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The Long-Term Consequences of Short-Term Incentives

Finance Working Paper N° 527/2017
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Abstract

This paper studies the long-term consequences of actions induced by vesting equity, a measure of short-term incentives. Vesting equity is positively associated with the probability of a firm repurchasing shares, the amount of shares repurchased, and the probability of the firm announcing a merger or acquisition (M&A). However, it is also associated with more negative long-term returns over the 2-3 years following repurchases and 4 years following M&A, as well as future M&A goodwill impairment. These results are inconsistent with CEOs buying underpriced stock or companies to maximize long-run shareholder value, but consistent with these actions being used to boost the short-term stock price and thus equity sale proceeds. CEOs sell their own stock shortly after using company money to buy the firm's stock, also inconsistent with repurchases being motivated by undervaluation.

Keywords: Repurchases, M&A, Short-Termism, CEO Incentives, Managerial Myopia

JEL Classifications: G12, G14, G32, G34, G35, M12, M52

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The Long-Term Consequences of Short-Term Incentives*

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1. Introduction

The short-termism induced by executive incentives is a major problem alleged by academics, practitioners, and policymakers. A central concern in Bebchuk and Fried's (2004) influential critique of executive pay is that CEOs are rewarded for short-term stock price increases, and so their main reform proposal is to escrow the CEO's equity until the long-term. In 2018, the UK's revised Corporate Governance Code increased the minimum vesting period of executive equity from three years to five years. The following year, the US Council of Institutional Investors revised its executive pay policy to recommend "extended, time-based vesting requirements – for example, those that might begin to vest after five years and fully vest over 10 (including beyond employment termination.)"

The concern with short-term incentives is that they lead the CEO to take myopic actions that boost the stock price at the expense of long-run value. However, finding systematic evidence is challenging for two main reasons. First, it is difficult to demonstrate a causal effect of short-term incentives since the CEO's contract is endogenous. Second, even if one found that CEO incentives cause particular actions, it is difficult to study the long-term implications of such actions.

Edmans, Fang, and Lewellen (2017, EFL) address the first challenge by introducing a new measure of short-term CEO incentives: the amount of stock and options scheduled to vest in a given month. CEOs typically sell a significant amount of vesting equity, and so they may boost the short-term stock price to increase the proceeds from their equity sales. Separately, vesting equity depends on the magnitude and vesting schedule of equity grants made several years ago[1], and so is unlikely to be driven by omitted variables such as current economic conditions. EFL find that vesting equity is significantly correlated with reductions in investment growth. They study investment since it is arguably a firm's most important day-to-day decision. However, it is difficult to ascertain whether

[1] The median vesting period for stock (options) is 3 (4) years.

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the scrapped investment would have been value-creating or value-destroying, and thus whether stock price concerns induce myopia or curb overinvestment. While EFL conduct cross-sectional tests that suggest myopia, they cannot use stock returns to study the long-term consequences of investment cuts, for two reasons. First, any association would be unlikely to be causal, because long-run stock returns are affected by many decisions other than investment. Second, investment is reported at the quarterly level and thus does not have a clear announcement date.

This paper studies two corporate actions whose long-term consequences can be estimated, enabling us to assess the impact of short-term incentives. The first is stock repurchases. Like investment cuts, repurchases boost the short-term stock price (Ikenberry, Lakonishok, and Vermaelen (1995)) and so CEOs with short-term concerns might have incentives to undertake them. Also like investment cuts, repurchases can either be myopic (if financed by scrapping valuable projects and/or if they are of overvalued stock) or efficient (if financed by free cash and/or if they are of undervalued stock). Critically, unlike investment cuts, long-term stock returns measure the value created for existing shareholders from the repurchase, regardless of whether the returns were caused by the repurchase. If the firm was undervalued (overvalued) and so future stock returns would have been positive (negative) anyway, the repurchase creates (destroys) value.

The second corporate action is M&A, which has different advantages to repurchases. First, M&A has an announcement date, enabling us to cleanly calculate long-term returns. Second, M&A is a much more significant event than an investment cut (or repurchase) – it is arguably the most transformative corporate decision that a firm can undertake – and so it is likely that at least a significant portion of the long-run stock return is attributable to the M&A. Indeed, prior research (e.g. Agrawal, Jaffe, and Mandelker (1992), Asquith (1983), Franks, Harris, and Titman (1991), and Rau and Vermaelen (1998)) uses long-run stock returns to assess the value implications of M&A.

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Importantly, Agrawal, Jaffe, and Mandelker (1992) find a significantly negative relation between short- and long-term M&A returns, suggesting that certain acquisitions boost short-term performance at the expense of long-run value. As an example of how vesting equity might induce such an acquisition, Bazaarvoice acquired PowerReviews in June 2012, which led to its stock price soaring above $20 and its officers and directors selling $90 million of stock. The US Department of Justice ("DoJ") launched an antitrust lawsuit in January 2013, which forced Bazaarvoice to divest PowerReviews and caused its stock price to drop below $7. In internal communications, Bazaarvoice executives stated that their motivation for the acquisition was "[e]limination of our primary competitor" to leave them with "literally, no other competitors." However, even if they suspected that a DoJ lawsuit would be likely, this would be of little concern since they could cash out beforehand.[2]

We study the relation between vesting equity and both repurchases and M&A announcements over 2006-2015. We hand-collect actual repurchases from 10-Q and 10-K filings to allow a monthly analysis that matches the timing of vesting equity to the timing of repurchases (Compustat only contains quarterly repurchase data). A one standard deviation increase in vesting equity is associated with a 1.2% increase in a firm's likelihood of repurchasing shares in a given month, controlling for the CEO's unvested equity, already-vested equity, other determinants of repurchase activity and year-month fixed effects. This increase compares with the unconditional repurchase probability of 24.5% and corresponds to a rise in shares repurchased of $0.5m. When focusing on repurchases that exceed the sample mean, the increase is 1.2% compared with an unconditional probability of 14.1%. We find similar results for M&A: a one standard deviation increase in vesting equity is associated with a 0.2% higher likelihood of announcing an M&A, versus the unconditional probability of 5.7%. The results

[2] The market did not foresee any antitrust risk, hence the positive reaction to the acquisition. All of the analyst reports after the acquisition announcement were strongly positive, with only Morgan Stanley mentioning risks but only related to integration rather than antitrust. In the two conference calls after the announcement but before the DoJ investigation, the acquisition was extensively discussed but none of the participants raised antitrust issues.

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continue to hold using vesting equity as an instrument for equity sales in a two-stage least squares (2SLS) analysis, and after controlling for the changes in investment documented by EFL. In addition, vesting equity is significantly associated with the likelihood of cash-financed M&A, but not M&A that is fully or partially equity-financed – consistent with the significantly higher announcement returns to cash-financed M&A.

We next study the long-term returns to repurchases and M&A. Again, we find a consistent picture across both events: vesting equity is associated with lower long-term returns. A one standard deviation increase in vesting equity is associated with a 0.44%, 0.44%, and 0.19% lower return in the first, second, and third years after the repurchase compared to the market portfolio. It is also associated with a 0.25% and 0.24% lower return in the first and second year after an M&A announcement. Compared to industry and characteristic-based benchmarks, the negative association with long-run returns persists for four years. These long-term returns suggest that the market is not fully aware of the short-term incentives that arise from vesting equity, either because vesting schedules are difficult to construct or because investors typically focus on pay levels. Our results highlight the importance of scrutinizing CEOs' pay horizons.

Additional analyses also support the idea that the repurchases and M&A induced by vesting equity may reduce long-term value. Vesting equity is associated with significantly higher stock returns in the month prior to repurchases, inconsistent with the CEO buying back underpriced equity. It is also significantly linked to future M&A goodwill impairment. This suggests that one channel through which vesting equity reduces long-run returns is by inducing CEOs to overpay for acquisitions, generating goodwill that is subsequently written down.

Finally, we find that CEOs concentrate their equity sales in a short window after announcing repurchases, which is difficult to reconcile with common justifications. If repurchases are motivated by undervaluation or an efficient reallocation of free cash, the CEO should not be selling equity at the

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same time – taking one action with the company's money and the opposite with his own money. Instead, the results are consistent with the CEO using repurchases to improve the conditions for his equity sales. If true, a potential remedy would be to prohibit CEO equity sales for a short period after a repurchase, to remove the incentives to use repurchases to inflate the stock price. We also find that CEOs sell equity immediately after M&A, inconsistent with the M&A deal being justified by its long-term value creation potential.

This paper is related to three literatures. The first literature studies the effects of short-term equity incentives. Several theories predict that they induce CEOs to boost current returns at the expense of long-run value[3], but causal evidence has not yet been established. Recent empirical studies link vesting equity to several corporate outcomes, but not long-run value. In addition to EFL, Edmans et al. (2018) show that CEOs reallocate news toward months in which their equity vests and away from adjacent months. Ladika and Sautner (2020) find that FAS 123R induced some firms to accelerate option vesting, which in turn led to a fall in investment, Gopalan, Huang, and Maharjan (2021) and Jochem, Ladika, and Sautner (2018) show that vesting equity leads to CEO turnover, and Van Alfen (2018) documents a negative effect of vesting equity on product market reputation. Our main contribution is to study the long-term consequences of short-term incentives, by identifying outcome variables (repurchases and M&A) whose long-term effects can be reasonably estimated. Moore (2020) confirms the link between vesting equity and repurchases using a small sample of large firms, but does not study long-run returns, M&A, or the concentration of equity sales after corporate events.

While one contribution is to study the long-term effects of short-term incentives, our outcome variables are of independent interest as they relate the paper to the literatures on the determinants and consequences of repurchases and M&A. There are widespread concerns that repurchases are driven

[3] Examples include Stein (1988, 1989), Bebchuk and Stole (1993), Bizjak, Brickley, and Coles (1993), Goldman and Slezak (2006), Benmelech, Kandel, and Veronesi (2010), Edmans et al. (2012), and Marinovic and Varas (2019).

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by short-term motivations, leading to both Democrat (Chuck Schumer and Bernie Sanders) and Republican (Marco Rubio) Senators announcing proposals to limit buybacks in February 2019. However, there is little causal evidence for these concerns. Starting with the determinants, repurchases are more common when the CEO's bonus is tied to earnings per share (EPS) (Cheng, Harford, and Zhang (2015)), and the company would have otherwise missed analyst EPS forecasts (Hribar, Jenkins, and Johnson (2006)); however, both are endogenous.[4] Moving to the consequences, Almeida, Fos, and Kronlund (2016) find that EPS-driven repurchases reduce employment, investment, and cash holdings (which may either increase or decrease firm value), but not shareholder value or return on assets. Almeida et al. (2020) hypothesize that, if the reductions in investment and employment were efficient, they would be related to plant productivity, but find that this is not the case in the presence of labor unions. These papers study repurchases driven by analyst EPS forecasts and thus do not have implications for the design of executive pay. Boards have much more control over executive pay than analyst forecasts, and thus can respond to any effect of pay on repurchases.

