyst consensus forecast and that plus 1 cent in a given quarter;
$BEATABOVE1_{t+1}$	A dummy variable that equals one if the reported EPS exceeds mean analyst consensus forecast plus 1 cent in a given quarter;
$INSTIPCT_t$	The total percentage of shares owned by institutional investors at the end of the 4th quarter of year *t*;
ALY_N_{t+1}	Natural logarithm of one plus the number of analysts;
$HORIZON_{t+1}$	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_{t+1}	Analyst forecast dispersion, calculated as the standard deviation of analyst forecasts scaled by the absolute value of the mean analyst consensus forecast;
$POSUE_{t+1}$	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 logit regressions of R&D cuts

$CUTANDBEAT_t$	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: $HEPS_t = EPS_t + (R\&D_t(1-\tau) - R\&D_{t-4}(1-\tau))/Shares\ Outstanding_t$. Subscripts *t* and *t-4* denote quarters, and τ is the firm's after-interest marginal tax rate in the fiscal year of quarter *t* from Blouin, Core, and Guay (2010). A firm-quarter is classified as *CUTANDBEAT* if $HEPS_t < Forecast_t$ and $EPS_t \geq Forecast_t$;
$R\&D_{t-4}$	R&D expense (*XRDQ*) in quarter *t-4* divided by total assets at the end of quarter *t-4*;

Additional variables used in the earnings announcement analysis

CAR_{t+1}	Cumulative market adjusted return from day -1 to +1 around the quarterly earnings announcement in year *t+1*. 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_{t+1}	Difference between the reported EPS and the mean analyst consensus forecast;
$LEVERAGE_t$	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 percent;
PASTRET(1M)	Monthly industry adjusted return for the month prior to the earnings announcement in percent;
Q4	A dummy variable to indicate the 4th quarter of a fiscal year;
ANNRET(LAG1-4)	Cumulative market adjusted returns from day -1 to +1 around the quarterly earnings announcements in the quarters -1 to -4 relative to the current quarter. The computation is the same as for the current quarter.

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 securities for the fiscal year ended on June 30th, 2009 (*NEWLYVESTING*), that of his unvested securities for the fiscal year ended on June 30th, 2008 (*UNVESTED*), and that of his already-vested securities for the fiscal year ended on June 30th, 2008 (*ALREADYVESTED*).

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 $(EXERPRC_p, EXPDATE_d)_{t+1}$ = *UNVESTEDOPTIONNUM* $(EXERPRC_p, EXPDATE_d)_t$ + *NEWLYAWARDEDOPTIONNUM* $(EXERPRC_p, EXPDATE_d)_{t+1}$ - *UNVESTEDOPTIONNUM* $(EXERPRC_p, EXPDATE_d)_{t+1}$

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 *ALREADYVESTEDOPTION* 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 *ALREADYVESTEDSTOCK* 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*, *ALREADYVESTED*, *RATIO*, and *RATIOALL.*

B.5 Variables used in the main specification				
NEWLYVESTING	***UNVESTEDADJ***	***ALREADYVESTED***	***RATIO***	***RATIOALL***
542,316	1,731,637.95	235,602,587	0.238	0.002

