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Accounting and economic consequences of CEO paycuts[☆]

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ABSTRACT

Boards sometimes cut a CEO's pay following poor performance. This study examines whether such CEO paycuts really work. We identify 1,496 instances of large CEO paycuts during the period 1994–2013. We then create a propensity-score-matched control group of firms that did not cut their CEOs' pay and employ a difference-in-differences approach to examine the consequences of paycuts. Our results show that, following a paycut, CEOs are likely to engage in earnings management in an attempt to accelerate improvement in the reported performance and to achieve a speedier restoration of their pay to pre-cut levels. Further, we find that improvement in long-term performance after a paycut occurs only for those firms with lower levels of earnings management after the paycut. Finally, we show that paycuts are more likely to lead to unintended value-destroying consequences in the absence of high institutional ownership or when the CEO is sufficiently entrenched, thereby impairing the effectiveness of internal monitoring by boards.

1. Introduction

Boards of directors (board) often cut CEO pay following poor performance[1] and these paycuts often go beyond the general pay-for-performance relation (Matsunaga and Park, 2001; Gao et al., 2012; Mergenthaler et al., 2012). Fama (1980) suggests that such paycuts can act as a mechanism for ex-post settling up by the CEO for his past performance, and therefore, can lead to decreased managerial agency costs and better performance in subsequent periods. Consistent with this line of reasoning, Gao et al. (2012) find that firm performance improves following a CEO paycut and conclude that a paycut is therefore an effective mechanism to motivate a poorly performing CEO.

However, it is possible that cutting the pay of an incumbent CEO might also induce an adverse response. CEO compensation contracts are generally based on stock price performance and accounting earnings numbers (Lambert and Larker, 1987; Sloan, 1993; Jackson et al., 2008). Multi-task agency theory (e.g., Holmstrom and Milgrom, 1991; Baker, 1992; Feltham and Xie, 1994) suggests that reliance on these performance measures as a proxy for the unobservable managerial effort can lead to distorted incentives, in the sense that a CEO can allocate effort inefficiently between productive and manipulative activities. Such manipulative activities include both accruals manipulation and real activities management, such as abnormal cuts in R&D expenditure, which will boost reported earnings in the short-run at the expense of long-term shareholder value. Following a paycut, it is possible for CEOs' incentives to

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[1] In a recent WSJ article (March 20, 2013) Thurm documents several instances of a firm cutting its CEO's pay following poor performance.

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engage in earnings management to increase because such activities can lead to faster improvement in reported performance, and hence, to speedier restoration of their pay to earlier levels. Thus, the effect of a paycut on a CEO's subsequent actions and the firm's future performance are unclear. In this study, we examine whether CEO paycuts really work both in the short run and long term.

To address our research question, we first identify 1496 instances of CEO paycuts from a sample of non-financial firms on Execucomp over the period 1994–2013. We classify a decrease in CEO pay as a "paycut" if the CEO's incentive compensation (i.e., bonus plus stock-based pay) that is not directly tied to performance is reduced by at least 25% from the previous year. By doing so, we are able to identify planned or deliberate paycuts arising from a revised contract as opposed to paycuts that follow as a consequence of poor performance based on an existing or prior managerial contract. We then use the propensity-score-matching (PSM) procedure to select a control sample that includes firms that did not initiate a CEO paycut, but are similar to the firms initiating a CEO paycut using factors that prior research has shown to be associated with a CEO paycut.

We then proceed to examine changes in earnings management before and after a CEO paycut for the firms that had a CEO paycut and benchmark these changes against this control sample. We consider both accruals-based and real activities-based earnings management in our analysis. We measure accruals-based earnings management as discretionary accruals calculated from the modified Jones model as formulated by Dechow, Sloan, and Sweeney (1995). We measure real earnings management as abnormal discretionary expenditure, following Roychowdhury (2006). Our analysis reveals a significant increase in the magnitude of discretionary accruals and abnormal discretionary expenditure after a CEO paycut compared to the period prior to the pay cut. The firms with a CEO paycut would have reported much lower profits in the year following the paycut had they not engaged in these earnings management activities. In contrast, we do not observe a similar increase in earnings management for the matched control firms.

We then examine cross-sectional variation in the proclivity of CEOs to manage earnings in the year following the pay cut. Prior research suggests that one role of corporate governance in financial reporting is to ensure compliance with financial accounting requirements and maintain the credibility of financial statements (Shleifer and Vishny, 1997; Core et al., 1999). We focus on the role of two particular features of corporate governance - CEO power vis-à-vis the board, and institutional ownership in the firm. We, find that the proclivity to manage earnings after a pay cut is higher for firms whose CEOs are more entrenched (as proxied by a higher *E-index*) because these CEOs are less likely to be constrained when their power relative to the board is greater. On the other hand, we find that the ability of CEOs to opportunistically manipulate earnings in the year after the paycut decreases in the presence of dedicated institutional ownership because more effective monitoring implied by dedicated institutional ownership inhibits CEOs from engaging in such opportunistic behavior (Bushee, 1998).

Finally, we examine the impact of paycuts on long-term profitability and risk. We find that one-year-ahead return on assets (ROA_{t+1}), cash flow from operations scaled by total assets (CFO_{t+1}), and stock returns increase after a CEO paycut (relative to the control sample), but only for those firms that have low levels of earnings management after paycut. In contrast, future performance is lower following a CEO paycut for firms that exhibit high levels of earnings management. These results also rule out the possibility that the earnings management proxies capture operational changes expected to happen after a CEO paycut rather than opportunistic CEO behavior to mask poor reported accounting performance in the short-run. We also find that one-year-ahead idiosyncratic return volatility increases (decreases) significantly after a CEO paycut (relative to the control sample) for firms that have high (low) levels of earnings management.

We consider two alternate explanations for our results. The first is that CEOs desire to have their pay restored to pre-paycut levels, and hence, manage earnings to achieve the accounting performance metric targets included in bonus and equity compensation contracts. In this case, it is difficult to link earnings management to the disciplining role of paycut as opposed to the CEO managing earnings to meet a given performance metric. We rule out this possibility by explicitly controlling for equity incentives in our difference-in-differences regression model. The second explanation is that the firm's poor performance provides incentives for earnings management. Poor performance can also lead to a CEO paycut. Thus, it may be the firm's poor performance and not the paycut per se that leads the CEO to engage in earnings management. However, our propensity score matching technique ensures that the treatment and control firms are similar along the performance dimensions. Thus, any observed differences in the level of earnings management after a paycut are more likely due to the paycut and not to differences in performance. Overall, our experimental design together with our evidence suggests that neither of these alternatives is a viable explanation for our results.

Our results raise two questions that require further explanation. First, why would a CEO engage in earnings management only after the board cuts his pay and not do so before the paycut? The CEO may have been able to avoid the paycut and other negative ramifications of poor performance by engaging in earnings management prior to the paycut. Second, why would a board that is able to cut the CEO's pay tolerate earnings management behavior, which imposes significant agency costs on the firm? These two questions are interrelated and are best explained by examining the firms' and managers' behavior both pre and post paycut periods in greater detail.

We posit that CEOs can time their earnings management so that they attract less scrutiny. The median ROAs of firms that cut CEO pay are 4.5%, 2.7% and 3.1% in the years $T-1$, T and $T+1$, respectively, where T is the year of CEO paycut. The median pre-managed ROAs for the corresponding years are 4.3%, 2.4%, and 2.2%, respectively. To show an improvement in ROA for year T (the year of the paycut) over the ROA for year T-1, the pre-managed earnings needs to be bumped up by at least 88% [(4.5% − 2.4%)/2.4%]. This exceedingly high level of earnings management is likely to attract considerably more scrutiny when compared to earnings management in year $T+1$ (the year after the paycut) when the benchmark to beat is relatively low. Thus, if the CEO is powerful and can influence the pay-setting process (Bertrand and Mullainathan, 2001; Bebchuk and Fried, 2004; Laksmana et al., 2012), he can devise a less risky strategy. The CEO can accept a paycut in the period of poor performance to placate stakeholders, and subsequently have the board restore the pay to earlier levels when the firm's reported accounting performance improves, albeit via real activities and accruals earnings management. This tacit understanding between the board and the CEO can also explain why a board first cuts the CEO's pay and then either tolerates earnings management or fails to formally recognize it.[2] In this manner, the CEO is also able to avoid the negative publicity, scrutiny, and political constraints associated with high compensation during times of poor performance, as suggested by Jensen and Murphy (2000).