Turning to M&A, it may seem puzzling why CEOs commonly undertake M&A despite the long-term returns being negative (e.g. Agrawal, Jaffe, and Mandelker (1992)). While prior research has pointed to overconfidence (Malmendier and Tate (2008)) or private benefits (Jensen (1986)) as potential motives, our results suggest that short-term incentives may also be a driver. The CEO's vesting equity can be objectively calculated, unlike his overconfidence or private benefits. Our results thus suggest when boards or shareholders should step in and particularly scrutinize M&A deals.

[4] For example, low-quality firms may be unable to hit EPS forecasts, and also may be unable to notice good investment opportunities; as a result, they buy back more stock.

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2. Data and Variable Measurement

2.1 Measuring short-term incentives

We use vesting equity as our measure of short-term incentives because executives are likely to sell equity upon vesting to diversify their risk. Even though many CEOs hold already-vested equity, they may face explicit or implicit constraints on selling it, which new vesting relaxes. One constraint is stock ownership guidelines set by the board. These are typically satisfied only by vested equity (Core and Larcker (2002)), and so vesting allows the CEO to sell equity without violating the guidelines. Second, the CEO may hold a threshold level of vested equity to signal confidence in the firm. Consistent with these motives, EFL and Edmans et al. (2018) show that equity sales are strongly related to vesting equity, and we confirm this in our sample in Section 5.5. Note that our identification does not require the CEO to sell his entire equity upon vesting, only that equity vesting is significantly correlated with equity sales.

We calculate vesting equity using data from Equilar, which gathers grant-by-grant information on executives' vested and unvested equity awards for the Russell 3000. This wide coverage compares favorably with ExecuComp, which covers the S&P 1500, and Incentive Lab (used in Moore (2020)), which covers the 750 largest firms each year. Our initial sample contains the entire 48,856 firm-CEO-years for which Equilar collects compensation data from January 2006 to May 2016. We use the approach of EFL to calculate vesting equity, which is described in more detail in Appendix B. This procedure involves three steps. First, we use Equilar's annual data to infer the number of shares and options that vest, grant-by-grant, in a particular year. Second, we allocate this vesting equity to a particular month. This requires the vesting date of equity, which we infer for options using their expiry

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date and estimate for stock using EFL's algorithm.[5] Third, we calculate the effective value of monthly vesting equity. Doing so requires the delta of each individual vesting option, which we are able to calculate since the first step yields grant-by-grant vesting data.[6] The resulting measure, *VESTING*, reflects the dollar change in vesting equity for a 100% change in price. We estimate *VESTING* for a sample of 412,390 firm-CEO-months, representing 5,806 unique firms and 9,011 unique CEOs.

2.2 Measuring stock returns to corporate actions

Our first main analyses concern actual repurchases; in Section 5.5, we show that the results are robust to studying repurchase announcements. We focus on actual repurchases for a number of reasons. First, it is actual repurchases that have long-term consequences, if a company repurchases stock that falls in value. Second, many announced repurchases are not followed through (Stephens and Weisbach (1998)). Third, companies do not need to announce repurchases once they have disclosed a repurchase program, which could have taken place several years prior.

The Securities and Exchange Commission (SEC) requires public companies to report the number of shares repurchased and the average price paid every month in their 10-Q and 10-K filings for periods ending on or after March 15, 2004. We manually collect monthly repurchases from these filings.[7] To ensure accuracy, we add up monthly repurchase amounts within a quarter and cross-check the sum with Compustat Quarterly; we manually review the filings if there is a discrepancy. We focus on open market repurchases by excluding repurchases that are related to employee stock option exercises. We create an indicator variable *REP* that equals one if the firm repurchases in a month and

[5] EFL estimate quarterly vesting equity because investment data is only available quarterly; we estimate monthly vesting equity since we hand-gather monthly repurchase data which allows a finer analysis.
[6] Prior to 2006, disclosure requirements do not allow us to infer vesting options on a grant-by-grant level.
[7] Although most firms report share repurchases based on calendar months, some do not. If a firm reports exact dates for its repurchases, we assign the repurchases to calendar months based on the reported dates. If a firm reports repurchases based on monthly periods spanning two calendar months, we assign the repurchases to the calendar months that overlap most with the reported monthly periods.

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zero otherwise. We also calculate *REP%*, the value of the shares repurchased as a percentage of market capitalization at the end of the prior month.

We collect data for all M&A announced between January 2006 and May 2016 from Securities Data Company ("SDC") Platinum. For our tests, we exclude transactions with reported deal sizes below $5 million, to ensure that we only include significant deals that are likely to affect future stock returns; results are consistent without this restriction or with filters of $1 million or $10 million. Table OA1 reports target firm characteristics. We define *MA*, an indicator variable that equals one if a firm announced an M&A in a month and zero otherwise. Unlike repurchase announcements, 96% of M&A announcements (for which we know the eventual outcome) in our sample are eventually completed.[8] Thus, it is the announcement that is the relevant event.

To gauge the value implications of share repurchases and M&A, we calculate the buy-and-hold abnormal returns (BHAR) surrounding these events. We calculate the long-term BHAR for each of the four years following the event month *m*, namely months [*m+1*, *m+12*], [*m+13*, *m+24*], [*m+25*, *m+36*], and [*m+37*, *m+48*], by geometrically compounding its monthly raw return during the period and then subtracting one of three benchmarks – the CRSP value-weighted index, the Fama-French 49 industry portfolio, and the Daniel, Grinblatt, Titman, and Wermers (1997, DGTW) characteristic-based portfolio matched by size, book-to-market, and prior year return. The characteristic-based benchmark is important because firms with high vesting equity tend to be large and have strong recent performance (both of which increase the dollar value of vesting equity); they also have high growth options and thus low book-to-market ratios.

[8] In our sample, 72% of M&A deals are completed, 3% are withdrawn, and the remaining 25% are either intended or pending and so the outcome is unknown within our sample period.

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2.3 Controls

While vesting equity leads to equity sales, and thus may induce a CEO to be concerned with the short-term stock price, other aspects of his contract can mitigate such incentives. We thus control for *UNVESTED*, the CEO's unvested equity holdings, which may increase his concern for the firm's long-term value, as well as already-vested equity (*VESTED*), salary (*SALARY*), and bonus (*BONUS*), to isolate the incentives provided by vesting equity. We also include the CEO's age, tenure, and a new CEO indicator (*AGE*, *TENURE*, and *NEWCEO*) to capture career concerns. Appendix A provides details on how these controls are measured.

We follow Huang and Thakor (2013) to construct additional controls used in the repurchase analysis. These include the natural logarithm of sales (*SALES*), market-to-book ratio (*MB*), long-term debt-to-assets ratio (*BKLEV*), operating and nonoperating return-on-assets ratios (*ROA* and *NROA*), and market-adjusted stock returns (*RET*). They measure firm size, leverage, accounting performance (which affects excess capital) and stock performance (which affects undervaluation) – factors previously shown to affect repurchase activity (Dittmar (2000), Jagannathan, Stephens, and Weisbach (2000), Guay and Harford (2000)).[9]

The additional controls used in the M&A analysis are mainly taken from Uysal (2011). We include market leverage, *MKLEV*, which Uysal (2011) shows is the primary driver of a firm's M&A decision; *SALES*, *MB*, *ROA*, and *RET* to proxy for firm size and performance; *MALIQ*, the total value

[9] Another motivation for repurchases, sometimes proposed, is to undo dilution from executive or employee option exercises. This motivation is unlikely to explain our results on theoretical and empirical grounds. There is no theoretical reason for using repurchases to offset dilution. Whether a repurchase creates value depends on whether the firm's stock is undervalued (and, if capital is constrained, the attractiveness of investment opportunities that must be foregone to engage in the repurchase) – not the number of shares outstanding or whether this number has recently increased due to option exercises. Even if repurchases are used to increase EPS, rather than create value, what matters is how far EPS is from a target (such as analyst forecasts) not whether EPS has recently decreased due to option exercises. Empirically, there is little support for the anti-dilution hypothesis. Although Bens, Nagar, Skinner, and Wong (2003) find supportive correlations, Gao and Kronlund's (2020) causal study finds no evidence. Specifically, they use a regression discontinuity comparing firms where executive options end up just in-the-money on the expiration date (and are thus exercised) with those that end up just out-of-the-money. The former do not buy back more shares than the latter.

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of M&A in the firm's industry over a year to measure industry M&A liquidity; and *INDCONC*, the Herfindahl index of the firm's industry to measure product market concentration.

2.4 Sample and summary statistics

The sample that intersects vesting data with repurchase (M&A) data and controls consists of 280,756 (283,236) firm-CEO-months. Table 1 reports summary statistics. Monthly vesting equity has a mean of $208,720. In a given month, 24.5% of firms buy back stock and 5.7% announce at least one M&A. The average percentage of shares repurchased is 0.1% for all firms and 0.41% for firms that conduct repurchases.

3. Share Repurchases

3.1 Equity vesting and share repurchases

We study the relation between vesting equity and repurchases by running the following panel regression on the full sample of firm-months:

$$REP_m\ (REP\%_m) = \alpha + \beta VESTING_m + \gamma CONTROLS + \varepsilon_m, \qquad (1)$$

where *CONTROLS* are the controls for repurchases discussed in Section 2.3. The sample is at the firm-CEO-month level, but we omit firm subscripts (and CEO subscripts if there are multiple CEOs in a firm-month) for brevity. In all regressions henceforth, we cluster standard errors by firm and month.[10]

[10] The sample contains 280,756 firm-CEO-months, which correspond to 278,767 firm-months. Out of the 278,767 firm-months, only 1,953 (0.7%) have multiple CEOs (36 have three CEOs). Table OA2 Panel A in the Online Appendix shows that the results of Table 2 are robust to replacing firm fixed effects with CEO fixed effects and clustering standard errors by CEO and month, which addresses the concern that CEO characteristics (such as risk aversion or overconfidence) may be driving our results. Bernile, Bhagwat, and Rau (2017) find that CEO risk aversion is driven by early-life experiences rather than time-varying, and Malmendier, Tate, and Yan (2011) find the same for overconfidence.

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Column (1) of Table 2 reports the regression results of estimating equation (1) with the indicator *REP* as the dependent variable using a probit model. We include year-month fixed effects to control for time variation in repurchases induced by common shocks, such as macroeconomic conditions. Vesting equity is positively associated with a firm's likelihood of repurchasing shares in a month at the 1% level. A one standard deviation increase in *VESTING* is associated with a 1.2% increase in the probability of a repurchase, compared with the unconditional probability of 24.5%. The economic significance increases if we focus on sizable repurchases, i.e. ones that exceed the sample average of 0.1%. A one standard deviation increase in *VESTING* is associated with a 1.2% increase in the probability of such a repurchase, compared with the unconditional probability of 14.1%.

Column (2) re-estimates equation (1) using a linear probability model (LPM). The coefficient on *VESTING* is similar in magnitude to the marginal effect reported in column (1) and remains significant at the 1% level. Compared to a probit model, an LPM assumes a homoscedastic error term and potentially gives unbounded predicted values of *REP*, but allows for non-normal errors and enables us to include firm fixed effects to control for firm-level heterogeneity in repurchase propensity. We do so in column (3); the coefficient on *VESTING* remains significantly positive at the 1% level.