Table 1: Sample selection and summary statistics

Panel A: Sample selection

Firm-CEO-years from Equilar for which we can calculate newly-vesting securities in year *t+1*, and unvested and already-vested securities in year *t* 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 vesting								
$NEWLYVESTINGSTOCK_{t+1}$	6,730	1,007,672	2,203,651	0	0	127,564	926,250	5,142,500
$NEWLYVESTINGOPTION_{t+1}$	6,730	2,539,718	5,062,821	0	173	660,451	2,496,377	11,700,000
$NEWLYVESTING_{t+1}$	6,730	3,626,232	6,372,761	0	310,737	1,257,137	3,917,051	15,900,000
$UNVESTEDSTOCK_{t}$	6,730	3,746,586	7,785,361	0	0	792,389	3,645,577	17,700,000
$UNVESTEDOPTION_{t}$	6,730	5,339,176	10,300,000	0	0	1,370,083	5,440,901	24,500,000
$UNVESTED_{t}$	6,730	9,337,752	15,700,000	0	841,833	3,341,484	10,400,000	39,500,000
$UNVESTEDADJ_{t}$	6,730	5,656,486	10,200,000	0	346,113	1,835,151	6,132,905	25,000,000
$ALREADYVESTEDSTOCK_{t}$	6,730	55,900,000	191,000,000	72,775	1,629,998	6,123,997	22,800,000	244,000,000
$ALREADYVESTEDOPTION_{t}$	6,730	12,600,000	25,900,000	0	288,680	2,828,472	11,900,000	60,400,000
$ALREADYVESTED_{t}$	6,730	70,400,000	205,000,000	415,985	4,156,739	13,300,000	43,500,000	298,000,000
$RATIO_{t}$	6,167	0.431	0.246	0.060	0.273	0.392	0.536	1.000
$RATIOALL_{t}$	6,710	0.116	0.116	0.000	0.024	0.090	0.167	0.336
Stock sold								
$STOCKSOLD_{t+1}$	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+1}	6,730	0.003	0.029	-0.017	0.000	0.000	0.002	0.037
$\Delta RDAD_{t+1}$	6,730	0.004	0.032	-0.023	0.000	0.000	0.004	0.044
$\Delta CAPEX_{t+1}$	6,730	0.002	0.043	-0.056	-0.009	0.000	0.010	0.061
$\Delta RDADCAPEX_{t+1}$	6,730	0.006	0.065	-0.080	-0.013	0.002	0.019	0.105
$\Delta CAPEXALL_{t+1}$	6,730	0.006	0.106	-0.123	-0.023	0.000	0.024	0.153
$\Delta RDADCAPEXALL_{t+1}$	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+1}	6,730	1.848	1.720	0.470	0.835	1.287	2.141	5.358
Q_t	6,730	2.017	2.024	0.470	0.868	1.372	2.333	5.868
MV_t	6,730	6.896	1.599	4.510	5.779	6.712	7.901	9.897
$MOMENTUM_t$	6,730	0.098	0.540	-0.552	-0.220	0.000	0.275	1.072
AGE_t	6,730	2.841	0.731	1.609	2.398	2.773	3.401	4.060
$CASH_t$	6,730	0.204	0.219	0.006	0.040	0.120	0.295	0.688
$BOOKLEV_t$	6,730	0.215	0.218	0.000	0.013	0.173	0.330	0.645
$RETEARN_t$	6,730	-0.191	1.362	-2.403	-0.144	0.163	0.389	0.724
ROA_t	6,730	0.005	0.179	-0.374	-0.012	0.046	0.090	0.190
$SALARY_t$	6,730	670,194	336,489	265,000	429,577	600,000	860,833	1,300,000
$BONUS_t$	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 incentives, including newly-vesting securities, adjusted unvested securities, and already-vested securities separately

Panel A: Baseline specifications

Dependent Variables	(1) ΔRD_{t+1}	(2) $\Delta RDAD_{t+1}$	(3) $\Delta CAPEX_{t+1}$	(4) $\Delta RDAD\text{-}CAPEX_{t+1}$	(5) $\Delta CAPEX\text{-}ALL_{t+1}$	(6) $\Delta RDAD\text{-}CAPEXALL_{t+1}$
$NEWLYVESTING_{t+1}$	**-0.309****	**-0.391****	**-0.205**	**-0.707****	**-1.395*****	**-2.154*****
	(0.148)	(0.165)	(0.183)	(0.285)	(0.513)	(0.616)
$UNVESTEDADJ_t$	-0.034	-0.053	0.000	-0.093	0.514	0.478
	(0.055)	(0.068)	(0.123)	(0.168)	(0.447)	(0.496)
$ALREADYVESTED_t$	-0.004	-0.002	0.039**	0.035*	0.020	0.016
	(0.005)	(0.006)	(0.017)	(0.018)	(0.037)	(0.042)
Q_{t+1}	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	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	-0.005*	-0.005*	0.004	-0.003	-0.005	-0.014
	(0.003)	(0.003)	(0.003)	(0.005)	(0.008)	(0.010)
$MOMENTUM_t$	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	-0.017*	-0.017	-0.008	-0.030	0.011	-0.004
	(0.010)	(0.010)	(0.012)	(0.019)	(0.036)	(0.041)
$CASH_t$	0.024**	0.027**	0.089***	0.123***	0.274***	0.315***
	(0.010)	(0.011)	(0.014)	(0.022)	(0.033)	(0.041)
$BOOKLEV_t$	-0.004	-0.006	-0.045***	-0.060***	-0.123***	-0.137***
	(0.010)	(0.011)	(0.014)	(0.021)	(0.043)	(0.049)
$RETEARN_t$	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	0.027**	0.036***	0.010	0.051**	0.007	0.059*
	(0.013)	(0.014)	(0.011)	(0.022)	(0.027)	(0.035)
$SALARY_t$	0.007	-0.014	-0.084	-0.134	0.011	-0.049
	(0.052)	(0.069)	(0.119)	(0.150)	(0.250)	(0.280)
$BONUS_t$	-0.001	-0.000	0.001	0.005	0.034	0.047
	(0.007)	(0.008)	(0.020)	(0.023)	(0.052)	(0.057)
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)
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 CEO's vesting equity and investment. Variable definitions are listed in Appendix A. *NEWLYVESTING*, *UNVESTEDADJ*, and *ALREADYVESTED* are in billions, and *SALARY* and *BONUS* are in ten millions. Standard errors are in parentheses, adjusted for heteroskedasticity, and clustered by firm. Year and firm fixed effects are included in all columns. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

Table 2 (Cont'd)