Our study makes several contributions. First, we contribute to the literature on executive compensation by examining the effectiveness of paycuts to induce CEO effort. One school of thought (Fama, 1980) suggests that the wage revision process can lead to improvement in firm performance. Gao et al. (2012) also provide empirical evidence consistent with this argument. We show that the reported improvement in financial performance after a CEO paycut is superficial in several instances. The pressure to achieve a quick turnaround and to restore compensation and reputation in the labor market to pre-paycut levels may lead CEOs to engage in both real earnings management and accruals management. An alternative interpretation of our results is that the board's intention when initiating a paycut may not be to induce CEO effort as hypothesized in theory. Rather, a paycut may just be a way of avoiding the scrutiny (and mitigating consequent political costs) associated with what might be viewed as unreasonably high compensation during a period of poor performance. Such a firm response might be particularly likely when the CEO is relatively powerful vis-à-vis the board. Hence, our findings suggest caution before considering CEO paycut as a strategy to induce greater CEO effort, as it can have unintended consequences in the absence of strong monitoring mechanisms. Second, our study is closely related to Matsunaga and Park (2001) and Mergenthaler et al. (2012), who show that after controlling for the general pay-for-performance relation, missing quarterly earnings benchmarks can lead to CEO paycuts. We extend that line of research by examining the consequences of such paycuts. We document that after a paycut, CEOs are more likely to manage earnings and beat benchmarks, and boards seem indifferent to the quality of such reported earnings. Third, we add to the corporate governance literature by showing that institutional ownership improves the credibility of financial reporting by acting as a check on managerial opportunism and the tendency to manipulate reported earnings after a CEO paycut. Finally, we contribute to the earnings management literature by identifying a setting where incentives to manage earnings seem particularly high.

We note that because the exact nature of a paycut is often not clearly stated in the proxy statements or press releases, our attempt to decompose the total change in pay into two components – one that arises from normal fluctuations in pay due to change in performance, and the other that is a deliberate and conscious decision by the board to reduce the CEO's pay– is an empirical approximation of a more complex underlying process. Therefore, although we present very strong results regarding the effect of paycuts on earnings management and on subsequent firm performance, the complex nature of the associations between pay, performance, and earnings management makes it difficult to make any definitive policy recommendations about CEO paycuts.

The rest of this study is organized as follows. We develop the hypotheses in the next section, describe the measurement of variables and sample selection in Section 3, report the results of the empirical analysis in Section 4, and present our conclusions in Section 5.

2. Related literature and hypothesis

The principal-agent problem between shareholders and managers has been a central concern for economists, dating back at least to Berle and Means (1932). A vast literature beginning with Jensen and Meckling (1976) examines the role of compensation contracts in alleviating the agency problem. Compensation contracts can align managers' interests with those of shareholders by linking CEO pay to firm performance.[3] In addition to pay-performance sensitivity, threat of dismissal also provides CEOs with incentives to maintain strong performance (Coughlan and Schidt, 1985; Warner et al., 1988; Weisbach, 1988; Jensen and Murphy, 1990; Jenter and Lewellen, forthcoming). Paycuts are also used by boards to induce greater CEO effort (Matsunaga and Park, 2001; Gao et al., 2012; Mergenthaler et al., 2012). Our study is closely related to this last stream of literature and examines the consequences of a CEO pay cut.

The wage revision process modeled in Fama (1980) provides the theoretical underpinnings for the effectiveness of a pay cut. We summarize the main arguments of the model here. Fama (1980) argues that the board learns about a manager's talents over a period of time based on the manager's performance and adjusts the manager's pay dynamically. When a firm performs poorly, the board evaluates whether the lack of CEO skill or effort led to the poor performance. If the board determines that the poor firm performance is attributable to the incumbent CEO being less skilled than the average skill level in the labor market, then the board will rationally terminate the contract of the CEO. However, if the board attributes the poor performance to low effort, the board can retain the CEO but cut the pay. If this revised level of pay is lower than the CEO's reservation price, then the CEO is likely to quit the job and search for a new one. Otherwise, the CEO will accept this paycut and will exert additional effort to produce a better performance so that he can get closer to his earlier level of pay. A paycut can also act as a signal that causes the CEO to update his beliefs about the strength of the board, thereby prompting him to respond to a paycut with higher effort. Thus, CEO paycuts are a form of ex post settling up incentive that can potentially lead to better future performance.

While a paycut may induce effort from CEOs to achieve improvement in measured performance, it remains an empirical question whether such improvement is due to productive or earnings management activities. It is possible that cutting the pay of an incumbent CEO could induce an adversarial response. Since managerial effort is unobservable, CEO compensation contracts are generally based

[2] We acknowledge that there can be several other alternate explanations for why a board might tolerate earnings management. For example, the board may not distinguish between managed and unmanaged earnings because it may not be cost effective for them to do so. It is also possible that earnings management might potentially save costs of contracting with other stakeholders, especially debt holders. Testing such alternate explanations is beyond the scope of this paper.

[3] Useful reviews of the executive compensation literature include Murphy (2000), Bushman and Smith (2001), Core et al. (2003), and Frydman and Jenter (2010).

on stock price performance and accounting earnings numbers (Lambert and Larker, 1987; Sloan, 1993). The multi-task agency literature (e.g. Holmstrom and Milgrom, 1991; Baker, 1992; Feltham and Xie, 1994) shows that the use of these imperfect performance measures can lead to distorted incentives, in the sense that the CEO allocates his effort inefficiently between productive and manipulative activities (e.g., compromising the long-term shareholder by indulging in accruals manipulation, or cutting R&D expenditure to boost earnings in the short-run).

Thus, following a paycut, CEOs can have particularly greater incentives to engage in earnings management because such activities can lead to faster improvement in reported performance, and hence to speedier restoration of their pay to earlier levels. This argument is consistent with the extensive prior accounting research that finds earnings-based bonus plans (e.g., Healy, 1985; Holthausen et al., 1995), and equity incentives (e.g., Cheng and Warfield, 2005; Bergstresser and Philippon, 2006; Brown and Lee, 2010) lead to earnings management. In addition to compensation-related incentives, CEOs also have incentives to restore their reputation in the labor market. CEOs may view a paycut as an adverse signal about their quality and will want to counteract this negative signal by reporting a rapid performance turnaround. Based on the discussion above, we hypothesize the following (stated in alternate form):

H1. Earnings management increases in the year following a CEO paycut.

Although CEOs have incentives to manage earnings upwards in the year following the paycut, we expect their proclivity to manage earnings can be constrained by effective corporate governance. Prior research suggests that one role of corporate governance in financial reporting is to ensure compliance with financial accounting requirements and maintain the credibility of financial statements (Shleifer and Vishny, 1997; Core et al., 1999). Thus, properly structured corporate governance mechanisms are expected to reduce earnings management because they provide effective monitoring of management in the financial reporting process. While several facets of corporate governance can affect earnings management, e.g., audit committees and board characteristics (Klein, 2002; Larcker et al., 2007), we focus on the role of two particular features of corporate governance that we feel are most relevant (based on prior research such as Bertrand and Mullainathan, 2001; Bebchuk and Fried, 2004) in the process of managing the paycut process and its aftermath: CEO power vis-à-vis the board as captured by *E-Index* and institutional ownership in the firm.

The *E-index* is based on six provisions in the governance mechanisms of a firm: staggered boards, limits to shareholder bylaw amendments, poison pills, golden parachutes, and supermajority requirements for mergers and charter amendments. Bebchuk et al. (2009) find that increase in the index level is monotonically associated with economically significant reduction in firm value. The presence of these provisions collectively represents how difficult it is to remove the incumbent CEO. We, expect that the proclivity to manage earnings after a pay cut will be higher in firms where managers are more entrenched (as proxied by a higher *E-index*) because the CEO is more likely to get away with it when his power is relatively greater vis-à-vis the board.

While the *E-index* captures a significant part of internal governance, we also consider institutional ownership to capture the effectiveness of external governance. Several studies document that institutional ownership helps overcome agency problems by ensuring that managers focus on long-term economic performance of the firm and constraining opportunistic self-serving behavior (Shleifer and Vishny, 1997; Core et al., 1999; Hartzell and Starks, 2003, etc.). These studies suggest that institutional investors can provide active monitoring that is difficult for smaller, more passive, or less-informed investors because institutional investors have the opportunity, resources, and ability to monitor managers in a more cost-effective manner than individual investors. In this context, accounting research also finds that institutional ownership enhances financial reporting quality. For example, Bushee (1998) reports that in the presence institutional investors, firms are less likely to cut R&D expenditure to meet earnings benchmarks. However, not all institutional investors have the same investment horizons and diversification levels. Bushee (1998) classifies institutional investors as dedicated, transient, and quasi-indexers. He finds that dedicated institutions have long investment horizons, concentrated shareholding, and independence from the firm for potential business relationship. These dedicated institutional investors are more likely to safeguard the value of their investment from opportunistic managerial behavior such as earnings management by effectively monitoring the managers. On the other hand, because of their short investment horizon and passive investment strategy, transient institutional investors and quasi-indexers are less likely to spend their resources on monitoring the managers and hence are not likely to keep earnings management after the pay cut under check. Accordingly, we posit the following:

H2a. Earnings management in the year following a CEO paycut increases in the relative power of the manager vis-à-vis the board of directors.