Columns (4)-(5) of Table 2 report the ordinary least squares (OLS) regression results of estimating equation (1) with *REP%* as the dependent variable. We include year-month fixed effects in column (4) and add firm fixed effects in column (5). *VESTING* remains significantly positive at the 1% level. Based on the coefficient in column (4), a one standard deviation increase in *VESTING* is associated with a 0.01% increase in the amount of shares repurchased scaled by market capitalization, compared with the sample mean of 0.1%. Using the average market value of $5.5bn, this translates into $0.5m per month, or $6m annualized. In comparison, EFL find that a one standard deviation increase in *VESTING* is associated with an annualized fall in investment of $1.8m. The $6m magnitude is sizable but also plausible: too large a repurchase may prompt the board to step in and block it, if the

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repurchase is indeed myopic. In addition, unvested equity will limit the amount of myopic actions that a rational CEO will undertake.

Turning to the controls, *UNVESTED* is significantly positive in all five specifications and *VESTED* is significantly negative in two. These coefficients are difficult to interpret: the CEO's voluntary holdings of vested equity are endogenous, as are his holdings of unvested equity since they depend on recent grants. Moreover, unvested equity might mitigate or exacerbate myopia depending on whether it vests in the short- or long-term. The coefficients on firm characteristics are generally consistent with prior literature – repurchases are more likely for firms that are large, less leveraged, and more profitable. For the linear specifications of Table 2, the variance inflation factors of the independent variables (excluding fixed effects) are all less than 3, compared to the standard cut-off of 10. This addresses concerns of potential multicollinearity in our independent variables.

Louis, Sun, and White (2010), Bonaimé and Ryngaert (2013), and Jackson (2018) also find that CEOs sell their own equity around the time their firms repurchase shares. However, this need not imply causality, i.e. that repurchases are conducted to increase the proceeds from equity sales. It may be that poor investment opportunities (an omitted variable) cause the CEO to divest, and also to cut investment which gives him surplus cash to repurchase equity[11] or repurchase stock to falsely signal undervaluation and mask the firms' poor prospects. An alternative explanation is reverse causality. If repurchases are the optimal action (e.g. because there is surplus cash), the stock price rises, and the CEO legitimately takes advantage of this by selling equity. These endogeneity concerns explain why we use vesting equity, rather than equity sales, to measure short-term incentives.

[11] Holding the surplus cash may be undesirable given the market may discount the value of cash holdings (Dittmar and Mahrt-Smith (2007)); paying it out as dividends would commit the firm to a new, higher, dividend level.

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3.2 Equity vesting and BHAR surrounding share repurchases

To disentangle whether the repurchases induced by vesting equity are efficient or myopic, we study long-run returns. The long-term return to the repurchase captures the value created by it. Thus, if repurchases are myopic (efficient), long-run returns should be negative (positive).

A weaker prediction of the myopia (efficiency) hypothesis is that stock returns just before repurchases should be positive (negative), since efficiency involves buying back stock only when it is undervalued. This prediction is weaker since ex post returns are the better measure of undervaluation – even if the stock rose prior to the repurchase, it still could be undervalued if it continued to rise afterwards. However, if the CEO is unable to predict future returns accurately, he will likely use recent returns to estimate undervaluation and should repurchase stock after a price drop if he is maximizing firm value. Indeed, Stephens and Weisbach (1998) find that actual repurchases in a given quarter are decreasing in the prior quarter's stock returns, and Dittmar and Field (2015) find that the returns to actual repurchases are decreasing in the prior six-month stock returns. We test this prediction by calculating the short-term BHAR, separately for months *m*, *m-1*, and *m-2*.

We regress the BHAR surrounding repurchases on *VESTING* on the full sample of firm-months in which repurchases are conducted:

$$BHAR_t = \alpha + \beta VESTING_m + \varepsilon_m. \qquad (2)$$

The dependent variable, BHAR, is first calculated at the monthly level from month *m-2* to month *m*, and then calculated annually for the four years following the event month.[12] We include year-month fixed effects to control for time variation in firm returns induced by market conditions, and firm fixed effects to remove differences in firms' average returns such as those due to risk.

[12] We combine monthly BHARs over the four years following repurchases into four annual BHARs for clarity of presentation. The negative relation between vesting and long-term BHAR is stronger if we accumulate BHARs over one-, two-, three-, and four-year periods, namely [*m+1*, *m+12*], [*m+1*, *m+24*], [*m+1*, *m+36*], and [*m+1*, *m+48*]. Separately, the results are consistent if we include the list of controls from equation (1) when estimating equation (2).

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Columns (1)-(7) of Table 3 report the OLS regression results of estimating equation (2) on the sample of all firms that repurchase any shares in month *m*. In Panel A, BHAR is calculated relative to the returns on the CRSP value-weighted index. The coefficient on *VESTING* is significantly positive at the 1% level in column (2), which suggests that repurchases conducted by CEOs with more vesting equity occur after higher short-term returns. A one standard deviation increase in *VESTING* is associated with a 0.12% increase in BHAR over month *m-1* (1.5% annualized). However, the coefficients on *VESTING* are negative for long-run returns. A one standard deviation increase in *VESTING* is associated with a 0.44% decrease in BHAR in both the first and the second years following the repurchase (significant at 1%), and a 0.19% decrease in BHAR in the third year (significant at 10%).[13] The coefficient becomes insignificant in the fourth year.

Panels B and C repeat the analyses in Panel A, but instead calculate BHAR relative to the returns on the Fama-French 49 industry portfolios and DGTW characteristic-based portfolios, respectively. We observe a similar pattern: *VESTING* is positively related to BHAR in the month immediately prior to repurchases but negatively related to BHAR over the next two years.

To better gauge the economic significance of these findings, we calculate the long-term returns to a portfolio of firms that engage in repurchases when *VESTING* is high. Specifically, we consider a subsample of firms that repurchase in a given month and have *VESTING* in the top quintile, where the quintile cutoff is defined either time-serially within the firm across all months, cross-sectionally for all firms in that month, or across the entire sample. We then calculate the mean BHAR of the firms in the subsample relative to the DGTW benchmarks.

Panel D reports the results. Under all three quintile definitions, we observe significantly positive returns in repurchase month *m* but significantly negative returns over *m+13* to *m+24*. Firms with top-

[13] The sample size in the long-run return analysis changes between columns depending on the availability of BHAR. We report economic significance for each column based on the specific sample used in the regression.

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quintile *VESTING* enjoy an average boost of 0.19-0.24% in BHAR in the repurchase month (significant at either the 10% or 5% level), but suffer an average loss of 0.99-1.6% in BHAR in the second year following the repurchase (significant at the 1% level).

The link between vesting equity and long-term returns suggests that the market does not take into account the short-term incentives that arise from vesting equity. This may be for two reasons. First, vesting schedules are difficult to construct. Some information may be unavailable before the firm files its proxy statement or needs to be manually collected from footnotes in Form 4 filings; mapping out the vesting schedule is complex and requires an algorithm to obtain it on a monthly frequency. Second, the market may not recognize the importance of vesting schedules, given that most focus on CEO pay is about pay levels. Von Lilienfeld-Toal and Ruenzi (2014) find long-run abnormal returns to portfolios formed on the CEO's total equity holdings, which are much more salient than vesting schedules. Edmans et al. (2018) find that the market's reaction to discretionary news releases fails to take vesting equity into account. Indeed, the market's failure to take into account the CEO's vesting equity is consistent with the long-term abnormal returns to repurchases and M&A. If the market were fully efficient, the long-term impact would immediately be capitalized upon announcement.

Separately, the results are consistent with other research finding that, in the short term, market may respond positively to actions that destroy value in the long term. For example, Bhojraj et al. (2009) compare firms that just beat analyst forecasts due to low R&D, low advertising or high accruals, with those who just missed due to high R&D, high advertising or low accruals. Beaters outperformed missers by 2% to 4% in the short-term, suggesting that the market took the earnings increase at face value, but subsequently underperform by 15% to 41% over the next three years.

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4. Mergers and Acquisitions

4.1 Equity vesting and M&A announcement

This section links vesting equity to another corporate action, M&A. Our hypothesis is that, similar to repurchases, vesting equity could induce a CEO to undertake M&A that boosts the short-term stock price at the expense of long-term returns.[14] In our sample, the average 3-day cumulative abnormal return (CAR) to an M&A announcement is 0.92%. While not substantial, there is large variation and a high number of deals are greeted very positively by the market – the 75th percentile return is 2.97%. In addition, the average CAR to M&A in firm-months where the acquirer CEO has positive vesting equity is 1.11%, with a 75th percentile return of 3.04%. This suggests that acquirers with vesting equity are able to find acquisitions that the market is particularly likely to respond positively to.

Although we observe a positive average announcement return, particularly by acquirers with vesting equity, it is not a necessary condition for our hypothesis. We only require the CEO to believe, ex ante, that he can find an M&A deal that will significantly increase the short-term stock price – not that his expectations will always be correct ex post. Given the potentially transformational nature of M&A, many CEOs believe that the best way to create substantial value is through an acquisition. Indeed, the sheer frequency and magnitude of M&A deals suggest that many CEOs believe they can create significant value through M&A, even though the evidence suggests that the average bidder does not (Roll, 1986). This is similar to how many investors buy actively-managed mutual funds even though the average fund underperforms the index (they believe that they can identify index-beating funds even if they cannot), and investors frequently trade stocks for non-liquidity reasons even though

[14] Note that it is not inconsistent for vesting equity to be associated with both reduced investment (as found by EFL) and increased M&A. M&A is publicly announced and leads to positive returns on average, whereas most capital and R&D expenditure is not announced. Instead, the first announcement that is affected by investment is the negative impact on earnings. Certain specific capital investment projects may be announced (e.g. business expansions), and Edmans et al. (2018) find that vesting equity is significantly associated with positive news releases, which include such announcements.

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the average trade loses money after transaction costs and taxes. Moreover, M&A is a less-than-fully rational setting because CEOs undertake M&A infrequently, and so the learning that typically exists with repeated actions may not exist with M&A. The behavioral corporate finance literature thus uses M&A as a prime example of managerial inefficiency that exists even in efficient markets (see the survey of Baker and Wurgler (2013)).

We run the following panel regression on the full sample of firm-months:

$$MA_m = \alpha + \beta VESTING_m + \gamma CONTROLS2 + \varepsilon_m, \qquad (3)$$

where *CONTROLS2* are the controls for M&A discussed in Section 2.3.

Table 4 reports the regression results of estimating equation (3) using a probit model in column (1) and an LPM in columns (2)-(3). We include year-month fixed effects in all three columns, and firm fixed effects in the last column.[15] Vesting equity is positively associated with a firm's likelihood of announcing an M&A in a given month at the 1% level. Based on the marginal effect in column (1), a one standard deviation increase in *VESTING* is associated with a 0.2% increase in the firm's likelihood of announcing an M&A, compared with the unconditional probability of 5.7%.