Panel B: Changes-in-changes specifications

Dependent Variables	(1) ΔRD_{t+1}	(2) $\Delta RDAD_{t+1}$	(3) $\Delta CAPEX_{t+1}$	(4) $\Delta RDAD\text{-}CAPEX_{t+1}$	(5) $\Delta CAPEX\text{-}ALL_{t+1}$	(6) $\Delta RDAD\text{-}CAPEXALL_{t+1}$
$\Delta NEWLYVESTING_{t+1}$	**-0.339****	**-0.378*****	**-0.159**	**-0.632****	**-1.488*****	**-2.091*****
	(0.141)	(0.142)	(0.192)	(0.262)	(0.536)	(0.609)
$\Delta UNVESTEDADJ_t$	-0.054	-0.099*	-0.185	-0.305**	-0.601*	-0.744*
	(0.049)	(0.056)	(0.113)	(0.145)	(0.361)	(0.394)
$\Delta ALREADYVESTED_t$	-0.006	-0.002	0.039**	0.034*	0.052	0.047
	(0.006)	(0.006)	(0.016)	(0.020)	(0.043)	(0.046)
ΔQ_{t+1}	0.000	0.000	0.003***	0.005***	0.013***	0.014***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.003)
ΔQ_t	0.001	0.001	0.001	0.002	0.001	0.002
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
ΔMV_t	0.005*	0.006**	0.015***	0.022***	0.001	0.009
	(0.003)	(0.003)	(0.003)	(0.005)	(0.008)	(0.009)
$\Delta MOMENTUM_t$	0.000	-0.000	-0.001	-0.000	0.014***	0.015***
	(0.001)	(0.001)	(0.002)	(0.003)	(0.005)	(0.005)
$\Delta CASH_t$	0.003	0.003	0.038***	0.040**	0.156***	0.172***
	(0.009)	(0.010)	(0.011)	(0.018)	(0.028)	(0.034)
$\Delta BOOKLEV_t$	-0.005	-0.003	-0.046***	-0.063***	-0.128***	-0.122***
	(0.011)	(0.012)	(0.013)	(0.022)	(0.033)	(0.040)
$\Delta RETEARN_t$	0.005	0.007	-0.003	0.004	-0.002	0.013
	(0.004)	(0.005)	(0.004)	(0.007)	(0.008)	(0.013)
ΔROA_t	0.011	0.015*	0.000	0.020	-0.011	0.022
	(0.008)	(0.009)	(0.010)	(0.015)	(0.022)	(0.025)
$\Delta SALARY_t$	-0.041	0.016	-0.030	-0.041	-0.416	-0.398
	(0.104)	(0.136)	(0.216)	(0.281)	(0.469)	(0.545)
$\Delta BONUS_t$	-0.011	-0.003	0.014	0.013	0.133**	0.142**
	(0.007)	(0.009)	(0.028)	(0.033)	(0.061)	(0.065)
Intercept	0.006***	0.006***	0.011***	0.019***	0.011**	0.016***
	(0.001)	(0.001)	(0.002)	(0.003)	(0.005)	(0.006)
Observations	4,378	4,378	4,378	4,378	4,378	4,378
Adjusted R^2	0.493	0.513	0.397	0.468	0.326	0.368

This panel reports the OLS regression results on the relationship between the CEO's vesting equity and investment. Variable definitions are listed in Appendix A. *NEWLYVESTING*, *UNVESTEDADJ*, and *ALREADYVESTED* are in billions, and *SALARY* and *BONUS* are in ten millions. The prefix *Δ* denotes the change from year *t-1* to *t* for variables with subscript *t* and from year *t* to *t+1* for variables with subscript *t+1*. Standard errors are in parentheses, adjusted for heteroskedasticity, and clustered by firm. Year and firm fixed effects are included in all columns. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

Table 2 (Cont'd)

Panel C: Baseline specification with option delta replaced with its intrinsic value