H2b. Earnings management in the year following a CEO paycut decreases in the level of dedicated institutional ownership.

We also analyze the impact of earnings management in the year after the paycut on future operating performance. Since accruals, by construction, reverse over time and real earnings management is negatively associated with future profitability (Cohen and Zarowin, 2010), we expect that income-increasing earnings management after a CEO paycut will lead to a decline in future performance. Thus, future performance after the CEO paycut is likely to vary depending on the extent to which CEOs opportunistically mask poor reported accounting performance in the short-run using earnings management. If indeed our earnings management proxies capture opportunistic CEO behavior and not genuine operational changes expected to happen after a CEO paycut, we expect greater improvement in future operating performance for firms with low levels of earnings management after the CEO paycut. Accordingly, our third hypothesis is:

H3. Firms with low levels of earnings management after a CEO paycut exhibit greater improvement in future operating performance than firms with high levels of earnings management after a CEO paycut.

3. Variable measurement and sample

3.1. Variable measurement

3.1.1. CEO pay cut

A CEO paycut can result from (1) a decrease in accounting earnings and/or stock price to which a part of CEO pay is linked, and (2) the board further cutting the CEO pay beyond the general pay-for-performance relation on a subjective basis. Because exact details of such decisions are not publicly available, these two aspects of a paycut are unobservable. We use a parsimonious model to disentangle these components. Specifically, we estimate the following model

$$\Delta INCENTIVEPAY_t = \alpha_1 \Delta ROA_t + \alpha_2 HI\Delta ROA_t + \alpha_3 LO\Delta ROA_t + \alpha_4 \Delta ROA_t * HI\Delta ROA_t + \alpha_5 \Delta ROA_t * LO\Delta ROA_t + \alpha_6 XRET_t + \alpha_7 HIXRET_t + \alpha_8 LOXRET_t + \alpha_9 XRET_t * HIXRET_t + \alpha_{10} XRET_t * LOXRET_t + \varepsilon \tag{1}$$

where $\Delta INCENTIVEPAY_t$ is the percentage change in the CEO incentive pay (bonus, long-term incentive plan, and stock-based compensation) for year *t*; *ROA* is income before extraordinary items divided by total assets for year *t*; and *XRET* is market adjusted one year buy and hold stock return for year *t*. The coefficients α_1 and α_6 represent changes in incentive pay due to changes in firm's accounting and stock price performance measures, respectively. Since prior research (Healy, 1985) suggests that incentive pay typically follows a threshold, range and max structure, we adopt a model similar to the one outlined in Shaw and Zhang (2010) to incorporate non-linearity in the incentive compensation structure. Specifically, we create indicator variables *LOROA* and *HIROA* that equal one if the firm's earnings performance (*ROA*) for the year is in the bottom decile and the top decile, respectively, of the sample distribution for that year, and zero otherwise. Similarly, *LOXRET* and *HIXRET* are indicator variables that equal one if the firm's stock price performance (*XRET*) for the year is in the bottom decile and the top decile, respectively, of the sample distribution for that year, and zero otherwise.[4] We include these indicator variables along with their interactions with the main performance measures in the regression model to make sure that CEO compensation is less sensitive to performance measures when the performance is either too low or too high. Hence we expect α_4, α_5, α_9 and α_{10} to be negative.

Following Bebchuk and Fried's (2004) managerial power hypothesis that "managers use their influence to obtain higher compensation through arrangements that have substantially decoupled pay from performance," we interpret the residual term from model (1) as the change in incentive pay that is not related to firm performance.[5]

We estimate Eq. (1) cross-sectionally for industry-years with at least twelve observations. The detailed definitions of the variables in this and all subsequent regression models are presented in Appendix A, and all continuous variables are winsorized at the top and bottom 1% of their respective distributions to mitigate the effects of extreme values. We identify firm-years with significant CEO paycuts based on the following criteria: (1) the same individual is the CEO from year -2 to $+1$; (2) there is a decline in CEO total pay and the residual term $\varepsilon < -0.25$, i.e., the decline in total CEO pay not caused by performance is at least -25%; (3) the lagged residual term $\varepsilon_{t-1} < 0.25$, i.e., the increase in total CEO pay not related to performance in the previous year does not exceed 25%. This criterion ensures that we do not misclassify large but normal fluctuations in pay as a paycut. It is quite possible that a firm does not grant stocks and options to its CEO uniformly each year.[6] Hence there can be fluctuations in the CEO pay over time. In the absence of this filter, we are likely to observe a paycut every other year; and (4) the CEO does not take a voluntary pay cut. We impose this fourth condition because rather than being disciplining paycuts, voluntary paycuts such as the "one-dollar salary" documented by Hamm et al. (2015) are often a gesture of sacrifice by CEOs of firms in crisis and might signal the CEOs' confidence in turning around the company in the near future.

Following Gao et al. (2012), we use the criterion of a 25% decline in incentive pay to define a paycut. Our results are robust to using a decline in incentive pay of 10% or 50% to define a paycut. We also find that much of this decline in total pay is due to a decline in stock-based compensation. Further, the decrease in stock-based compensation is largely due to a reduction in the number of stocks and options granted, rather than to a decrease in stock price. Thus, our measure of paycut captures the reduction in benefits provided to the CEO.

3.1.2. Measures of earnings management

Following prior literature, we use discretionary accruals to proxy for accrual-based earnings management. We use the following modified Jones model (Dechow, Sloan, and Sweeney, 1995) to estimate discretionary accruals:

$$ACCRUALS_t/A_{t-1} = \alpha_0 + \alpha_1[1/A_{t-1}] + \alpha_2[(\Delta SALE_t - \Delta AR_t)/A_{t-1}] + \alpha_3[PPE_{t-1}/A_{t-1}] + \varepsilon_{i,t} \tag{2}$$

[4] Our results remain unaltered if we use quartiles rather than deciles to identify lower and upper bounds for performance measures.

[5] Other interpretations of the residual term from model (1) include use of non-financial measures (Ittner et al., 1997) and individual performance evaluation (Bushman et al., 1996) in designing CEO compensation. We are agnostic to the nature of this portion of incentive pay that is not related to firm performance because, for our purposes, any reduction in incentive pay that is not the result of a mechanical application of the bonus formula (that links pay with firm performance) is a result of board intervention/choice. Our primary focus in this study is on the consequence of such an intervention.

[6] or example Apple Inc. CEO Tim Cook's 2012 total compensation package was \$4.17 million, a drastic reduction compared to the 2011 package of \$376 million. Virtually all of the 2011 stock option awards vest in two chunks - one in 2016 and the other in 2021. This structure was intended to keep the CEO at the helm for many years, as the value of the stock will depend on how well the company is doing in the long-term. Further this structure gives a big one-time, long-term incentive rather than several smaller grants every year. Thus, while there appears to be a decline in 2012 compensation relative to 2011 compensation, it does not constitute a "paycut" in real economic terms.

where $ACCRUALS_t$ is earnings before extraordinary items and discontinued operations minus operating cash flows reported in the statement of cash flows in year t; A_{t-1} is total assets in year $t-1$; $\Delta SALE_t$ is change in net sales from year $t-1$ to year t; ΔREC_t is change in accounts receivable from year $t-1$ to year t; and PPE_t is gross property, plant, and equipment in year t. We estimate the above regression cross-sectionally for industry-years with at least 15 observations. The residuals from Eq. (2) represent discretionary accruals (*DACC*).

Next, following Roychowdhury (2006), we examine two proxies for real activities management. The first proxy captures the abnormal production costs. Roychowdhury (2006) points out that a firm can overproduce and spread fixed overhead over a larger number of units, thereby lowering COGS and reporting higher earnings. Following Roychowdhury (2006) we first estimate the normal level of production costs as follows:

$$PROD_t/A_{t-1} = \alpha_0 + \alpha_1[1/A_{t-1}] + \alpha_2[SALE_t/A_{t-1}] + \alpha_2[\Delta SALE_t/A_{t-1}] + \alpha_3[\Delta SALE_{t-1}/A_{t-1}] + \varepsilon_{i,t} \quad (3)$$

where $PROD_t$ represents production costs in period t, defined as the sum of cost of goods sold in year t and change in inventory from the year $t-1$ to year t; A_{t-1} is total assets in year $t-1$; $SALE_t$ is net sales in year t; and $\Delta SALE_t$ is change in net sales from year $t-1$ to year t. We estimate Eq. (3) cross-sectionally for each industry-year with at least 15 observations. The estimated residuals from Eq. (3) capture the abnormal level of production costs (*RPROD*). The magnitude of the residual is indicative of the extent of over-production, and the corresponding increase in reported earnings through reduction in the COGS.