The coefficient on the CEO's bonus is positive and that on CEO age is negative, consistent with Yim (2013). Turning to firm controls, the firm's accounting and stock performance are generally positive and significant, suggesting that good performance allows a firm to finance M&A. Market leverage is significantly negative, consistent with Uysal (2011).

We previously noted that the average CAR to acquirers with vesting equity is higher than for the full sample, suggesting that CEOs with vesting equity are undertaking deals that the market responds particularly positively to. Cash-financed deals may be an example of such acquisitions, since they avoid the dilution associated with equity financing. Indeed, Betton, Eckbo, and Thorburn (2008) find

[15] Table OA2 Panel B in the Online Appendix shows that the results of Table 4 are robust to replacing firm fixed effects with CEO fixed effects and clustering standard errors by CEO and month.

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that, over 1980-2005, the average announcement return is significantly positive to all-cash-financed deals, but significantly negative to all-stock-financed deals. In our sample, these means are 1.42% and 0.45%, respectively.

We thus hypothesize that vesting equity will especially induce CEOs to undertake cash-financed deals. Panel A of Table 5 shows that vesting equity is positively and significantly associated with the likelihood of undertaking a cash-financed M&A deal, but Panel B shows that it is unrelated to the probability of an acquisition that is partially or fully equity-financed.

4.2 Equity vesting and BHAR surrounding M&A announcement

We now evaluate the efficiency of vesting-induced M&A. As in the repurchase analyses, we regress the BHAR surrounding M&A announcements on *VESTING* on the full sample of firm-months in which M&A is announced:

$$BHAR_t = \alpha + \beta VESTING_m + \varepsilon_m. \qquad (4)$$

Unlike repurchases, we have the exact announcement dates for M&A so, for the calculation of BHAR, we redefine month $m+1$ as starting the day after the M&A announcement.[16] Again, we include year-month and firm fixed effects. We do not control for deal characteristics (e.g. whether the target is public or private) as this would be a "bad control". Deal characteristics are endogenous and the CEO cannot excuse low returns by claiming that, for example, he chose a public target. Put differently, choosing deals with undesirable characteristics is a channel through which a CEO may destroy value. We study stock returns only after the event month, not prior (unlike for repurchases) as we have no clear prediction for whether prior stock returns should be positive or negative.

[16] The results are similar if we define *m* as the calendar month of the M&A announcement or if we define *m* as [-15, + 15] days surrounding the M&A announcement. On average, each firm has a median of two months with M&A announcement(s) during our sample period. Some firms announce multiple M&A in a month. To avoid artificially inflating sample size, for the long-run BHAR analysis and the announcement return analysis, we retain the deal with the largest absolute market reaction for each firm-month.

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Table 6 reports the regression results of estimating equation (4) with BHAR calculated relative to the returns on the market, industry, and characteristic-based portfolios in Panels A, B, and C, respectively. All three panels indicate a similar pattern to Table 3: *VESTING* is negatively related to long-term returns. All 12 coefficients are negative, with two significant in each of Panels A and B and one significant in Panel C. Based on the coefficients reported in Panel A, a one standard deviation increase in *VESTING* is associated with a 0.25% and 0.24% decrease in BHAR in the first and second year after the M&A, respectively. Panels B and C show that the negative relation with long-term returns persists for up to four years, consistent with Agrawal, Jaffe, and Mandelker's (1992) finding of five-year negative long-term returns to M&A.

To better gauge economic significance, we also calculate the long-term characteristic-adjusted returns to a portfolio of firms that engage in M&A when *VESTING* is in the top quintile, defined in the same three ways as in Table 3, Panel D. Panel D of Table 6 reports the results. We observe significantly negative returns over *m+1* to *m+12* under two quintile definitions and over *m+13* to *m+24* under all three quintile definitions. These results indicate that firms with *VESTING* in the top quintile suffer an average loss of 0.65-1.23% in BHAR in the first year following M&A and 1.03-1.49% in BHAR in the second year.

4.3 Equity vesting and M&A goodwill impairments

This section studies a potential channel through which the negative long-run returns of Section 4.2 transpire: M&A goodwill impairment. Goodwill is the difference between the purchase price of a target and the fair value of its net identifiable assets. Goodwill alone need not imply that the acquirer overpaid for the target (and thus need not lead to a negative short-term reaction), since it may be justified by the target's non-identifiable assets such as human capital and customer loyalty – indeed, Henning, Lewis, and Shaw (2000) find that the market values goodwill. However, if the acquirer

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subsequently revises downwards its estimate of the fair value of the target, a goodwill impairment arises. This indicates that the acquirer likely overpaid, leading to a decline in the stock price.

We run the following regression:

$$IMPAIREDMA\%_t = \alpha + \beta VESTING_m + \gamma CONTROLS2 + \varepsilon_m. \qquad (5)$$

Because impairment write-downs are uncommon, we measure t over quarters $q+1$ to $q+8$, $q+1$ to $q+12$, and $q+1$ to $q+16$, respectively, to capture the cumulative write-down of goodwill over a given period. Specifically, we calculate *IMPAIREDMA%* as the total amount of goodwill written down by the firm over window t scaled by its total M&A deal size in quarter q to which vesting month m belongs. We use the same controls as in Table 4, where the dependent variable is the M&A indicator.

The results are reported in Table 7 and show that vesting equity is significantly positively related to subsequent M&A impairment losses. A one standard deviation increase in *VESTING* is associated with a 0.14, 0.35, and 0.38 percentage point increase in M&A impairment losses over the next two, three, and four years, respectively. The average two-, three-, and four-year impairment losses in our sample are 4.21%, 9.94%, and 15.07%, respectively. The results suggest that one channel through which vesting equity leads to lower long-term returns to M&A is that it induces CEOs to overpay for acquisitions, generating goodwill that is subsequently written down.

5. Additional Analyses and Robustness Tests

5.1 Estimated gains to the CEO

As a back-of-the-envelope calculation of the dollar gain to the CEO, the average (-1, +1) announcement return in our sample is 1.8% for repurchases and 0.92% for M&A. When multiplied by the average annual amount of vesting equity, this translates into $58,250 and $28,562, respectively. While not substantial, these gains are in line with the profits from illegal insider trading. For example,

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Meulbroek (1992) reports a median gain per security of $17,628. This figure is for 1980-89 (i.e., with a midpoint of 1985), whereas our numbers are for 2006-16 (i.e., with a midpoint of 2011). Adjusting for inflation, the Meulbroek (1992) number becomes $36,830 in 2011 terms. Yermack (1997) reports the median gain over 1992–94 from timing option grants (later found by Lie (2005) to be illegal) was $11,100 ($15,600) after 20 (50) trading days. Adjusted for inflation, these numbers become $17,285 and $24,288. Thus, the returns to announcing repurchases and M&A are of similar magnitude to those from illegal insider trading and option backdating, even though they are not illegal. Thus, the risk-adjusted benefit to the CEO is significantly higher. Turning to legal actions, Adams and Ferreira (2008) similarly find that small monetary amounts can have large effects: board meeting fees (which average $1,000) significantly increase director attendance.

5.2 Equity sales surrounding repurchases and M&A

One concern is that the CEO may not be able to benefit from repurchases and M&A because blackout policies restrict him from selling shortly afterwards – Bettis, Coles, and Lemmon (2000) find that 78% of firms have blackout policies. We thus study whether the CEO's equity sales are concentrated in a small window following repurchases and M&A. If so, this demonstrates that he is able to benefit from these events, either because the firm does not have a blackout policy, because the policy allows the blackout window to end upon these events[17], or because he schedules these actions to take place just before a trading window.

Table 8 reports the results. First, for each repurchase announced in a month for which the CEO has equity vesting, we compute *EQUITYSOLD%* (the value of equity sales as a percentage of market capitalization 90 days before the announcement) over window (0, 2], (0, 5], (0, 10], (0, 15], or (0, 20],

[17] For example, the policy may view an M&A announcement as reducing inside information, and thus allow for equity sales shortly after.

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with 0 being the announcement date.[18] We conduct this analysis for repurchase announcements, rather than actual repurchases, since we do not have the specific dates of actual repurchases. We then compare these numbers to *EQUITYSOLD%* computed over window [-2, 0), [-5, 0), [-10, 0), [-15, 0), or [-20, 0) and test their differences. As Panel A of Table 8 shows, the differences are statistically and economically significant: for example, 0.008% of the firm's equity is sold by the CEO within the two-day window immediately following a repurchase announcement, twice the amount sold immediately before of 0.003%. The difference is significant at the 1% level for all five windows.

Independently of our main research question to study the long-term consequences of vesting equity, these results are of interest in their own right as they contradict commonly-stated justifications for repurchases. One reason is that the stock is undervalued, but if so the CEO should not be selling his own equity at the same time. A second is that the firm has enough cash to take all value-increasing investment opportunities and that repurchases are the next best use of cash. However, if the firm has been able to take all value-creating projects and is using cash wisely, the CEO should wish to remain invested in the firm. Instead, the results are consistent with the CEO announcing repurchases to falsely signal undervaluation to the market to improve the conditions for his equity sales. If true, a potential remedy would be to prohibit CEO equity sales for a short period after a repurchase announcement.

Panel B of Table 8 repeats the analysis for M&A and similarly finds a concentration of equity sales after the announcement. This result is inconsistent with CEOs undertaking an acquisition because it is likely to create long-term value. However, cashing out is individually rational if the deal was conducted to boost short-term stock prices, or yield the CEO private benefits.

[18] We obtain data on equity sales from the Thomson Reuters Insider Filing, excluding sales marked with transaction code F (which occur when the executive sells equity, or has equity withheld by the company, to satisfy a tax liability upon vesting or to fund the exercise of an option). We exclude these transactions to focus on discretionary sales; results are stronger without this exclusion.

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5.3 Separating repurchases and M&A from investment

As discussed in the Introduction, EFL show that vesting equity leads CEOs to cut R&D and capital expenditure. Thus, a concern is that the greater share buybacks and M&A that we document are simply by-products of the cash saved from the investment cuts, rather than independent channels through which the CEO attempts to boost the short-term stock price. This may also mean that long-term returns are negatively related to vesting equity because of investment cuts rather than value-decreasing repurchases and M&A. We thus conduct additional analyses to address these concerns.

One approach is to control for changes in investment. We did not do so in the main analyses because investment may be considered a "bad control" – a channel through which vesting equity could lead to repurchases. However, doing so allows us to investigate whether repurchases and M&A are independent consequences of vesting equity, rather than by-products of investment cuts. Table OA3, Panel A thus adds the changes in R&D and capital expenditure (both scaled by total assets) from the prior quarter as additional controls to the Table 2 regressions linking vesting equity to repurchases; Panel B does so for the Table 4 regressions on M&A.[19] In both panels, the coefficients on *VESTING* are barely affected. Table OA4 (OA5) adds these controls to the regressions linking vesting equity to the long-term returns to repurchases (M&A) and finds that the results are either unchanged or slightly stronger. For example, the link between the characteristics-adjusted returns to M&A and *VESTING* (Panel C of Table OA5) is now significant in years 2 and 3.