Dependent Variables	(1) ΔRD_{t+1}	(2) $\Delta RDAD_{t+1}$	(3) $\Delta CAPEX_{t+1}$	(4) $\Delta RDAD\text{-}CAPEX_{t+1}$	(5) $\Delta CAPEX\text{-}ALL_{t+1}$	(6) $\Delta RDAD\text{-}CAPEXALL_{t+1}$
$NEWLYVESTINGIN_{t+1}$	**-0.292****	**-0.392*****	**-0.147**	**-0.650*****	**-1.248*****	**-1.961*****
	(0.114)	(0.126)	(0.127)	(0.201)	(0.376)	(0.446)
$UNVESTEDADJIN_t$	-0.004	0.000	-0.015	-0.038	0.495	0.543
	(0.052)	(0.064)	(0.089)	(0.133)	(0.341)	(0.385)
$ALREADYVESTEDIN_t$	-0.006	-0.002	0.046***	0.043**	0.010	0.004
	(0.005)	(0.006)	(0.016)	(0.018)	(0.036)	(0.040)
Q_{t+1}	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	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	-0.005**	-0.005**	0.004	-0.003	-0.005	-0.015*
	(0.002)	(0.002)	(0.002)	(0.004)	(0.007)	(0.008)
$MOMENTUM_t$	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	-0.017**	-0.017*	-0.009	-0.030**	0.010	-0.004
	(0.008)	(0.009)	(0.010)	(0.015)	(0.030)	(0.034)
$CASH_t$	0.024***	0.027***	0.089***	0.123***	0.274***	0.315***
	(0.009)	(0.009)	(0.011)	(0.018)	(0.027)	(0.035)
$BOOKLEV_t$	-0.004	-0.006	-0.045***	-0.060***	-0.124***	-0.138***
	(0.009)	(0.009)	(0.011)	(0.017)	(0.036)	(0.041)
$RETEARN_t$	0.008***	0.008**	-0.000	0.009**	-0.007	0.006
	(0.003)	(0.003)	(0.002)	(0.005)	(0.006)	(0.008)
ROA_t	0.027**	0.036***	0.010	0.051***	0.008	0.060**
	(0.011)	(0.011)	(0.009)	(0.018)	(0.022)	(0.029)
$SALARY_t$	0.004	-0.019	-0.089	-0.145	0.006	-0.062
	(0.043)	(0.058)	(0.099)	(0.125)	(0.207)	(0.233)
$BONUS_t$	-0.002	-0.000	0.002	0.005	0.036	0.048
	(0.006)	(0.006)	(0.017)	(0.019)	(0.043)	(0.047)
Intercept	0.074***	0.071***	-0.013	0.083*	-0.037	0.054
	(0.025)	(0.026)	(0.030)	(0.046)	(0.091)	(0.104)
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 CEO's vesting equity and investment, replacing the option delta with its intrinsic value. Variable definitions are listed in Appendix A. *NEWLYVESTINGIN*, *UNVESTEDADJIN*, and *ALREADYVESTEDIN* are in billions, and *SALARY* and *BONUS* are in ten millions. Standard errors are in parentheses, adjusted for heteroskedasticity, and clustered by firm. Year and firm fixed effects are included in all columns. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

Table 3: The relationship between change in investment and equity incentive ratios

Panel A: Measuring CEO incentives as the ratio of newly-vesting securities to the sum of newly-vesting securities and adjusted unvested securities

Dependent Variables	(1) ΔRD_{t+1}	(2) $\Delta RDAD_{t+1}$	(3) $\Delta CAPEX_{t+1}$	(4) $\Delta RDAD\text{-}CAPEX_{t+1}$	(5) $\Delta CAPEX\text{-}ALL_{t+1}$	(6) $\Delta RDAD\text{-}CAPEXALL_{t+1}$
$RATIO_t$	**-0.006****	**-0.007*****	**0.002**	**-0.007**	**-0.004**	**-0.017**
	(0.003)	(0.003)	(0.004)	(0.006)	(0.012)	(0.013)
Q_{t+1}	0.003***	0.004***	0.006***	0.011***	0.021***	0.026***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.004)
Q_t	0.003***	0.003***	0.000	0.004**	-0.008***	-0.003
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)
MV_t	-0.007**	-0.007**	0.005*	-0.004	-0.005	-0.018
	(0.003)	(0.003)	(0.003)	(0.005)	(0.009)	(0.011)
$MOMENTUM_t$	0.004**	0.004***	0.010***	0.017***	0.019***	0.027***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.005)	(0.006)
AGE_t	-0.020*	-0.019	-0.010	-0.034*	0.013	-0.003
	(0.011)	(0.012)	(0.012)	(0.020)	(0.039)	(0.045)
$CASH_t$	0.019*	0.023*	0.089***	0.119***	0.268***	0.304***
	(0.011)	(0.012)	(0.015)	(0.023)	(0.035)	(0.043)
$BOOKLEV_t$	-0.011	-0.013	-0.037***	-0.058***	-0.100**	-0.120**
	(0.010)	(0.011)	(0.014)	(0.021)	(0.045)	(0.050)
$RETEARN_t$	0.009**	0.009**	0.000	0.011*	-0.001	0.017*
	(0.004)	(0.004)	(0.002)	(0.006)	(0.007)	(0.009)
ROA_t	0.033**	0.041***	0.009	0.057***	0.012	0.077**
	(0.013)	(0.014)	(0.011)	(0.021)	(0.028)	(0.035)
$SALARY_t$	0.011	0.018	-0.065	-0.077	-0.150	-0.184
	(0.051)	(0.062)	(0.128)	(0.150)	(0.263)	(0.285)
$BONUS_t$	-0.006	-0.004	0.003	0.002	0.051	0.060
	(0.007)	(0.008)	(0.021)	(0.024)	(0.055)	(0.060)
Intercept	0.097***	0.094***	-0.022	0.101*	-0.037	0.088
	(0.033)	(0.035)	(0.037)	(0.059)	(0.118)	(0.135)
Observations	6,167	6,167	6,167	6,167	6,167	6,167
Adjusted R^2	0.411	0.437	0.332	0.419	0.245	0.289