Another proxy for real activities management proposed by Roychowdhury (2006) is abnormal discretionary expenditure. Firms can cut discretionary expenditures such as R&D, advertising, and SG&A expenses in order to boost current period earnings. However, this reduction in discretionary expenditures can also be due to normal business conditions. Hence, following Roychowdhury (2006) we model the normal level of discretionary expenditures as:

$$DISX_t/A_{t-1} = \alpha_0 + \alpha_1[1/A_{t-1}] + \alpha_2[SALE_{t-1}/A_{t-1}] + \varepsilon_{i,t} \quad (4)$$

where $DISX_t$ is discretionary expenditures (i.e., the sum of R&D, advertising, and SG&A expenditures) in year t; A_{t-1} is t total assets in year $t-1$; and $SALE_{t-1}$ is net sales in year $t-1$. We estimate Eq. (4) cross-sectionally for industry-years with at least 15 observations. The estimated residuals from Eq. (4) capture the abnormal level of discretionary expenditures, i.e. the cuts in discretionary expenditures that are unrelated to the underlying business and presumably are done to meet earnings benchmarks. We multiply the residuals by -1 (denoted as *RDISX*) so that higher values indicate greater reductions in discretionary expenditures (i.e., greater increases in reported earnings).

Firms that manage earnings are likely to engage in accruals manipulation and/or management of one or both of the two real activities. Hence, following Cohen and Zarowin (2010) and Zang (2012) we also construct a proxy of total earnings management, *TOTALEM*, which is the sum of *DACC*, *RPROD* and *RDISX*.[7]

3.2. Sample

We obtain CEO compensation data, accounting data, analysts' earnings forecasts, and stock returns data from Execucomp, COMPUSTAT, I/B/E/S, and CRSP, respectively. Our initial sample comprises 35,537 firm-year observations from 1994 to 2013 with non-missing CEO total compensation.[8] From this initial sample we first remove observations of firms in the financial services sector (SIC codes 6000–6999) because traditional earnings management measures do not apply to this industry. We also drop observations relating to CEOs with short tenure, i.e., less than four years, because we need data on total compensation for two years before the year of the pay cut and one year after the year of the paycut. Finally, we drop observations without sufficient data on COMPUSTAT to calculate earnings management proxies. This yields our final sample of 21,523 firm-year observations, of which 1496 observations relate to firm-years with a CEO paycut. Since we are interested in documenting inter-temporal changes in earnings management and firm performance related to a CEO paycut, we also select data three years before and three years after the paycut for these firms.[9] This constitutes our treatment sample (*TREAT*).

We then use a propensity-score matching procedure to select a control group of firms.[10] To do this, we identify a sample of firms that are similar to the treatment firms along multiple dimensions but do not have a CEO paycut. The level of similarity is indicated by the closeness of the propensity scores. We eliminate observations if the propensity scores of the treatment and control firms differ by more than 0.01. Further, we allow a matching firm-year to be used only once. The propensity score is the predicted value from the following probit model relating the incidence of a CEO paycut to several determinants identified by prior research (Matsunaga and Park, 2001; Gao et al., 2012; Mergenthaler et al., 2012):

[7] Cohen and Zarowin (2010) also use a composite measure that combines abnormal cash flow from operations and abnormal discretionary expenses. We do not use this metric because, for our sample setting, the mean (and median) abnormal cash flow from operations is positive, indicating that it arises from reduction in discretionary expenses rather than from acceleration of the timing of sales through increased price discounts or lenient credit terms. Hence, combining RCFO and RDISX would lead to double counting in our setting.

[8] Our sample starts in 1994 because we need information on CEO pay for at least two years before a paycut and the Execucomp database starts in 1992.

[9] We want the window to be long enough to allow CEOs to respond to the paycut. At the same time, we want the window to be sufficiently short to avoid picking up factors that might impact earnings management choices of all sample firms. As a tradeoff, we choose a 3-year window for the pre-paycut and post-paycut sub-periods.

[10] ropensity-score matching procedure as described in detail in Rosenbaum and Rubin (1983) and Rosenbaum (2002). Recent examples of application of propensity score matching in accounting studies include Armstrong et al. (2010), McInnis and Collins (2011), etc.

$$PAYCUT_t = \lambda_0 + \lambda_1 HIGHPAY_{t-1} + \lambda_2 LOROA_t + \lambda_3 LOXRET_t + \lambda_4 STRING_t + \lambda_5 TENURE_t + \lambda_6 IOWN_t + \lambda_7 LN(1 + ANALYSTS)_t + \lambda_8 EINDEX + \lambda_9 CEOCHAIR_t + \lambda_{10} BOARDIND_t + \lambda_{11} LITIGATION_t + \lambda_{12} SIZE_t + \lambda_{13} MB_t + \lambda_{14} LEV_t + \lambda_{15} IDOVOL_t + \lambda_{16} MKTVOL_t + \varepsilon \quad (5)$$

where $PAYCUT_t$ is an indicator variable that equals one if the CEO's pay is cut during the year *t* (as defined in Section 3.1.1). $HIGHPAY_{t-1}$ is an indicator variable that equals one if the CEO's total pay in the previous year is above the industry median, and zero otherwise. CEOs with a high level of pay are more likely to get a paycut. $LOROA_t$ and $LOXRET_t$ are indicator variables that equal one if the firm's *ROA* and *XRET* for the year are below the respective industry medians. Firms performing poorly relative to their peers are more likely to have a paycut. *STRING* is the number of quarters in the year *t* during which the firm meets or beats analyst earnings forecasts. Firms missing earnings estimates are more likely to have a paycut. *TENURE* is the number of years the CEO has held this position. A long-tenured CEO may be more powerful, and hence is less likely to have a paycut. On the other hand, the board may also be more patient with a new CEO, and hence, not cut the new CEO's pay as quickly. Therefore, we make no prediction on the sign of the coefficient on *TENURE*. The decision to cut the CEO pay following poor performance is also determined by the strength of the governance mechanisms in place and the litigation risk faced by the firm. Hence, we include the level of institutional ownership (*IOWN*), the level of analyst following (*ANALYST*), the Entrenchment Index (*EINDEX*) as defined by Bebchuk, Cohen, and Ferrell (2009), an indicator variable for a CEO who is also the Chairman of the board (*CEO_CHAIR*), the number of independent directors on the board divided by the board size (*BOARD_IND*), and an indicator variable for industries that are more susceptible to litigation (*LITIGAITON*). Finally, we include firm-specific characteristics that are likely to affect the level of CEO pay, and hence are likely to be related to paycuts. These variables include firm size (*SIZE*), growth opportunities proxied by market-to-book value of equity (*MB*), leverage (*LEV*), firm-specific risk captured by idiosyncratic return volatility (*IDO_VOL*), and market-wide risk measured by volatility of the CRSP value-weighted index (*MKT_VOL*).

Since we examine the behavior of the paycut firms for three years following and three years preceding the paycut, we also examine the behavior of the control firms for three years after and three years before the paycut for the matched treatment firm. Thus, the each firm in the control sample is aligned with its corresponding treatment firm in calendar time. Our propensity-matched sample consists of 12,080 firm-year observations. Credible inferences can be drawn from a propensity-score matched sample only if unobservable factors are assumed to vary randomly across treatment and control samples. Although we have tried to be as comprehensive as possible in the propensity score model, we cannot definitively rule out the possibility of that unobservable factors affect the treatment and control firms differently. However, the difference-in-difference design that we employ limits the threat to causal inferences and enables us to compare the changes in earnings management from the pre-paycut period to the post-paycut period for the paycut firms to corresponding changes for the control group.

4. Empirical analysis

4.1. Descriptive statistics

We present the Eq. (1) estimation results in Panel A of Table 1. Consistent with our expectations, CEO incentive compensation is sensitive to both accounting and stock return performance. Further, the pay-performance sensitivity is lower for very high and very low performance levels, indicating non-linearity in the relation. A key statistic from this table is the low adjusted R-squared (despite including firm and year fixed effects) that we document. It indicates that on average only 2.1% of the change in incentive pay is explained by the change in firm performance and other firm/time invariant factors. In other words, there is a high level of subjectivity used by the boards in determining CEO incentive pay.

Panel B of Table 1 shows the temporal distribution of CEO paycuts and reveals that the frequency of paycuts has remained fairly stable over time except for the periods 2001–03 and 2008–09. These years relate to the time period of the dot-com bust and the financial crisis, respectively, which predictably experienced a higher frequency of paycuts. In Panel C of Table 1, we find that the electronic equipment, business services, and retail industries have the highest frequency of CEO paycuts (32% combined). Panel D of Table 1 shows that the vast majority (83%) of our sample firms reduce their CEOs' pay by 25–65%.