Another approach is to remove quarters with investment cuts from our analysis, and study whether vesting equity continues to be related to repurchases and M&A within the remaining sample. Table OA6 studies the relation between repurchases and M&A within firm-months that belong to quarters

[19] We calculate the quarterly change in investment as this is the highest frequency at which investment data is available. Estimating the monthly change in investment by dividing the quarterly change by three would not affect the results, other than changing the magnitude of the coefficients. Controlling instead for the levels of R&D and capital expenditure, which is not susceptible to "bad control" concerns, also makes no difference to the results.

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with non-negative growth in R&D expenditure (Panel A), capital expenditure (Panel B), or total investment (Panel C); quarterly is the highest frequency with which we observe investment. In all fifteen specifications, the coefficient on *VESTING* is positive and significant at the 1% level. Table OA7 repeats the analysis for M&A. The results are positive and significant in seven of nine specifications. *VESTING* loses significance when adding firm fixed effects in Panels B and C. This is because M&A is a relatively rare event to begin with and controlling for firm fixed effects requires us to identify purely off time-series variation. For Panel A, which removes quarters where R&D is cut, we still have a sufficient sample size to obtain statistical significance. However, since capital expenditure cuts are much more common, the sample size in Panels B and C is 37% smaller.

Table OA8 repeats the analysis of the long-term returns to repurchases, illustrated in Table 3, but focusing on firm-months that belong to quarters with non-negative total investment changes (the results are similar if we focus on non-negative R&D changes, or non-negative capital expenditure changes). In all three panels (BHAR over the market, industry, and characteristic-based portfolio), *VESTING* is negatively and significantly related to the long-term returns to repurchases in years 1, 2, and 3. Table OA9 repeats the Table 6 analysis of the long-term returns to M&A, focusing on firm-months that belong to quarters with non-negative total investment changes. All 12 coefficients are negative; however, due to the reduction in sample size by over 40%, only four are significant.

5.4 Intensive margin

A separate concern is that firm-months with vesting equity may be unusual months. For example, there may be particular months in which firms make many decisions, such as repurchasing shares, undertaking M&A, and granting new equity. Since equity typically vests on the anniversary of grants, this may mechanically lead to repurchases and M&A occurring in vesting months. We thus rerun the analyses dropping firm-months with no vesting equity, i.e. studying the intensive margin of how the

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amount of vesting equity drives firm decisions within vesting months. Even though we lose over 85% of the sample observations, Panel A of Table OA10 shows that the relation between vesting equity and repurchases remains significant in all five specifications. Panel B shows that the link with M&A remains significant in two out of three specifications. Similarly, Table OA11 shows that the link between vesting equity and the long-term returns to repurchases becomes slightly stronger when focusing on the intensive margin only. Table OA12 shows that the link with the long-term returns to M&A becomes markedly stronger. This is logical: given the potentially significant long-term consequences of M&A, a small amount of vesting equity is unlikely to induce the CEO to undertake a value-destructive transaction.

In unreported results, we find weak results along the extensive margin, i.e. when the dependent variable is an indicator for whether any equity is vesting in the month. This is intuitive since it is the amount of vesting equity that matters, not just the existence of vesting equity – given the potentially negative long-term consequences of repurchases and (in particular) M&A, it is unlikely that a small amount of vesting equity will induce myopic actions. This may also explain why the link between vesting equity and repurchase (M&A) returns is slightly (markedly) stronger when focusing on the intensive margin alone. In contrast, Edmans et al. (2018) show that strategic news releases are linked to vesting equity at both the intensive and extensive margins. This is likely because strategic news releases have few negative long-term consequences. Thus, even a small amount of vesting equity may lead to the CEO engaging in a strategic news release.

5.5 Additional robustness tests

This section describes the results of additional robustness tests. One concern is that a CEO may not be able to time an M&A deal to coincide with the month in which M&A vests, given the preparation and due diligence involved. Wangerin (2019) shows that acquirers shorten due diligence

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when they face stronger short-term reporting incentives and competitive pressure from other bidders, suggesting they have some latitude over the duration of the M&A process.[20] (Indeed, shorter due diligence is associated with worse post-acquisition performance and more goodwill impairment, echoing our results.) However, this discretion will not be unlimited. Table OA13 thus repeats the analysis of Table 4, which links vesting equity to M&A, at the quarterly rather than monthly frequency. This analysis assumes that the CEO has control over the quarter in which M&A is announced but does not require him to be able to control the precise month. Vesting equity continues to be positively linked to the likelihood of M&A at a quarterly frequency, in both the probit and LPM analyses, and all coefficients are significant at the 1% level. In unreported results, we find that vesting equity also remains positively linked to repurchases at a quarterly frequency.

The next set of tests verify robustness to alternative definitions of the dependent variables. Table OA14 does so for the corporate actions that we study in Tables 2 and 4. Panel A studies the link between vesting equity and repurchase announcements, rather than actual repurchases. We do not use repurchase announcements in the core analyses for the reasons described in Section 2.2. However, since repurchase announcements can increase the short-term stock price even if not eventually executed, a CEO with short-term concerns may have incentives to undertake them. The dependent variable is *REPANN*, an indicator for whether a firm announces a share repurchase program or actual share repurchase in a given month. Under both probit and LPM specifications, *VESTING* is significantly positive at the 1% level. For example, a one standard deviation increase in *VESTING* is associated with a 0.1% increase in a firm's likelihood of announcing a repurchase in a given month, compared with the unconditional probability of 1.45%.

[20] Wangerin (2019) studies due diligence between M&A announcement and completion, as this is observable to the econometrician. However, most due diligence occurs pre-announcement.

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Panel B studies robustness to alternative definitions of the M&A dependent variable. The first alternative is *MANUM*, the number of acquisitions announced in a given month. Columns (1) and (2), without and with firm fixed effects respectively, show that *VESTING* is significantly positive at the 1% level. The second alternative is *MASUM*, the aggregate value of all acquisitions made in a month, scaled by the acquirer's market capitalization at the end of the previous month.[21] Columns (3) and (4), without and with firm fixed effects respectively, show that *VESTING* is significantly positive at the 1% level.

Table OA15 conducts the return analyses of Table 3 (for repurchases) and Table 6 (for M&A) studying long-term CAR rather than BHAR. While BHAR geometrically compounds a stock's raw return and then subtracts the geometrically-compounded benchmark return, CAR first calculates a stock's benchmark-adjusted monthly returns and then arithmetically compounds them over several months. Conrad and Kaul (1993) argue that the BHAR method is more accurate for statistical reasons, hence using it in the main analyses, but here we verify robustness to CAR. The inferences are unchanged: there are negative long-term returns over the following three years for repurchases and one year for M&A.[22]

The next set of tables verifies robustness to alternative ways of calculating *VESTING*. One concern with *VESTING* is that an option's delta is increasing in the current stock price, which may be correlated with unobservable variables (such as growth opportunities) that also drive repurchase and M&A activity. While this would seem to work against our repurchase results (higher growth opportunities would encourage investment rather than repurchases), it may explain our M&A results (a higher stock price would make it easier to stock-finance M&A, or obtain board approval for M&A).

[21] We set missing transaction sizes to zero in calculating *MASUM*. The results are unchanged if we instead drop M&A deals with missing transaction sizes.

[22] Panel A for repurchases does not have columns for prior-month returns – since these returns were calculated for single months, CAR is the same as BHAR so the numbers would be identical to Table 3.

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Table OA16 recalculates *VESTING* assuming that all options are at-the-money. This still allows option deltas to vary with their maturity date and the volatility of the underlying stock, but removes their dependence on the strike price.

A related concern is that the current stock price may affect *VESTING* through triggering vesting. Our use of vesting equity is motivated by it being determined by equity grants made several years prior. While true for grants with time-based vesting, performance-based vesting is becoming more common. Bettis et al. (2010) find that 46% of performance-based vesting provisions are contingent on stock price thresholds, twice as frequent as the next category. If good investment opportunities increased the stock price, triggering vesting, and also reduced the cash available to undertake repurchases, this would lead to a negative correlation between *VESTING* and repurchases, the opposite of our finding. However, reverse causality may be a concern if vesting is contingent on accounting thresholds (23% of cases), since repurchases may increase earnings and trigger vesting. Table OA17 recalculates *VESTING* including only time-based vesting grants, and removes post-2006 grants labeled "performance-based," "contingent," or "accelerated," as well as post-2006 grants with unknown vesting schedules.

Table OA18 addresses the concern that an option's delta depends on its time-to-maturity, but if CEOs exercise their options shortly after they vest, their effective horizons are shorter. We thus recalculate *VESTING* using options' intrinsic values: we assign a delta of one to all in-the-money options and zero to all out-of-the-money options, because only the former would be exercised immediately upon vesting. In Tables OA16-OA18, the inferences regarding both the frequency of and returns to repurchases and M&A are unchanged.

Finally, the main analysis uses vesting equity as the independent variable of interest, since boards and investors can estimate how much equity is vesting in a given month and so are interested in how repurchases and M&A relate to this magnitude. However, we can also use vesting equity as an

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instrument for equity sales in a 2SLS analysis. Doing so verifies our assumption that vesting equity leads to equity sales and thus short-term stock price concerns. EFL and Edmans et al. (2018) already document such a link for an earlier time period.

We first run the following 2SLS regressions to assess the relation between equity sales and repurchase activity:

$$EQUITYSOLD_m = \alpha_1 + \beta_1 VESTING_m + \gamma_1 CONTROLS1 + \varepsilon_{1m}, \quad (6)$$

$$REP_m\ (REP\%_m) = \alpha_2 + \beta_2\, FIT_EQUITYSOLD_m + \gamma_2 CONTROLS1 + \varepsilon_{2m}. \quad (7)$$

REP_m ($REP\%_m$) are defined as before. $EQUITYSOLD_m$ is the number of shares that a CEO sells in a given month m multiplied by the firm's stock price at the end of month m-1. We then estimate the relation between equity sales and M&A announcements by replacing the dependent variable in the second-stage with M&A indicator MA_m, and *CONTROLS1* with *CONTROLS2*.

Table OA19, Panel A presents the 2SLS results of estimating equations (6)-(7). Columns (1) and (3) report the first-stage results. The coefficients on *VESTING* are positive and significant at the 1% level. A one standard deviation increase in *VESTING* is associated with a rise in *EQUITYSOLD* by $35,250, 20% of the average level. This number becomes $18,101 (10% of the average level) when we include firm fixed effects. The weak instrument test rejects the null of no correlation between *VESTING* and *EQUITYSOLD*: with year-month fixed effects, the F-statistic is 29.8 compared to the Stock and Yogo (2005) critical value of 16.38 for significance at the 10% level. Thus, consistent with Edmans et al. (2018), we find that vesting equity is significantly correlated with same-month equity sales. Columns (2) and (4) report the second-stage results. The coefficients on the instrumented equity sales (*FIT_EQUITYSOLD*) are positive and significant at the 1% level in both columns, consistent with the reduced-form regressions in Table 2. A one standard deviation increase in equity sold, $886,387, is associated with a 36.1% higher likelihood of undertaking a repurchase in a given month,

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versus the unconditional probability of 24.5%. While this economic significance appears large, the average equity sold in a month is only $177,160, which is associated with a 7.2% higher likelihood of undertaking a repurchase.