This panel reports the OLS regression results on the relationship between the CEO's equity incentives (measured using *RATIO*) and investment. Variable definitions are listed in Appendix A. *SALARY* and *BONUS* are in ten millions. Standard errors are in parentheses, adjusted for heteroskedasticity, and clustered by firm. Year and firm fixed effects are included in all columns. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

Table 3 (Cont'd)

Panel B: Measuring CEO incentives as the ratio of newly-vesting securities to the sum of newly-vesting securities, adjusted unvested securities, and already-vested securities

Dependent Variables	(1) ΔRD_{t+1}	(2) $\Delta RDAD_{t+1}$	(3) $\Delta CAPEX_{t+1}$	(4) $\Delta RDAD\text{-}CAPEX_{t+1}$	(5) $\Delta CAPEX\text{-}ALL_{t+1}$	(6) $\Delta RDAD\text{-}CAPEXALL_{t+1}$
$RATIOALL_t$	**-0.019****	**-0.021****	**-0.003**	**-0.029****	**-0.014**	**-0.054**
	(0.008)	(0.008)	(0.009)	(0.015)	(0.030)	(0.035)
Q_{t+1}	0.003***	0.004***	0.006***	0.011***	0.021***	0.026***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.004)
Q_t	0.003***	0.003***	0.000	0.005***	-0.008***	-0.002
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)
MV_t	-0.006**	-0.006**	0.005*	-0.003	-0.005	-0.015
	(0.003)	(0.003)	(0.003)	(0.005)	(0.008)	(0.010)
$MOMENTUM_t$	0.004***	0.004***	0.010***	0.016***	0.019***	0.027***
	(0.001)	(0.002)	(0.002)	(0.003)	(0.005)	(0.006)
AGE_t	-0.017*	-0.017*	-0.011	-0.033*	0.006	-0.010
	(0.010)	(0.010)	(0.012)	(0.019)	(0.036)	(0.042)
$CASH_t$	0.024**	0.027**	0.088***	0.122***	0.272***	0.313***
	(0.010)	(0.011)	(0.014)	(0.022)	(0.033)	(0.042)
$BOOKLEV_t$	-0.004	-0.007	-0.045***	-0.061***	-0.121***	-0.134***
	(0.010)	(0.011)	(0.014)	(0.021)	(0.043)	(0.049)
$RETEARN_t$	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	0.027**	0.036***	0.010	0.051**	0.008	0.060*
	(0.013)	(0.014)	(0.011)	(0.022)	(0.027)	(0.035)
$SALARY_t$	-0.018	-0.045	-0.073	-0.163	-0.033	-0.152
	(0.051)	(0.070)	(0.118)	(0.150)	(0.250)	(0.281)
$BONUS_t$	-0.001	0.001	0.001	0.006	0.037	0.052
	(0.007)	(0.008)	(0.020)	(0.023)	(0.052)	(0.057)
Intercept	0.081***	0.081**	-0.015	0.093*	-0.025	0.083
	(0.030)	(0.032)	(0.036)	(0.055)	(0.109)	(0.125)
Observations	6,710	6,710	6,710	6,710	6,710	6,710
Adjusted R^2	0.404	0.426	0.317	0.405	0.232	0.272

This panel reports the OLS regression results on the relationship between the CEO's equity incentives (measured using *RATIOALL*) and investment. Variable definitions are listed in Appendix A. *SALARY* and *BONUS* are in ten millions. Standard errors are in parentheses, adjusted for heteroskedasticity, and clustered by firm. Year and firm fixed effects are included in all columns. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

Table 4: The relationship between abnormal discretionary expenses and equity incentives

	(1)	(2)	(3)
Dependent Variables		*$ABDISEXP_{t+1}$*	
$NEWLYVESTING_{t+1}$	**-0.769***		
	(0.404)		
$UNVESTEDADJ_{t}$	-0.001		
	(0.021)		
$ALREADYVESTED_{t}$	0.116		
	(0.266)		
$RATIO_{t}$		**-0.026*****	
		(0.008)	
$RATIOALL_{t}$			**-0.032**
			(0.023)
Q_{t+1}	0.018***	0.018***	0.018***
	(0.003)	(0.004)	(0.003)
Q_{t}	0.005*	0.004	0.005*
	(0.003)	(0.003)	(0.003)
MV_{t}	0.008	0.005	0.005
	(0.008)	(0.008)	(0.008)
$MOMENTUM_{t}$	-0.001	-0.001	0.000
	(0.004)	(0.004)	(0.004)
AGE_{t}	0.032	0.024	0.035
	(0.025)	(0.027)	(0.025)
$CASH_{t}$	-0.038	-0.047	-0.038
	(0.036)	(0.037)	(0.036)
$BOOKLEV_{t}$	-0.131***	-0.151***	-0.137***
	(0.042)	(0.040)	(0.042)
$RETEARN_{t}$	-0.073***	-0.074***	-0.074***
	(0.013)	(0.014)	(0.013)
ROA_{t}	-0.126***	-0.111***	-0.126***
	(0.038)	(0.034)	(0.039)
$SALARY_{t}$	0.041	0.047	0.043
	(0.036)	(0.037)	(0.037)
$BONUS_{t}$	-0.227	-0.146	-0.255
	(0.206)	(0.214)	(0.209)
Intercept	-0.065	-0.020	-0.049
	(0.069)	(0.070)	(0.069)
Observations	6,005	5,525	5,990
Adjusted R^2	0.91	0.91	0.91