Table 2, Panel A reports the estimation results for the probit model in Eq. (5). Consistent with expectations, a CEO paycut is more likely when the level of CEO pay in the previous year is higher than that of its industry peer CEOs, contemporaneous firm performance is lower than its peers, and the firm belongs to an industry facing greater litigation risk. On the other hand, a CEO pay cut is less likely when the firm meets or beats analysts' earnings expectations more frequently. However, none of the governance-related variables has a significant coefficient. Panel B of Table 2 checks for the covariate balance of our propensity-matched sample by comparing the mean values of several firm characteristics for the treatment group and the control group. The differences in means for the two sub-samples are statistically insignificant, which indicates that the matching algorithm is successful in achieving balance for all the observable covariates.

Table 3 presents univariate difference-in-differences results for the mean values of CEO total pay, firm performance, and earnings management proxies for the treatment and control groups during the pre- and post-paycut periods. In the pre-paycut period, the mean value of *INCENTIVEPAY* for the treatment group (firms with a paycut) is lower than that of the control group (firms without a paycut). However, after the paycut the mean *INCENTIVEPAY* of the treatment group increases and this increase in *INCENTIVEPAY* for the treatment group is significant even after adjusting for the increase in *INCENTIVEPAY* of the control group. In terms of firm performance, the mean *XRET* for the treatment group is lower than that of the control group in the pre-paycut period. But after the

Table 1

Sample distribution. Panel A of this table shows the estimation results from Eq. (1) used to construct the paycut measure. Panel B, C, and D show yearly, industry-wise and size-wise distribution of CEO paycut.

Dependent variable = Δ*INCENTIVEPAY*	Coeff.	t-stat
Panel A: Sensitivity of CEO incentive pay to firm performance		
ΔROA	4.3889***	(7.6706)
HIΔROA	0.2314***	(5.0626)
LOΔROA	−0.1639***	(−3.6225)
ΔROA * HIΔROA	−4.5955***	(−7.7038)
ΔROA * LOΔROA	−4.5225***	(−7.7276)
XRET	0.4958***	(8.9519)
HIXRET	−0.3488***	(−5.6020)
LOXRET	0.3670	(1.3250)
XRET * HIXRET	0.2284***	(4.3874)
XRET * LOXRET	0.1434	(0.9120)
Year fixed effects	Yes	
Firm fixed effects	Yes	
N	16,942	
Adjusted R-square	0.021	

Year	Frequency	Percent
Panel B: Sample distribution by year		
1994	12	0.80%
1995	24	1.60%
1996	41	2.74%
1997	31	2.07%
1998	57	3.81%
1999	56	3.74%
2000	67	4.48%
2001	120	8.02%
2002	160	10.70%
2003	127	8.49%
2004	97	6.48%
2005	88	5.88%
2006	68	4.55%
2007	59	3.94%
2008	97	6.48%
2009	137	9.16%
2010	66	4.41%
2011	71	4.75%
2012	64	4.28%
2013	54	3.61%
Total	1496	100.00%

Fama and French 48 industry	Frequency	Percent
Panel C: Distribution of CEO paycut by industry		
2: Food products	36	2.41%
10: Apparel	34	2.27%
12: Medical equipment	43	2.87%
13: Pharmaceutical products	72	4.81%
14: Chemicals	47	3.14%
19: Steel works etc.	41	2.74%
21: Machinery	61	4.08%
30: Petroleum & natural gas	66	4.41%
31: Utilities	70	4.68%
32: Communications	38	2.54%
34: Business services	177	11.83%
36: Electronic equipment	198	13.24%
37: Measuring and control equipment	45	3.01%
38: Paper	32	2.14%
40: Transportation	40	2.67%
41: Wholesale	56	3.74%
42: Retail	106	7.09%
Other industries with < 2% frequency	334	22.33%
Total	1496	100%

Size of pay cut	Frequency	Percent

(continued on next page)

Table 1 (*continued*)

Dependent variable = Δ*INCENTIVEPAY*	Coeff.	t-stat
Panel D: Distribution of CEO paycut by size		
25–35%	541	36.16%
35–45%	380	25.40%
45–55%	190	12.70%
55–65%	146	9.76%
65–75%	90	6.02%
75–85%	76	5.08%
85–95%	56	3.74%
95–100%	17	1.14%
Total	1496	100.00%

paycut, *XRET* increases significantly for the treatment group. We observe a similar trend for *ROA* of the treatment group. Taken at face value, these results are consistent with the findings of Gao et al. (2012) that a CEO's pay is cut in response to poor firm performance, and that the paycut spurs the CEO to take actions to improve reported performance.

We next proceed to study this apparent improvement in reported firm performance after the paycut more closely by examining whether it is driven by earnings management. Indeed, we find high levels of discretionary accruals and real earnings management in the year following the paycut. Specifically, the means of *DACC* and *RDISX* in the post-paycut period are 0.0077 and 0.0135, respectively, for the treatment group. These mean values are higher than the corresponding values for the control group. Similarly, the mean of *PREEMROA* for the treatment group is lower in the post-paycut period than in the pre-paycut period. These mean values are lower than the corresponding numbers for the control group. These results collectively provide preliminary evidence that the observed increase in reported *ROA* in the year after the CEO paycut may be driven by accruals and real activities management.

4.2. Earnings management following a CEO paycut

In this section, we report the results of multivariate tests that examine the relation between CEO paycuts and earnings management. We use the following model:

$$EM_t = \beta_0 + \beta_1 TREAT_t + \beta_2 POST_t + \beta_3 POST_t * TREAT_t + \sum_{j=1}^{n} \beta_j * CONTROL_j + \varepsilon \tag{6}$$

We estimate several versions of this model, where the dependent variable EM_t in each version is a different proxy for earnings management, as defined in the variable measurement section. *TREAT* is an indicator variable that equals one if the observation belongs to the treatment group, and zero otherwise. *POST* is an indicator variable that equals one if the observation belongs to the post-paycut period, and zero otherwise. Our coefficient of interest is β_3, which measures the difference in the incremental change in the earnings management proxy from the pre-paycut period to the post-paycut period between the treatment group and the control group. We expect β_3 to be positive since we hypothesize that the treatment group is more likely to engage in earnings management than the control group in the post-paycut period.

In estimating the regression specified in Eq. (6), we include several variables that capture the incentives and costs associated with earnings management. We explain the construction of these variables in Appendix A. Our first set of controls includes the stock price and accounting performance measures, $XRET_t$ and ROA_t. Dechow et al. (2010) argue that firms manage earnings to mask poor performance. Since poor performance can also lead to a paycut, it is important to control for performance to rule out the possibility that a firm's poor performance and not the paycut leads CEOs to engage in earnings management.

We include $LN(1 + DELTA_t)$ in the model to capture compensation-related incentives to manage earnings. *DELTA* is the dollar change in the CEO's equity portfolio value for a 1% change in the firm's stock price. Cheng and Warfield (2005) find that managers' equity compensation also provides an incentive to manage earnings.[11] It is important to control for the *DELTA* because CEOs would want to have their pay restored to pre-paycut levels and hence would manage earnings to achieve the accounting targets included in bonus and equity contracts. Without explicitly controlling for *DELTA*, it will be difficult to link earnings management to the disciplining role of the paycut rather than the CEO managing earnings to meet a contracted performance metric.

Our next set of controls capture capital market pressures to manage earnings. Bartov et al. (2002) and Kasznik and McNichols (2002) find that the stock market places a greater premium on firms that repeatedly meet or beat earnings (MBE) targets. In turn, such firms have strong incentives to keep meeting or beating analyst estimates and avoid stock price declines that will result from breaking the MBE streak. Therefore to capture this pressure, we include the number of times a firm meets or beats analysts' earnings

[11] hile several studies in addition to Cheng and Warfield (2005) document a positive relation between CEO equity incentives and earnings manipulation, Armstrong et al. (2010) note that studies documenting a positive association between equity incentives and earnings management differ on which component of CEO equity incentives drives the relation. In fact, Armstrong et al. (2010) find a negative association between accounting irregularities and equity incentives after matching CEOs on the observable characteristics of their contracting environment. Since the evidence on the relation between equity incentives and accounting irregularities is mixed, we make no prediction on the expected sign of the coefficient for this variable.

Table 2
Propensity score matching.