Table OA20, Panel A repeats the 2SLS results with *MA* as the dependent variable in the second-stage. Column (1) shows a positive association between equity sales and vesting equity, with an economic magnitude similar to Column (1) of Table OA19. Column (2) continues to find a positive and significant coefficient on instrumented equity sales (*FIT_EQUITYSOLD*). A one standard deviation increase in equity sold is associated with an 8.8% higher likelihood of announcing an M&A in a given month, versus the unconditional probability of 5.7%.

Panel B of both tables presents the corresponding OLS analyses, regressing on uninstrumented equity sales (*EQUITYSOLD*). Panel B of Table OA19 finds inconsistent results – equity sales are positively related to the likelihood of a repurchase but negatively related to the size of a repurchase, both significant at the 10% level. Panel B of Table OA20 finds no relation between equity sales and M&A. These results suggest that, while vesting-induced equity sales are positively associated with repurchases and M&A, general equity sales are not. This may be because they include unexpected liquidity-motivated sales, which should not be associated with myopic behavior as the CEO is unable to take actions in advance. As a result, our analysis focuses on the scheduled vesting of equity.

6. Conclusion

This paper suggests that the impending vesting of equity leads CEOs to take myopic actions, that boost the short-term stock price at the expense of long-term value. An increase in vesting equity is associated with a greater frequency of stock repurchases and M&A announcements and lower long-term returns surrounding these events. These results provide suggestive evidence of the negative causal effects of short-term CEO incentives on long-term firm value.

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One potential practical implication is to extend the vesting periods of equity beyond a CEO's departure, to deter potentially value-destructive actions arising from equity that vests during his tenure. Indeed, the revised (July 2018) UK Corporate Governance Code states that "the remuneration committee should develop a formal policy for post-employment shareholding requirements"; the UK Investment Association's 2019 pay principles state that "shareholders expect these post-employment shareholding requirements to be established for all new executive directors and for existing executive directors at the earliest opportunity"; and the Council of Institutional Investors recommends "extended, time-based vesting requirements … including beyond employment termination."

However, the case for lengthening vesting periods is not unambiguous. While we have provided evidence of the potential costs of short-term incentives, there may also be costs of lengthening vesting periods. For example, longer vesting periods may subject the CEO to risk outside his control and lead to him demanding a risk premium, or avoiding value-creating risky projects as shown theoretically by Brisley (2006). Relatedly, Laux (2012) demonstrates that, if equity is forfeited upon dismissal, long vesting periods may encourage the CEO to take short-term actions that reduce the risk of being fired.

Moreover, if the vesting period is extended but stays within the CEO's tenure, he will still have incentives to engage in myopic behavior whenever it vests. Instead, our results suggest that boards should particularly scrutinize a CEO's decisions at times when he has significant equity vesting. An alternative remedy would be to spread out the vesting of a large equity grant across different dates in a year, rather than it all vesting on grant anniversary.

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Appendix A: Definition of variables

This appendix describes the calculation of variables used in the core analyses. Underlined variables refer to variable names within CRSP or Compustat. Subscript *m* indexes event month, and subscript *q* and *y* index the quarter and the year to which month *m* belongs, respectively. Firm subscript is omitted for brevity.

Variable	Definition
Outcome variables of interest	
REP_m	An indicator variable that equals one if a firm reports a share repurchase in its 10-Q or 10-K filings in month *m*, and zero otherwise.
$REP\%_m$	The value of shares repurchased in month *m* as reported by the firm in its 10-Q or 10-K filings as a percentage of market capitalization at the end of month *m-1* (in percentage points) and zero if there is no repurchase. The value of shares repurchased is calculated as the number of shares repurchased times the average price paid, and the market capitalization is calculated as closing price times number of shares outstanding (*PRC* × *SHROUT*) from CRSP monthly. Missing market capitalization is replaced with (*PRCCQ* × *CSHOQ*) from Compustat Quarterly at the end of quarter *q-1*.
MA_m	An indicator variable that equals one if a firm announced an M&A in month *m*, and zero otherwise.
$CASHMA_m$	An indicator variable that equals one if a firm announced an M&A and the deal was an all-cash acquisition in month *m*, and zero otherwise; we keep the deal with the largest absolute market reaction if the firm announced multiple M&A in a month.
$NCASHMA_m$	An indicator variable that equals one if a firm announced an M&A but the deal was not an all-cash acquisition in month *m*, and zero otherwise; we keep the deal with the largest absolute market reaction if the firm announced multiple M&A in a month.
$BHAR_m$	A firm's buy-and-hold abnormal return (BHAR) during month *m*, with *m* indicating either the calendar month in which a share repurchase occurred or the month that ends on M&A announcement (i.e., the last day of the month is the M&A announcement day). For repurchase events, BHAR is calculated as the firm's raw return during month *m* minus a benchmark return over the same month on: the CRSP value-weighted index, the Fama-French 49 industry portfolio (obtained from Kenneth French's website), or the DGTW (1997) characteristic-based portfolio. BHARs and benchmark returns for M&A events are calculatedly similarly as those for repurchase events, but use daily returns rather than monthly returns. $BHAR_{m-2}$ and $BHAR_{m-1}$ are analogously calculated as a given firm's BHAR for month *m-2* and *m-1*, respectively.
$BHAR_{m+1\ to\ m+12}$	A firm's BHAR from *m+1* to *m+12*, with *m* indicating the event month defined above. For repurchase events, BHAR is calculated as the firm's geometrically-compounded monthly raw returns minus the geometrically-compounded return on either the CRSP value-weighted index, the Fama-French 49 industry portfolio, or the DGTW (1997) characteristic-based portfolio. BHAR and benchmark returns for M&A events are calculatedly similarly to those for repurchase events, but use daily returns rather than monthly returns. $BHAR_{m+13\ to\ m+24}$, $BHAR_{m+25\ to\ m+36}$, and $BHAR_{m+37\ to\ m+48}$ are analogously calculated as a given firm's BHAR for month *m+13* to *m+24*, *m+25* to *m+36*, and *m+37* to *m+48*, respectively.
CAR_m	Three-day market-adjusted abnormal return surrounding an M&A announcement made by a firm during month *m*, calculated as the sum of daily abnormal returns over [*-1*, *+1*], with 0 indicating the announcement day. The daily abnormal return is the firm's daily raw return minus the corresponding return on the CRSP value-weighted index. We keep the deal with the largest absolute market reaction if the firm announced multiple M&A in a month.
$IMPAIREDMA\%_t$	Percentage of M&A impairment loss, calculated as the total absolute value of goodwill impairment loss booked by a firm (*GDWLIPQ*) over window *t* scaled by the sum of deal

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size for all M&A announced by the firm in quarter *q* in which month *m* belongs. It is zero if a firm announced at least one M&A in quarter *q* but booked zero impairment loss over *t*. We measure *t* over quarter *q+1* to *q+8*, *q+1* to *q+12*, and *q+1* to *q+16*, respectively. The sum of deal size for M&A is obtained from SDC Platinum.

CEO's vesting equity

$VESTING_m$	Stock price sensitivity of the CEO's vesting equity in month *m*, calculated as the sensitivity of vesting stock [number of vesting shares in month *m* × stock price at the end of month *m-1*] plus the sensitivity of vesting options [aggregated delta of vesting options in month *m* × stock price at the end of month *m-1*]. Vesting options are assigned to month *m* based on expiry dates, and vesting stocks are assigned to month *m* based on grant dates. See Appendix B for details on the algorithm to estimate the vesting date of option and stock grants and details on the calculation of option delta.

Other variables and controls

$EQUITYSOLD_m$ (*EQUITYSOLD%*)	The value of the shares sold (excluding those related to payment of exercise price or tax liability by delivering or withholding securities) by the CEO in month *m*, calculated as the total number of shares sold during the month × stock price at the end of month *m-1*, in billions. *EQUITYSOLD%* is the value of the shares sold by the CEO within a particular window defined in Table 8, as a percentage of the market capitalization 90 days before the repurchase announcement or the M&A announcement.
$UNVESTED_{y-1}$	CEO's stock price sensitivity of his unvested equity at the end of year *y-1*.
$VESTED_{t-1}$	CEO's stock price sensitivity of his already-vested equity at the end of year *y-1*.
$SALARY_{y-1}$	CEO's salary in year *y-1*.
$BONUS_{y-1}$	CEO's cash bonus in year *y-1*.
AGE_y	CEO's age in year *y*.
$TENURE_y$	CEO's tenure in year *y*.
$NEWCEO_y$	An indicator variable to denote new CEO in year *y* to which month *m* belongs.
$SALES_{q-1}$	Natural logarithm of total sales (*SALES*) of quarter *q-1*.
MB_{q-1}	The ratio of market value of assets to book value of assets, calculated as [market capitalization plus book value of total debt (*DLTTQ*+*DLCQ*)] divided by total assets, both at the end of quarter *q-1*.
$BKLEV_{q-1}$	Long-term debt-to-asset ratio (*DLTTQ*/*AT*) of quarter *q-1*.
ROA_{q-1}	Operating income (*OIBDPQ*) in quarter *q-1* divided by the average of the total assets at the beginning and the end of quarter *q-1*.
$NROA_{q-1}$	Non-operating income (*NIPIQ*) in quarter *q-1* by the average total assets of the quarter.
RET_{m-1}	A firm's BHAR relative to the CRSP value-weighted index over month *m-1*.
$MKLEV_{y-1}$	Average quarterly market leverage over year *y-1*, calculated as book value of total debt divided by market value of total debt following Uysal (2011), where market value of total debt is the sum of book value of total debt, market capitalization, and preferred stock (*PSTKQ*) minus deferred taxes and investment tax credit (*TXDITCQ*).
$MALIQ_{q-1}$	Industry M&A liquidity is the total value of acquisitions made by all Compustat firms within the firm's three-digit SIC group during the year to which quarter *q-1* belongs, divided by the total assets of all firms in the same industry group and year.
$INDCONC_{q-1}$	Herfindahl index, calculated as the sum of the squares of the market shares of the Compustat firms within the same three-digit SIC group for the year to which quarter *q-1* belongs. Market share is the sales of the firm during the year divided by total sales in the firm's industry group of that year.
MV_{q-1}	Natural logarithm of market capitalization at the end of quarter *q-1*.

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Appendix B: Calculation of Vesting Equity

This appendix describes our calculation of vesting equity, which follows EFL. First, we retrieve a CEO's number of vesting shares in a given year using Equilar's variable "Shares Acquired on Vesting of Stock," which includes shares vested from restricted stock plans, restricted stock unit plans, and long-term incentive plans. We then infer a CEO's number of vesting options in the year, grant-by-grant, from his unvested options at the beginning and the end of the year as well as his newly awarded options during the year. Option grants are sorted using their strike price and expiry date.