This table reports the OLS regression results on the relationship between the CEO's vesting equity and abnormal discretionary expenses, *$ABDISEXP_{t+1}$*. Variable definitions are listed in Appendix A. *NEWLYVESTING*, *UNVESTEDADJ*, and *ALREADYVESTED* are in billions, and *SALARY* and *BONUS* are in ten millions. Standard errors are in parentheses, adjusted for heteroskedasticity, and clustered by firm. Firm fixed effects are included in all columns. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

Table 5: The relationship between change in investment and the sale of securities

Panel A: Correlations between the actual sale of securities and the newly-vesting securities

Spearman \ Pearson	(i)	(ii)	(iii)	(iv)
(i) $STOCKSOLD_{t+1}$		0.258***	0.330***	**0.377*****
(ii) $NEWLYVESTINGSTOCK_{t+1}$	0.363***		0.179***	0.600***
(iii) $NEWLYVESTINGOPTION_{t+1}$	0.240***	0.279***		0.923***
(iv) $NEWLYVESTING_{t+1}$	**0.393*****	0.559***	0.822***	

This panel reports Pearson and Spearman correlations between the equity sales ($STOCKSOLD_{t+1}$) and equity vesting ($NEWLYVESTINGSTOCK_{t+1}$, $NEWLYVESTINGOPTION_{t+1}$, and $NEWLYVESTING_{t+1}$). Variable definitions are listed in Appendix A. Pearson (Spearman) correlations are reported above (below) the main diagonal. *** (**) (*) indicates significance at the 1% (5%) (10%) level.

Table 5 (Cont'd)

Panel B: Using newly-vesting securities *NEWLYVESTING* as an IV for the sale of securities

Dependent Variables	(1) *STOCK-SOLD*$_{t+1}$	(2.1) *ΔRD*$_{t+1}$	(2.2) *ΔRDAD*$_{t+1}$	(2.3) *ΔCAPEX*$_{t+1}$	(2.4) *ΔRDAD-CAPEX*$_{t+1}$	(2.5) *ΔCAPEX-ALL*$_{t+1}$	(2.6) *ΔRDADCAP-EXALL*$_{t+1}$
NEWLYVESTING$_{t+1}$	**0.328*****						
	(0.034)						
FIT_ STOCKSOLD$_{t+1}$		**-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$_t$	-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)
ALREADYVESTED$_t$	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)
Q_{t+1}	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	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$_t$	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$_t$	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$_t$	-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$_t$	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$_t$	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$_t$	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$_t$	-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)
SALARY$_t$	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$_t$	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)
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)
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 panel reports the 2SLS regression results on the relationship between CEO equity sales and investment, using *NEWLYVESTING* as an instrumental variable for *STOCKSOLD*. Column (1) presents the first-stage regression results, 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_STOCKSOLD* is the fitted value of *STOCKSOLD* from the first-stage regressions. *STOCKSOLD*, *NEWLYVESTING*, *UNVESTEDADJ*, and *ALREADYVESTED* are in billions, and *SALARY* and *BONUS* are in ten millions. Standard errors are in parentheses, adjusted for heteroskedasticity, and clustered by firm. Year and firm fixed effects are included in all columns. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

Table 6: The relationship between the likelihood of meeting/beating analyst consensus forecast and equity incentives