Dependent variable = $PAYCUT_t$	Coeff.	t-stat
Panel A: Determinants of CEO paycut		
$HIGHPAY_{t-1}$	0.2821***	(8.4493)
$LOROA_t$	0.0806***	(2.8417)
$LORET_t$	0.0767***	(2.7695)
$STRING_t$	−0.0407***	(−3.5785)
$TENURE_t$	0.0135***	(7.9640)
$IOWN_t$	0.0562	(1.3855)
$LN(1 + ANALYSTS_t)$	0.0009	(0.4207)
$EINDEX_t$	−0.0026	(−0.2027)
CEO_CHAIR_t	0.0812	(1.4705)
$BOARD\_IND_t$	0.0676	(0.6893)
$LITIGATION_t$	0.1740***	(5.9099)
$SIZE_t$	−0.0372***	(−3.0683)
MB_t	−0.0041*	(−1.7438)
LEV_t	−0.0052	(−0.5030)
IDO_VOL_t	0.2961***	(4.6998)
MKT_VOL_t	1.4438***	(5.9217)
N	21,523	
Adj. R^2	0.031	

	TREAT	*CONTROL*	Difference	*t*-test for difference
Panel B: Covariate balance between the matched pairs				
PROPENSITY SCORE	0.0847	0.0846	0.0001	0.0102
HIGHPAY	0.3692	0.3585	0.0107	0.6100
LOROA	0.5017	0.4943	0.0074	0.4000
LORET	0.6194	0.6268	−0.0074	−0.4100
STRING	2.5217	2.4990	0.0227	0.4600
TENURE	10.4780	10.6720	−0.1940	−0.6500
IOWN	0.5487	0.5456	0.0032	0.2500
LN(1+ANALYSTS)	9.3625	9.4328	−0.0703	−0.2400
EINDEX	1.9686	1.9686	0.0000	0.0000
CEO_CHAIR	0.0656	0.0682	−0.0027	−0.2900
BOARD_IND	0.7188	0.7164	0.0024	0.4500
LITIGATION	0.3947	0.3980	−0.0033	−0.1900
SIZE	7.2793	7.2854	−0.0061	−0.1100
MB	2.7223	2.8227	−0.1004	−0.4400
LEV	0.4678	0.4303	0.0375	0.8600
IDO_VOL	0.4078	0.4068	0.0011	0.1100
MKT_VOL	0.1579	0.1578	0.0001	0.0400

Panel A of this table presents the results from estimating Eq. (5).

$$PAYCUT_t = \lambda_0 + \lambda_1 HIGHPAY_{t-1} + \lambda_2 LOROA_t + \lambda_3 LORET_t + \lambda_4 STRING_t + \lambda_5 TENURE_t + \lambda_6 IOWN_t + \lambda_7 LN(1 + ANALYSTS)_t + \lambda_8 EINDEX + \lambda_9 CEOCHAIR_t + \lambda_{10} BOARDIND_t + \lambda_{11} LITIGATION_t + \lambda_{12} SIZE_t + \lambda_{13} MB_t + \lambda_{14} LEV_t + \lambda_{15} IDOVOL_t + \lambda_{16} MKTVOL_t + \varepsilon.$$

The dependent variable *PAYCUT* is an indicator variable that equals one if there is a CEO paycut during the year, and zero otherwise. All other variables are as defined in Appendix A. Heteroskedasticity consistent z-statistics clustered at firm and year level are reported in parentheses. For brevity, we do not report the coefficient estimates for the intercept. ***, **, and * correspond to 1%, 5%, and 10% significance levels, respectively.

Panel B of this table compares the mean values of several firm characteristics for the treatment group and the control group. The treatment sample comprises of firms with a CEO paycut during the year (N = 1496). For each firm-year in our treatment sample, we select a matching firm (without a CEO paycut) in the same year that has the closet propensity score. The propensity score is the predicted value derived from the estimation of equation (5). All variables are as defined in Appendix A. All continuous variables are winsorized at top and bottom 1% to mitigate the effect of outliers. The significance of difference in mean between the two sub-samples is based on two-tailed t-tests.

** 5% Significance level.

*** 1% Significance level.

* 10% Significance level.

forecasts in the past four quarters ($STRING_t$) and the number of analysts following the firm ($ANALYSTS_t$) as explanatory variables in the model. Teoh et al. (1998) and Rangan (1998) find that managers tend to manage earnings upwards in order to inflate the stock prices before SEOs. To capture this incentive, we include an indicator variable, $ISSUE_{t+1}$, that equals one if the firm issues equity in the next year, and zero otherwise. Barth et al. (1999) and Skinner and Sloan (2002) document a "torpedo effect", which shows that high growth firms suffer steep stock price declines for missing earnings benchmarks. Consequently these firms have incentives to manage earnings upwards. Therefore, we include market-to-book ratio at the beginning of the year (MB_{t-1}) to capture a firm's growth opportunities.

Table 3
Univariate difference-in-differences tests.

	Pre			Post			
	TREAT (1)	*CONTROL* (2)	*Difference* (3) = (1) − (2)	*TREAT* (4)	*CONTROL* (5)	*Difference* (6) = (4) − (5)	Diff-in-Diff (7) = (6) − (3)
INCENTIVEPAY ($ millions)	3.0920	3.6154	−0.5234***	3.5964	3.7833	0.1869*	0.7103***
XRET	0.0290	0.0549	−0.0259**	0.0663	0.0606	0.0057	0.0316*
ROA	0.0206	0.0449	−0.0243*	0.0351	0.0446	−0.0095***	0.0148***
DACC	0.0013	0.0022	−0.0008	0.0077	−0.0020	0.0097***	0.0105***
RPROD	−0.0163	−0.0181	0.0018	−0.0066	−0.0128	0.0062	0.0044
RDISX	−0.0065	0.0023	−0.0088**	0.0135	0.0019	0.0116**	0.0204***
PREEMROA	0.0425	0.0597	−0.0172**	0.0208	0.0590	−0.0382***	−0.0209**

This table reports mean values for CEO compensation, firm performance, and earnings management proxies for the treatment (with a CEO pay cut event) and control (firms without a paycut event) group. We also look three years back and forward, relative to the year of CEO pay cut to construct a "pre" and "post" period for each firm. The significance of difference in mean between the two sub-samples is based on two-tailed t-tests. The definitions of variables are in Appendix A. All continuous variables are winsorized at top and bottom 1% to mitigate the effect of outliers.

*** 1% Significance level.

** 5 Significance level.

* 10% Significance level.

We also control for constraints (both external and internal) on earnings management behavior. Following Zang (2012) we predict lower earnings management in firms that are audited by Big-4 auditors ($BIG4_t$) because Big-4 auditors impose greater scrutiny and thereby deter earnings management. Following Bushee (1998), Klein (2002), Larcker, Richardson and Tuna (2007), and Zang (2012) we include the governance related variables stock ownership by institutional investors ($IOWN_t$), CEO power proxied by the entrenchment index ($EINDEX_t$), board independence ($BOARD\_IND_t$), and CEO duality status (CEO_CHAIR_t). Better governance is likely to ensure better financial reporting quality and act as a check on earnings management. Finally, following Barton and Simko (2002), we include the net operating assets at the beginning of the year (NOA_{t-1}) to capture a firm's limits to manage earnings using accruals. Income increasing accruals from the previous year are reflected in the balance sheet as NOA. Since high levels of NOA will stand out, it reduces the flexibility of firms to use income increasing accruals to boost earnings. Hence, such firms are less likely to substitute accruals manipulation with real earnings management.

We also control for litigation risk and implicit claims in the model. The effects of these factors on earnings management incentives are unclear. On one hand, firms facing high litigation risk and having high implicit claims are likely manage earnings upwards in order to meet earnings targets and avoid the negative publicity that comes from missing these targets (Ali and Kallapur, 2001; Bowen et al., 1995). Yet, these firms may not engage in earnings management (at least accruals manipulation) because they also face greater scrutiny. To capture these factors, we use an indicator variable, $LITIGATION_t$, which equals one if the firm is in a high litigation industry, and zero otherwise. The high litigation risk industries include pharmaceuticals, biotech, computers, and electronics. We measure implicit claims, $IMPLICIT\_CLAIMS_t$ as labor intensity (i.e., 1- the ratio of gross PPE/total assets).

Finally, we control for firm size ($SIZE_t$) and leverage (LEV_t). Prior studies on the relation between firm size and earnings management provide mixed evidence. On one hand, it can be argued that larger firms are more likely to manage earnings (downwards) in response to greater regulatory/political scrutiny (Watts and Zimmerman, 1986). However, recent studies (e.g., Doyle et al., 2007) suggest that larger firms have sufficient expertise and resources to establish robust internal controls and maintain them. Therefore larger firms are likely to have better financial reporting quality. Hence, we make no prediction on the sign of the coefficient on *SIZE*. Positive accounting theory (Watts and Zimmerman, 1986), suggests that firms manage earnings in order to avoid debt covenant violations or rating downgrades (Brown et al., 2015). We use the extent of financial leverage, *LEV,* to proxy for the closeness to covenant violation and expect that more levered firms are more likely to manage earnings upwards. We also include industry and year fixed effects to control for industry characteristics and overall macroeconomic factors over time. We use OLS to estimate these models and, because these models are estimated using pooled cross-sectional data, we base statistical inferences on heteroskedasticity-consistent standard errors that are clustered at the firm and year level.