Second, we convert vesting equity from annual to monthly basis by estimating the vesting date of equity. For options, this is simple. Options vest and expire on the anniversary of a grant (as assumed in the literature and as we verify in a random sample). For shares, there is no expiry date, and grant dates are only available for shares awarded after 2006 in Equilar, so we follow EFL's algorithm to assign them to a particular month. In the first step, a CEO's vesting shares in a given year are attributed to stock awards post 2006 for which we know the grant dates from Equilar. These include cliff-vesting grants, which vest at the end of the vesting period, and graded-vesting grants, which we assume to vest annually on a straight-line basis following Gopalan et al. (2014). In the second step, the remaining vesting shares are attributed to pre-2006 grants evenly across all the grant dates that we observe from post-2006 awards in Equilar.

For robustness, EFL propose two alternative algorithms to assign vesting shares. The first uses post-2006 cliff and graded[23] stock awards without performance provisions (as opposed to all post-2006 cliff and graded stock awards) in the first step. This addresses the concern that, for performance-vesting equity, the grant date anniversaries may not be a good guide to the vesting date. The second algorithm similarly uses post-2006 non-performance-vesting cliff and graded stock awards in the first step, but the second step uses only grant dates for performance-vesting stock - since non-performance-vesting stock was used in the first step, so the remaining unmatched shares are unlikely from this pool. Our results are unchanged under either alternative algorithm.

[23] Equilar classifies the vesting schedule into "cliff," "graded," "retirement," and "N/A." While "retirement" awards is less than 1% of the total, "N/A" comprises 10%.

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Table 1: Summary statistics

Variable	N	5%	Mean	Median	95%	SD
Main outcome variables of interest						
REP_m	280,756	0	0.245	0	1	0.43
$REP\%_m$	280,756	0	0.101	0	0.699	0.333
MA_m	283,236	0	0.057	0	1	0.232
$IMPAIREDMA\%_{[q+1, q+8]}$	42,886	0	4.348	0	53.878	13.779
$IMPAIREDMA\%_{[q+1, q+12]}$	42,886	0	10.02	0	115.199	29.637
$IMPAIREDMA\%_{[q+1, q+16]}$	42,886	0	15.042	0	162.5	42.202
CAR_m	16,292	-6.65%	0.92%	0.54%	9.95%	5.13%
$CAR_{m\ VESTING>0}$	2,921	-6.37%	1.11%	0.62%	10.81%	5.22%
$CAR_{m\ VESTING=0}$	13,371	-6.74%	0.88%	0.52%	9.72%	5.11%
CEO incentives from vesting equity						
$VESTING_m$	280,756	0	208,720	0	988,135	952,703
Controls						
$UNVESTED_{y-1}$	280,756	0	4,955,200	1,041,373	24,197,822	10,139,662
$VESTED_{y-1}$	280,756	92,848	59,910,572	8,494,712	247,215,718	192,966,596
$SALARY_{y-1}$	280,756	173,333	614,169	533,796	1,250,000	352,528
$BONUS_{y-1}$	280,756	0	145,244	0	800,000	444,253
AGE_y	280,756	42	54	54	67	8
$TENURE_y$	280,756	1	8	6	24	7
$NEWCEO_y$	280,756	0	0.037	0	0	0.189
$SALES_{q-1}$	280,756	1.552	4.834	4.852	8.239	2.075
MB_{q-1}	280,756	0.204	1.492	1.084	4.276	1.384
$BKLEV_{q-1}$	280,756	0	0.174	0.113	0.575	0.196
ROA_{q-1}	280,756	-0.059	0.019	0.024	0.077	0.046
$NROA_{q-1}$	280,756	-0.003	0	0	0.008	0.005
RET_{m-1}	280,756	-0.183	0.001	-0.002	0.201	0.117
$MKLEV_{y-1}$	283,236	0	0.244	0.176	0.727	0.24
$MALIQ_{q-1}$	283,236	0	0.014	0	0.087	0.028
$INDCONC_{q-1}$	283,236	0.01	0.042	0.026	0.128	0.04
$EQUITYSOLD$	283,236	0	177,160	0	675,665	886,387

This table reports summary statistics. For main variables, we focus on the sample employed in the repurchase analysis. For additional variables, we calculate summary statistics using the respective sample employed in other analyses. All continuous variables are winsorized at the 1% and 99% levels. Variable definitions are in Appendix A.

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Table 2: Repurchase and vesting equity

	(1)	(2)	(3)	(4)	(5)
	Probit	**LPM**		**OLS**	
Dependent Variables		REP_m		$REP\%_m$	
$VESTING_m$	**41.977*****	**15.191*****	**11.534*****	**9.758*****	**6.808*****
	(4.896)	(1.778)	(1.091)	(1.247)	(1.101)
	[12.388***]				
$UNVESTED_{y-1}$	10.746***	4.415***	1.942***	1.876***	1.253***
	(1.421)	(0.507)	(0.393)	(0.287)	(0.350)
$VESTED_{y-1}$	-0.194**	-0.055**	0.002	-0.010	-0.005
	(0.078)	(0.025)	(0.032)	(0.012)	(0.023)
$SALARY_{y-1}$	0.356***	0.126***	0.056***	0.064***	0.026**
	(0.057)	(0.018)	(0.018)	(0.009)	(0.013)
$BONUS_{y-1}$	-0.001	-0.001	-0.002	-0.001	0.000
	(0.028)	(0.010)	(0.007)	(0.005)	(0.005)
AGE_{y-1}	-0.311	-0.056	-0.255***	-0.114***	-0.138***
	(0.201)	(0.053)	(0.079)	(0.026)	(0.051)
$TENURE_{y-1}$	0.445**	0.077	0.175**	0.052*	0.106**
	(0.222)	(0.063)	(0.078)	(0.031)	(0.049)
$NEWCEO_y$	0.035	0.015	0.005	0.007	0.000
	(0.033)	(0.009)	(0.007)	(0.006)	(0.005)
$SALES_{q-1}$	0.132***	0.035***	0.028***	0.011***	0.009**
	(0.012)	(0.003)	(0.006)	(0.002)	(0.004)
MB_{q-1}	-0.010	0.004	-0.008***	0.001	-0.010***
	(0.012)	(0.003)	(0.003)	(0.001)	(0.002)
$BKLEV_{q-1}$	-0.702***	-0.189***	-0.111***	-0.108***	-0.104***
	(0.083)	(0.020)	(0.022)	(0.011)	(0.017)
ROA_{q-1}	3.497***	0.485***	-0.107**	0.398***	0.045
	(0.371)	(0.078)	(0.052)	(0.043)	(0.037)
$NROA_{q-1}$	-0.424	0.043	-0.008	0.417*	0.136
	(1.822)	(0.382)	(0.175)	(0.232)	(0.135)
RET_{m-1}	-0.027	-0.003	-0.006	0.020*	0.016*
	(0.053)	(0.013)	(0.009)	(0.010)	(0.009)
Year-Month FE	Yes	Yes	Yes	Yes	Yes
Firm FE			Yes		Yes
Observations	280,734	280,756	280,756	280,756	280,756
Pseudo (Adjusted) R^2	0.110	0.118	0.437	0.049	0.187

This table presents the regression results on the relation between share repurchases and the CEO's vesting equity. Variable definitions are in Appendix A. Column (1) estimates a probit model, columns (2)-(3) estimate a linear probability model (LPM), and columns (4)-(5) estimate an ordinary least squares (OLS) model. *VESTING*, *UNVESTED*, *VESTED*, *SALARY*, and *BONUS* are in billions. *AGE* and *TENURE* are in hundreds. Inclusion of Fixed Effects (FE) is as indicated. Standard errors are in parentheses, clustered by firm and month. In column (1), the marginal effect for *VESTING* is displayed below the standard errors. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

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Table 3: Long-term returns to repurchases and vesting equity

Panel A: BHAR over market portfolio

Period	(1) *m-2*	(2) *m-1*	(3) *m*	(4) *[m+1, m+12]*	(5) *[m+13, m+24]*	(6) *[m+25, m+36]*	(7) *[m+37, m+48]*
Dependent Variables	*BHAR over value-weighted market index return*						
VESTING$_m$	**0.220**	**0.919*****	**0.026**	**-3.328*****	**-3.239*****	**-1.437***	**-0.258**
	(0.265)	(0.220)	(0.247)	(1.064)	(0.752)	(0.773)	(0.691)
Year-Month & Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	73,433	73,449	73,452	72,499	69,388	66,254	62,767
Adjusted R^2	0.031	0.037	0.037	0.237	0.238	0.261	0.261

Panel B: BHAR over industry portfolio

Period	(1) *m-2*	(2) *m-1*	(3) *m*	(4) *[m+1, m+12]*	(5) *[m+13, m+24]*	(6) *[m+25, m+36]*	(7) *[m+37, m+48]*
Dependent Variables	*BHAR over Fama-French 49 industry portfolio return*						
VESTING$_m$	**0.162**	**0.784*****	**-0.010**	**-2.895*****	**-3.294*****	**-0.799**	**-0.684**
	(0.262)	(0.233)	(0.222)	(0.913)	(0.611)	(0.777)	(0.515)
Year-Month & Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	72,507	72,523	72,526	71,597	68,505	59,811	48,845
Adjusted R^2	0.022	0.028	0.027	0.222	0.220	0.254	0.277

Panel C: BHAR over characteristic-based portfolio

Period	(1) *m-2*	(2) *m-1*	(3) *m*	(4) *[m+1, m+12]*	(5) *[m+13, m+24]*	(6) *[m+25, m+36]*	(7) *[m+37, m+48]*
Dependent Variables	*BHAR over DGTW characteristic-based portfolio return*						
VESTING$_m$	**0.313**	**1.021*****	**-0.063**	**-2.636*****	**-2.624*****	**1.077**	**0.124**
	(0.196)	(0.238)	(0.221)	(0.750)	(0.693)	(0.890)	(0.832)
Year-Month & Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	66,948	67,077	67,137	66,042	62,281	50,976	41,192
Adjusted R^2	0.014	0.017	0.019	0.238	0.249	0.264	0.282

Panel D: BHAR over characteristic-based portfolio for firms with largest vesting equity

Period	(1) *m-2*	(2) *m-1*	(3) *m*	(4) *[m+1, m+12]*	(5) *[m+13, m+24]*	(6) *[m+25, m+36]*	(7) *[m+37, m+48]*
Variables	*BHAR over DGTW characteristic-based portfolio return*						
Top quintile within firm	**-0.03%**	**0.08%**	**0.19%***	**-0.54%**	**-1.60%*****	**-0.18%**	**0.24%**
	(0.001)	(0.001)	(0.001)	(0.004)	(0.004)	(0.004)	(0.004)
Top quintile within month	**-0.01%**	**0.06%**	**0.24%****	**-0.02%**	**-0.99%*****	**0.52%**	**-0.16%**
	(0.001)	(0.001)	(0.001)	(0.004)	(0.004)	(0.003)	(0.003)
Top quintile of firm-months	**-0.06%**	**-0.03%**	**0.23%****	**0.00%**	**-1.25%*****	**0.37%**	**0.13%**
	(0.001)	(0.001)	(0.001)	(0.004)	(0.004)	(0.003)	(0.003)