Dependent Variables	(1) $BEAT_{t+1}$	(2) $BEAT\text{-}BELOW1_{t+1}$	(3) $BEAT\text{-}ABOVE1_{t+1}$	(4) $BEAT\text{-}BELOW1_{t+1}$	(5) $BEAT\text{-}ABOVE1_{t+1}$
$NEWLYVESTING_{t+1}$	**5.566***	**6.705****	**-0.173**		
	(3.021)	(3.262)	(2.953)		
	[1.878*]	[1.263**]	[-0.068]		
$NEWLYVESTINGSTOCK_{t+1}$				**8.834**	**3.194**
				(9.455)	(7.247)
				[1.664]	[1.246]
$NEWLYVESTINGOPTION_{t+1}$				**6.936***	**-1.093**
				(3.743)	(3.456)
				[1.307*]	[-0.426]
$UNVESTEDADJ_t$	2.596	3.228	0.045***	3.220	-0.450
	(2.002)	(2.093)	(0.016)	(2.091)	(1.955)
$ALREADYVESTED_t$	-0.107	-0.174	-0.052***	-0.167	0.005
	(0.075)	(0.107)	(0.008)	(0.106)	(0.085)
MV_t	0.018	-0.049**	0.248***	-0.050**	0.045***
	(0.017)	(0.020)	(0.090)	(0.021)	(0.016)
Q_t	-0.035***	0.031***	-0.022	0.032***	-0.052***
	(0.008)	(0.009)	(0.023)	(0.009)	(0.008)
ROA_t	0.480***	0.384***	0.234***	0.384***	0.249***
	(0.088)	(0.117)	(0.062)	(0.117)	(0.090)
AGE_t	-0.027	-0.001	0.106***	-0.001	-0.022
	(0.024)	(0.028)	(0.036)	(0.028)	(0.023)
$INSTIPCT_t$	0.176***	-0.147**	0.090***	-0.147**	0.234***
	(0.063)	(0.072)	(0.035)	(0.072)	(0.062)
ALY_N_{t+1}	0.152***	0.049	-0.042***	0.049	0.106***
	(0.036)	(0.044)	(0.015)	(0.044)	(0.036)
$HORIZON_{t+1}$	0.018	-0.123***	0.806***	-0.122***	0.091***
	(0.033)	(0.047)	(0.024)	(0.047)	(0.035)
ALY_DISP_{t+1}	-0.092***	-0.121***	-1.242***	-0.121***	-0.042***
	(0.015)	(0.029)	(0.195)	(0.029)	(0.015)
$POSUE_{t+1}$	0.924***	0.040	-0.457	0.039	0.805***
	(0.025)	(0.029)	(1.948)	(0.029)	(0.024)
Intercept	-0.461**	-0.277	0.002	-0.272	-1.243***
	(0.190)	(0.257)	(0.086)	(0.258)	(0.196)
Observations	17,173	17,173	17,173	17,173	17,173
Pseudo R^2	0.126	0.027	0.091	0.027	0.091

This table reports the probit regression results on the relationship between the CEO's vesting equity and the likelihood of beating the quarterly analyst consensus forecast. Variable definitions are listed in Appendix A. *NEWLYVESTING*, *NEWLYVESTINGSTOCK*, *NEWLYVESTINGOPTION*, *UNVESTEDADJ*, and *ALREADYVESTED* are in billions. Standard errors are in parentheses, adjusted for heteroskedasticity, and clustered by firm. For *NEWLYVESTING*, *NEWLYVESTINGSTOCK*, and *NEWLYVESTINGOPTION*, the marginal effects (dF/dx) are displayed below the standard errors. Year and industry fixed effects are included in all columns. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

Table 7: Linking R&D cuts to meeting or beating analyst forecasts

Dependent Variables	*CUTANDBEAT*$_t$ Indicator		
	(1)	(2)	(3)
	All firms	Firms with $R\&D_{t-4} > 0$	Firms with R&D cuts
NEWLYVESTING$_y$	**35.469*****	**31.095*****	**37.567*****
	(11.182)	(10.916)	(13.609)
UNVESTEDADJ$_{y-1}$	-8.224	-11.245	-0.736
	(8.503)	(8.390)	(8.797)
ALREADYVESTED$_{y-1}$	-1.798***	-0.987**	-0.847*
	(0.549)	(0.439)	(0.469)
Q_{y-1}	-0.290***	-0.273***	-0.086*
	(0.057)	(0.054)	(0.048)
Q_t	-0.087	-0.067	-0.078
	(0.055)	(0.051)	(0.056)
MV$_{t-1}$	0.145**	0.017	0.057
	(0.068)	(0.070)	(0.069)
MOMENTUM$_{t-1}$	-0.173	-0.118	-0.039
	(0.114)	(0.111)	(0.116)
AGE$_{y-1}$	0.181*	0.100	-0.024
	(0.103)	(0.102)	(0.109)
CASH$_{t-1}$	0.297	-0.495	-0.358
	(0.380)	(0.312)	(0.331)
BOOKLEV$_{t-1}$	-0.614*	0.024	-0.217
	(0.332)	(0.285)	(0.269)
RETEARN$_{t-1}$	0.027	0.016	0.032
	(0.077)	(0.056)	(0.054)
ROA$_{t-1}$	1.987	0.444	0.895
	(1.428)	(1.181)	(1.079)
R&D$_{t-4}$	31.006***	20.528***	15.983***
	(2.584)	(2.090)	(2.085)
SALARY$_{y-1}$	-1.907	3.956	0.157
	(2.758)	(2.925)	(3.092)
BONUS$_{y-1}$	-0.978	0.321	0.663
	(1.777)	(1.542)	(1.385)
Intercept	-4.651	-2.892	-1.726
	(0.483)	(0.455)	(0.461)
Observations(CUTANDBEAT=0)	15,083	6,113	1,853
Observations(CUTANDBEAT=1)	582	582	582
PROB (NEWLYVESTING at Mean-Std/2)	0.020	0.062	0.208
PROB (NEWLYVESTING at Mean+Std/2)	0.027	0.078	0.251
Odds	0.309	0.250	0.207