The estimation results for Eq. (6) are presented in Table 4. Discretionary accruals, abnormal production, abnormal discretionary expenditure, and total earnings management are the dependent variables in columns (1)–(4), respectively. In column (1), consistent with our expectations, the coefficient on $POST * TREAT$ is positive and significant (p-value $< 1\%$). The positive coefficient indicates that on average discretionary accruals are higher for the treatment group following the paycut. In column (2), the coefficient on *POST*TREAT* is insignificant, which suggests that treatment firms are not more likely to change their production activities in the post-paycut period than control firms. However, in column (3) the coefficient on $POST * TREAT$ is positive and significant (p-value $<$ 1%), which implies that treatment firms are more likely to cut their discretionary expenditures (such as R&D, advertising, and SG&A) to boost earnings in the short-run, compared to control firms. The coefficient on $POST * TREAT$ is also positive and significant (p-value $< 1\%$) in column (4), where the dependent variable is the proxy for total earnings management, which captures both accruals and real activities management. These results are economically significant. We find that the changes in discretionary accruals, abnormal production costs, abnormal discretionary expenditure, and total earnings management for the treatment group after the paycut is greater than the corresponding changes in these measures for the control firms over the same time period by 1.18%,

Table 4
CEO paycut and earnings management.

Dependent variable	(1) $DACC_t$		(2) $RPROD_t$		(3) $RDISX_t$		(4) $TOTALEM_t$	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
$TREAT_t$	−0.0001	(−0.0572)	0.0069	(0.8464)	−0.0038	(−0.6282)	0.0038	(0.3120)
$POST_t$	−0.0039*	(−1.8778)	−0.0010	(−0.1587)	−0.0081**	(−2.1829)	−0.0127	(−1.4370)
$POST_t * TREAT_t$	0.0118***	(2.8511)	−0.0032	(−0.3384)	0.0137***	(3.2449)	0.0227**	(1.9573)
ROA_t	0.0227	(1.3372)	−0.1782***	(−2.9322)	0.0011	(0.0569)	−0.1488**	(−2.2087)
$XRET_t$	0.0045	(1.1844)	0.0037	(1.3666)	−0.0013	(−0.7380)	0.0076*	(1.7553)
$LN(1 + DELTA_t)$	−0.0001	(−0.1702)	−0.0052***	(−2.8850)	−0.0034**	(−2.4256)	−0.0090***	(−3.1150)
$STRING_t$	0.0026***	(2.8855)	0.0074***	(3.2591)	0.0031	(1.5300)	0.0079**	(2.0008)
$LN(1 + ANALYSTS_t)$	−0.0096***	(−5.9402)	−0.0309***	(−3.8975)	−0.0281***	(−5.2494)	−0.0666***	(−5.2833)
$ISSUE_{t+1}$	0.0129***	(3.8477)	0.0065	(0.9261)	0.0253***	(6.1556)	0.0313***	(3.2670)
MB_{t-1}	−0.0004	(−1.2220)	−0.0029***	(−2.9388)	−0.0020***	(−2.6588)	−0.0051***	(−2.7443)
$BIG4_t$	−0.0112***	(−3.3981)	0.0159	(0.7870)	−0.0363**	(−2.1790)	−0.0317	(−0.9570)
$IOWN_t$	−0.0012	(−0.2962)	0.0055	(0.3293)	0.0046	(0.3162)	0.0112	(0.4062)
$EINDEX_t$	0.0002	(0.2361)	0.0107***	(3.0149)	0.0065**	(2.1326)	0.0169***	(2.7853)
$BOARD\_IND_t$	−0.0118**	(−2.0349)	−0.0368	(−1.3282)	−0.0294	(−1.3598)	−0.0804*	(−1.8436)
CEO_CHAIR_t	−0.0020	(−0.7539)	0.0102	(1.2938)	−0.0045	(−0.6459)	0.0054	(0.4720)
$LITIGATION_t$	−0.0127**	(−2.4232)	−0.1251***	(−4.2696)	−0.0633***	(−2.8448)	−0.1953***	(−4.4081)
$IMPLICIT\_CLAIMS_t$	0.0190***	(4.3807)	0.0413**	(2.1771)	−0.0307**	(−2.2493)	0.0237	(0.8196)
NOA_{t-1}	−0.0200***	(−2.5876)	0.0751***	(2.6387)	0.1498***	(7.7387)	0.2010***	(4.6270)
$SIZE_t$	0.0050***	(5.7822)	0.0282***	(6.2900)	0.0346***	(11.0657)	0.0663***	(9.5503)
LEV_t	−0.0021	(−1.2300)	0.0100***	(3.1646)	0.0048**	(2.1558)	0.0130**	(2.3432)
Industry and year dummies	Included		Included		Included		Included	
N	12,080		12,080		12,080		12,080	
Adj. R^2	0.034		0.098		0.149		0.117	

This table presents the results from estimating Eq. (6).
$EM_t = \beta_0 + \beta_1 TREAT_t + \beta_2 POST_t + \beta_3 POST_t * TREAT_t + \sum_{j=1}^{n} \beta_j * CONTROL_j + \varepsilon.$
The dependent variable *EM* is discretionary accruals, abnormal production (*RPROD*), abnormal discretionary expenditure (*RDISX*), and total earnings management proxy (*TOTALEM*) in columns 1–4, respectively. All variables are as defined in Appendix A. Heteroskedasticity consistent t-statistics clustered at firm and year level are reported in parentheses. For brevity, we do not report the coefficient estimates for the intercept, industry dummies, and year dummies.
*** 1% Significance level.
** 5 Significance level.
* 10% Significance level.

−0.32%, 1.37%, and 2.27% of total assets, respectively. Given that the average ROA of treatment firms in the post paycut period is 3.51% (from Table 3), the increases in discretionary accruals, abnormal production costs, abnormal discretionary expenditure, and total earnings management constitute 22%, 8%, 5%, and 39% of the reported ROA for these firms.

The coefficients on the control variables are generally consistent with expectations. Capital market pressure as reflected by the tendency to habitually meet or beat analysts' forecasts, upcoming stock issuances, and pressure of implicit claims are positively associated with earnings management. On the other hand, greater scrutiny in terms of large analyst following, Big 4 auditor, board independence, implicit claims, litigation risk, as well as lack of flexibility to manipulate accruals, reduce earnings management as evidenced by the negative coefficients on these variables.

4.3. Impact of governance on earnings management after a CEO paycut

We next examine the cross-sectional variation in the proclivity of CEOs to manage earnings after the paycut. Specially, we estimate the following model:

$$EM_t = \lambda_0 + \delta_1 TREAT_t + \delta_2 POST_t + \delta_3 POST_t * TREAT_t + \delta_4 POST_t * TREAT_t * EINDEX_t + \sum_{j=1}^{n} \delta_j * CONTROL_j + \varepsilon \quad (7)$$

where *EINDEX* is the entrenchment index (*E-index*) as measured by Bebchuk et al. (2009). The dependent variable, control variables, and estimation techniques are the same as explained previously for Eq. (6). We present the results of estimating Eq. (7) in Panel A of Table 5. Discretionary accruals, abnormal production costs, abnormal discretionary expenditure, and total earnings management are the dependent variables in columns (1)–(4), respectively. We find a positive and significant (p-value < 5%) coefficient on the interaction term $POST * TREAT * EINDEX$, in columns (1) and (4), which indicates that accruals management after a CEO paycut is more pronounced in firms where the CEO is more powerful and entrenched. Economically, an increase of one provision in the E-index increases discretionary accruals and total earnings management for the treatment group after the paycut by 80% and 47% (δ_4/δ_3) respectively.

We also examine the role of institutional ownership by estimating the following model:

Table 5
Impact of corporate governance on earnings management following a CEO paycut.