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Panels A-C present the OLS regression results on the relation between the buy-and-hold abnormal return (BHAR) from two months before to four years after a repurchase month and the CEO's vesting equity. BHAR is calculated over the value-weighted market index in Panel A, the Fama-French industry portfolio in Panel B, and the DGTW benchmark portfolio in Panel C. Panel D presents the returns to a portfolio of firms that have *VESTING* in the top quintile in a month in which a share repurchase occurred. The quintile cutoff is defined either time-serially within the firm across all months, cross-sectionally for all firms in that month, or across-all firm-months. BHAR is calculated over the DGTW benchmark portfolio to control for differences in firms' market capitalization, book-to-market, and prior-year return. Variable definitions are in Appendix A. *VESTING* is in billions. Standard errors are in parentheses, clustered by firm and month. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

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Table 4: M&A announcement and vesting equity

	(1)	(2)	(3)
	Probit	**LPM**	
Dependent Variables		MA_m	
$VESTING_m$	**20.363*****	**3.770*****	**2.693*****
	(3.673)	(0.729)	(0.621)
	[1.983***]		
$UNVESTED_{y-1}$	3.253***	0.974***	0.348**
	(0.825)	(0.173)	(0.164)
$VESTED_{y-1}$	0.100**	0.029**	0.004
	(0.047)	(0.011)	(0.019)
$SALARY_{y-1}$	-0.054	-0.004	0.009
	(0.041)	(0.006)	(0.006)
$BONUS_{y-1}$	0.047***	0.008***	0.003
	(0.015)	(0.003)	(0.002)
AGE_{y-1}	-0.758***	-0.063***	-0.003
	(0.119)	(0.012)	(0.023)
$TENURE_{y-1}$	0.393**	0.025	-0.016
	(0.157)	(0.017)	(0.024)
$NEWCEO_y$	-0.095***	-0.007***	-0.004
	(0.026)	(0.003)	(0.003)
$MKLEV_{y-1}$	-0.444***	-0.043***	-0.098***
	(0.048)	(0.004)	(0.007)
$SALES_{q-1}$	0.154***	0.015***	0.001
	(0.008)	(0.001)	(0.002)
MB_{q-1}	-0.011*	-0.001	0.002**
	(0.006)	(0.001)	(0.001)
ROA_{q-1}	0.877***	-0.018	0.067***
	(0.201)	(0.020)	(0.021)
RET_{m-1}	0.379***	0.033***	0.034***
	(0.050)	(0.005)	(0.004)
$MALIQ_{q-1}$	2.011***	0.226***	-0.005
	(0.311)	(0.038)	(0.034)
$INDCONC_{q-1}$	0.380*	0.051*	-0.056
	(0.220)	(0.027)	(0.046)
Year-Month FE	Yes	Yes	Yes
Firm FE			Yes
Observations	283,225	283,236	283,236
Pseudo (Adjusted) R^2	0.068	0.030	0.088

This table presents the regression results on the relation between the likelihood of an M&A announcement and the CEO's vesting equity. Variable definitions are in Appendix A. Column (1) estimates a probit model and columns (2)-(3) estimate an LPM. *VESTING*, *UNVESTED*, *VESTED*, *SALARY*, and *BONUS* are in billions. *AGE* and *TENURE* are in hundreds. Inclusion of Fixed Effects (FE) is as indicated. Standard errors are in parentheses, clustered by firm and month. In column (1), the marginal effect for *VESTING* is displayed below the standard errors. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

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Table 5: M&A announcement and vesting equity: cash versus non-cash deals

Panel A: Cash M&A

	(1)	(2)	(3)
	Probit	**LPM**	
Dependent Variables		$CASHMA_m$	
$VESTING_m$	**38.245*****	**3.698*****	**3.166*****
	(4.689)	(0.514)	(0.525)
	[1.623***]		
Controls	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes
Firm FE			Yes
Observations	283,209	283,236	283,236
Pseudo (Adjusted) R^2	0.053	0.011	0.022

Panel B: Non-cash M&A

	(1)	(2)	(3)
	Probit	**LPM**	
Dependent Variables		$NCASHMA_m$	
$VESTING_m$	**1.366**	**0.072**	**-0.473**
	(4.747)	(0.601)	(0.519)
	[0.088]		
Controls	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes
Firm FE			Yes
Observations	283,219	283,236	283,236
Pseudo (Adjusted) R^2	0.066	0.021	0.090

Panel A presents the regression results on the relation between the likelihood of an announcement of M&A entirely paid with cash and the CEO's vesting equity. Panel B presents the regression results on the relation between the likelihood of an announcement of M&A not entirely paid with cash and the CEO's vesting equity. Variable definitions are in Appendix A. Column (1) estimates a probit model and columns (2)-(3) estimate an LPM. *VESTING*, *UNVESTED*, *VESTED*, *SALARY*, and *BONUS* are in billions. *AGE* and *TENURE* are in hundreds. Inclusion of Fixed Effects (FE) is as indicated. Standard errors are in parentheses, clustered by firm and month. In column (1) of both panels, the marginal effect for *VESTING* is displayed below the standard errors. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

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Table 6: Long-term stock returns to M&A announcements and vesting equity

Panel A: BHAR over market portfolio

	(1)	(2)	(3)	(4)
Period	*[m+1, m+12]*	*[m+13, m+24]*	*[m+25, m+36]*	*[m+37, m+48]*
Dependent Variables	*BHAR over value-weighted market index return*			
VESTING$_m$	**-1.930***	**-1.871***	**-2.160**	**-1.703**
	(1.124)	(1.105)	(1.378)	(1.181)
Year-Month & Firm FE	Yes	Yes	Yes	Yes
Observations	46,021	45,551	43,678	41,643
Adjusted R^2	0.319	0.324	0.335	0.346

Panel B: BHAR over industry portfolio

	(1)	(2)	(3)	(4)
Period	*[m+1, m+12]*	*[m+13, m+24]*	*[m+25, m+36]*	*[m+37, m+48]*
Dependent Variables	*BHAR over Fama-French 49 industry portfolio return*			
VESTING$_m$	**-1.403**	**-2.272****	**-1.809**	**-2.147****
	(0.935)	(1.022)	(1.316)	(1.005)
Year-Month & Firm FE	Yes	Yes	Yes	Yes
Observations	45,616	45,157	43,279	38,289
Adjusted R^2	0.307	0.308	0.333	0.361

Panel C: BHAR over characteristic-based portfolio

	(1)	(2)	(3)	(4)
Period	*[m+1, m+12]*	*[m+13, m+24]*	*[m+25, m+36]*	*[m+37, m+48]*
Dependent Variables	*BHAR over DGTW characteristic-based portfolio return*			
VESTING$_m$	**-1.548**	**-0.845**	**-0.577**	**-1.952***
	(1.090)	(0.960)	(1.708)	(1.063)
Year-Month & Firm FE	Yes	Yes	Yes	Yes
Observations	38,067	37,695	35,897	30,081
Adjusted R^2	0.320	0.330	0.330	0.355

Panel D: BHAR over characteristic-based portfolio for firms with largest vesting equity

	(1)	(2)	(3)	(4)
Period	*[m+1, m+12]*	*[m+13, m+24]*	*[m+25, m+36]*	*[m+37, m+48]*
Variables	*BHAR over DGTW characteristic-based portfolio return*			
Top quintile within firm	**-1.23%*****	**-1.49%*****	**-0.22%**	**0.28%**
	(0.004)	(0.005)	(0.005)	(0.005)
Top quintile within month	**-0.65%**	**-1.03%****	**0.54%**	**0.62%**
	(0.004)	(0.005)	(0.005)	(0.004)
Top quintile of firm-months	**-0.80%***	**-1.16%****	**0.38%**	**0.61%**
	(0.004)	(0.005)	(0.005)	(0.004)

Panels A-C present the OLS regression results on the relation between the BHAR from one month to four years after an M&A announcement date and the CEO's vesting equity. BHAR is calculated over the value-weighted market index in Panel A, the Fama-French industry portfolio in Panel B, and the DGTW benchmark portfolio in Panel C. Panel D presents the returns to a portfolio of firms that have *VESTING* in the top quintile in a month in which M&A was announced. The quintile cutoff is defined either time-serially within the firm across all

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months, cross-sectionally for all firms in that month, or across-all firm-months. BHAR is calculated over the DGTW benchmark portfolio to control for differences in firms' market capitalization, book-to-market, and prior-year return. Variable definitions are in Appendix A. *VESTING* is in billions. Standard errors are in parentheses, clustered by firm and month. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

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Table 7: Post-M&A goodwill impairments and vesting equity

	(1)	(2)	(3)
	[q+1, q+8]	*[q+1, q+12]*	*[q+1, q+16]*
Dependent Variables		*IMPAIREDMA%*	
$VESTING_m$	**1.105*****	**2.718*****	**2.952****
	(0.347)	(0.811)	(1.134)
Controls	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	42,886	42,886	42,886
Adjusted R^2	0.408	0.426	0.439

This table presents the OLS regression results on the relation between M&A impairment losses, scald by deal size, and the CEO's vesting equity. Variable definitions are in Appendix A. *VESTING*, *UNVESTED*, *VESTED*, *SALARY*, and *BONUS* are in billions. *AGE* and *TENURE* are in hundreds. Standard errors are in parentheses, clustered by firm and month. *** (**) (*) indicates significance at the 1% (5%) (10%) two-tailed level, respectively.

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Table 8: Equity sales surrounding repurchase and M&A announcement

Panel A: Equity sales post- vs. pre- repurchase announcement in vesting months

	(1)	(2)	(3)	(4)	(5)
Number of trading days post/pre an event	x=2	x=5	x=10	x=15	x=20
(a) *EQUITYSOLD%* over (0, +x]	0.008%	0.038%	0.110%	0.206%	0.288%
(b) Benchmark *EQUITYSOLD%* over [-x, 0)	0.003%	0.014%	0.044%	0.095%	0.144%
t-stats of testing (a) = (b)	**5.38*****	**6.16*****	**6.18*****	**5.40*****	**4.96*****

Panel B: Equity sales post- vs. pre- M&A announcement in vesting months

	(1)	(2)	(3)	(4)	(5)
Number of trading days post/pre an event	x=2	x=5	x=10	x=15	x=20
(a) *EQUITYSOLD%* over (0, +x]	0.004%	0.023%	0.073%	0.134%	0.225%
(b) Benchmark *EQUITYSOLD%* over [-x, 0)	0.002%	0.011%	0.041%	0.086%	0.144%
t-stats of testing (a) = (b)	**7.01*****	**10.31*****	**9.55*****	**8.03*****	**7.64*****

Panel A reports (a) *EQUITYSOLD%*, the value of equity sold as a percentage of market capitalization 90 days before the repurchase announcement over window (0, x], with day 0 being the repurchase announcement date, and x being the 2nd, 5th, 10th, 15th, 20th trading days post the event, and how it compares to (b) a benchmark percentage calculated over [-x, 0). Variable definitions are in Appendix A. The last row reports the *t*-statistics of testing whether *EQUITYSOLD%* equals the corresponding benchmark. Panel B repeats the analysis with the event day 0 being the M&A announcement date. We limit the sample to vesting months with at least one repurchase announcement date for Panel A, and vesting months with at least one M&A announcement date for Panel B.

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