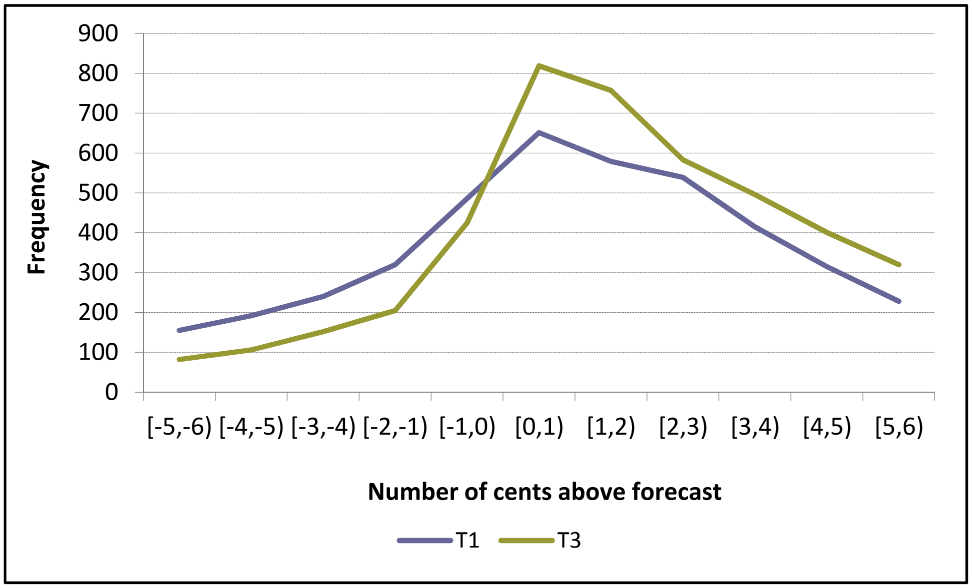
This table reports the logistic regressions results estimated on the panel of firm-quarters with the dependent variable set to one for *CUTANDBEAT* quarters in which the firm (1) meets or beats the analysts' consensus earnings forecast, and (2) would have missed the forecast if its R&D expense remained at the same level as in the same quarter of the prior fiscal year. Subscript *t* denotes the quarter of the analyst forecast. Subscript *y* denotes the fiscal year to which quarter *t* belongs. Variable definitions are in Appendix A. *NEWLYVESTING*, *UNVESTEDADJ*, and *ALREADYVESTED* 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. *PROB* is the implied probability of CUTANDBEAT=1, evaluated at the mean of all control variables, and with *NEWLYVESTING* at the mean plus or minus half of its standard deviation.

Table 8: The relationship between earnings announcement returns and equity incentives

Dependent Variables	(1)	(2) CAR (-1, +1)	(3)
$TERC.\ NEWLYVESTING_{t+1}$	**-0.167**	**-0.278****	**0.545****
	(0.139)	(0.137)	(0.212)
$TERC.\ NEWLYVESTING_{t+1} \times BEAT_{t+1}$			**-1.215*****
			(0.230)
$TERC.\ UNVESTEDADJ_t$	0.198	0.080	0.093
	(0.140)	(0.134)	(0.133)
$TERC.\ ALREADYVESTED_t$	0.170	0.102	0.106
	(0.113)	(0.106)	(0.106)
DIF_{t+1}		0.332	0.314
		(0.292)	(0.284)
$BEAT_{t+1}$		6.358***	7.603***
		(0.203)	(0.351)
MV_t	-0.193**	-0.386***	-0.377***
	(0.081)	(0.081)	(0.081)
Q_t	-0.049	0.012	0.010
	(0.057)	(0.054)	(0.054)
$LEVERAGE_t$	1.549***	1.964***	1.937***
	(0.440)	(0.421)	(0.420)
PASTRET(1Y)	-0.004	-0.009***	-0.009***
	(0.003)	(0.003)	(0.003)
PASTRET(1M)	0.017	0.002	0.001
	(0.011)	(0.010)	(0.010)
Q4	0.148	0.375*	0.383*
	(0.208)	(0.205)	(0.205)
ANNRET(LAG1)	-0.016	-0.030***	-0.031***
	(0.010)	(0.010)	(0.010)
ANNRET(LAG2)	-0.017*	-0.024***	-0.025***
	(0.010)	(0.009)	(0.009)
ANNRET(LAG3)	-0.007	-0.008	-0.009
	(0.009)	(0.009)	(0.009)
ANNRET(LAG4)	0.010	0.009	0.009
	(0.009)	(0.008)	(0.008)
Intercept	-0.352	-2.651*	-3.436**
	(1.610)	(1.568)	(1.559)
Observations	18,686	18,686	18,686
Adjusted R^2	0.007	0.087	0.089

The table shows regressions of cumulative market adjusted returns over days -1 to +1 around the quarterly earnings announcements in year *t+1* in percent (CAR_{t+1}). Variable definitions are in Appendix A. *TERC. NEWLYVESTING*, *UNVESTEDADJ*, and *ALREADYVESTED* are tercile ranks 0-2 for the vesting variables. Standard errors are in parentheses, clustered by announcement day. Industry fixed effects are included in all columns. *** (**) (*) 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.

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