Dependent variable	(1) $DACC_t$		(2) $RPROD_t$		(3) $RDISX_t$		(4) $TOTALEM_t$	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Panel A: Impact of E-Index								
$TREAT_t$	−0.0002	(−0.0800)	0.0068	(0.8282)	−0.0040	(−0.6598)	0.0035	(0.2845)
$POST_t$	−0.0040*	(−1.9413)	−0.0008	(−0.1350)	−0.0084**	(−2.3723)	−0.0130*	(−1.6846)
$POST_t$ * $TREAT_t$	0.0109**	(2.2018)	0.0098	(0.7549)	0.0098**	(2.1784)	0.0244**	(2.3536)
$POST_t$ * $TREAT_t$ * $EINDEX$	0.0087*	(1.8066)	−0.0069	(−1.4036)	0.0052	(1.7384)	0.0114**	(2.4781)
Controls	Included		Included		Included		Included	
Industry dummies	Included		Included		Included		Included	
Year dummies	Included		Included		Included		Included	
N	12,080		12,080		12,080		12,080	
Adj. R^2	0.027		0.085		0.139		0.104	
Dependent variable	(1) $DACC_t$		(2) $RPROD_t$		(3) $RDISX_t$		(4) $TOTALEM_t$	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Panel B: Impact of dedicated institutional ownership								
$TREAT_t$	−0.0002	(−0.0963)	0.0067	(0.8213)	−0.0040	(−0.6583)	0.0033	(0.2762)
$POST_t$	−0.0039*	(−1.9148)	−0.0010	(−0.1675)	−0.0086**	(−2.4514)	−0.0183*	(−1.6236)
$POST_t$ * $TREAT_t$	0.0100***	(2.9337)	−0.0114	(−1.0206)	0.0169**	(2.4113)	0.0162**	(1.9549)
$POST_t$ * $TREAT_t$ * $HIDEDIOWN_t$	−0.0072*	(−1.7116)	0.0059	(0.3812)	−0.0002	(−0.0175)	−0.0153*	(−1.8105)
$POST_t$ * $TREAT_t$ * $LODEDIOWN_t$	0.0141***	(2.8968)	0.0235**	(1.9682)	0.0136**	(1.9798)	0.0171**	(1.8702)
Controls	Included		Included		Included		Included	
Industry dummies	Included		Included		Included		Included	
Year dummies	Included		Included		Included		Included	
N	12,080		12,080		12,080		12,080	
Adj. R^2	0.035		0.099		0.151		0.118	

Panel A of this table presents the results from estimating Eq. (7).
$EM_t = \lambda_0 + \delta_1 TREAT_t + \delta_2 POST_t + \delta_3 POST_t *TREAT_t + \delta_4 POST_t *TREAT_t *EINDEX_t + \sum_{j=1}^{n} \delta_j *CONTROL_j + \varepsilon$.

Panel B of this presents the results from estimating Eq. (8).
$EM_t = \gamma_0 + \gamma_1 TREAT_t + \gamma_2 POST_t + \gamma_3 POST_t * TREAT_t + \gamma_4 POST_t * TREAT_t * HIDEDIOWN_t + \gamma_5 POST_t * TREAT_t * LODEDIOWN_t + \sum_{j=1}^{n} \gamma_j * CONTROL_j + \varepsilon$.

The dependent variable EM in columns 1–4 is discretionary accruals *(DACC)*, abnormal production (*RPROD*), abnormal discretionary expenditure *(RDISX)*, and total earnings management (*TOTALEM*) proxy, respectively. *DACC* is calculated using modified Jones model. *RPROD* and *RDISX* are calculated following Roychowdhury (2006). *TOTALEM = DACC + RPROD + RDISX*. *E-Index* is the entrenchment index as defined in Bebchuk et al. (2009). *HIDEDIOWN* is a dummy variable that equals one if the dedicated institutional ownership in the firm is above the 75th percentile of the industry-year grouping, and zero otherwise. *LODEDIOWN* is a dummy variable that equals one if the dedicated institutional ownership in the firm is below the 25th percentile of the industry-year grouping, and zero otherwise. All other variables are as defined in Appendix A. For brevity, we do not report the coefficient estimates for the intercept, control variables, industry dummies, and year dummies. Control variables include all the other independent variables used in Tables 3 and 4. Heteroskedasticity consistent t-statistics clustered at firm and year level are reported in parentheses.

*** 1% Significance level.
** 5 Significance level.
* 10% Significance level.

$$EM_t = \gamma_0 + \gamma_1 TREAT_t + \gamma_2 POST_t + \gamma_3 POST_t * TREAT_t + \gamma_4 POST_t * TREAT_t * HIDEDIOWN_t + \gamma_5 POST_t * TREAT_t * LODEDIOWN_t + \sum_{j=1}^{n} \gamma_j * CONTROL_j + \varepsilon \quad (8)$$

where $HIDEDIOWN_t$ is an indicator variable that equals one if the dedicated institutional ownership in the firm is above the 75th percentile of the industry-year grouping, and zero otherwise; $LODEDIOWN_t$ is an indicator variable that equals one if the dedicated institutional ownership in the firm is below the 25th percentile of the industry-year grouping, and zero otherwise. The dependent variables, control variables, and estimation techniques are as explained in the previous sub-section.[12]

We present the results of estimating Eq. (8) in Panel B of Table 5. The coefficient on the interaction term

[12] We use a dummy variable for dedicated institutional ownership in the interaction term to facilitate interpretation of the coefficient. Our inferences are unchanged when we include a continuous measure for dedicated institutional ownership (i.e., the three-way interaction term has a negative and significant coefficient). In the model, we also include dummy variables to capture high and low levels of transient institutional investors, quasi-indexers, and the interaction of these dummy variables with *POST* ∗ *TREAT* as control variables.

Table 6
Effect of CEO paycut on future operating performance and stock returns.

Dependent variable	(1) ROA_{t+1}		(2) CFO_{t+1}		(3) $XRET_{t+1}$	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
TREAT	−0.0042	(−1.5179)	−0.0098***	(−3.4147)	0.0117	(1.2443)
POST	−0.0035	(−1.1016)	−0.0001	(−0.0239)	−0.0031	(−0.2431)
*POST*TREAT*	0.0071*	(1.6518)	0.0117***	(3.1437)	−0.0278**	(−2.1428)
*POST*TREAT*LOEM*	0.0249***	(4.2443)	0.0298***	(4.1648)	0.0572**	(2.1734)
*POST*TREAT*HIEM*	−0.0231***	(−6.2781)	−0.0251***	(−5.8962)	−0.0092*	(−1.6058)
LOEM	0.0074**	(2.1434)	0.0227***	(6.1536)	0.0140*	(1.7407)
HIEM	−0.0013	(−0.4579)	−0.0120***	(−4.7573)	−0.0281**	(−2.2895)
SIZE	0.0063***	(4.9237)	0.0030**	(2.2590)	−0.0130***	(−2.8651)
BM	−0.0617***	(−7.7265)	−0.0507***	(−11.4604)	0.1037***	(2.7837)
Industry dummies	Included		Included		Included	
Year dummies	Included		Included		Included	
N	11,456		11,456		11,456	
Adj. R^2	0.190		0.191		0.077	

This table presents the results from estimating Eq. (7).

$$PERFORMANCE_{t+1} = \mu_0 + \mu_1 TREAT_t + \mu_2 POST_t + \mu_3 POST_t *TREAT_t + \mu_4 LOEM_t + \mu_5 HIEM_t + \mu_6 POST_t *TREAT_t *LOEM_t + \mu_7 POST_t *TREAT_t *HIEM_t + \mu_8 SIZE + \mu_9 BM_t + \varepsilon.$$

The dependent variable $PERFORMANCE_{t+1}$ is one year ahead *ROA, CFO, XRET* in columns 1–3, respectively. *LOEM* is a dummy variable that equals one if the *TOTALEM* is below the 25th percentile of the industry-year grouping, and zero otherwise. *HIEM* is a dummy variable that equals one if the *TOTALEM* is above the 75th percentile of the industry-year grouping, and zero otherwise. All variables are as defined in Appendix A. Heteroskedasticity consistent standard errors clustered at firm and year level are reported in parentheses. For brevity, we do not report the coefficient estimates for industry and year dummies.

*** 1% Significance level.

** 5 Significance level.

* 10% Significance level.

$POST_t * TREAT_t * HIDEDIOWN_t$ is negative and significant (p-value $<$ 10%) in columns (1) and (4) but not in columns (2) and (3), which suggests that high institutional ownership acts as an effective check on treatment firms' tendency to manage accruals after the paycut. However, we do not find a significant effect of high institutional ownership on treatment firms' tendency to manage real activities after a CEO paycut. In contrast, when institutional ownership is low, the tendency of treatment firms to manage accruals as well as real activities increases after a paycut, as reflected by the positive and significant (p-value $<$ 5%) coefficient on $POST_t * TREAT_t * LODEDIOWN_t$. In terms of economic significance, we find that compared to treatment firms with average level of institutional ownership (the institutional ownership is in Q2 and Q3 of the distribution), firms with higher levels of institutional ownership have 72% and 94% (γ_4/γ_3) lower discretionary accruals and total earnings management, respectively, after the paycut. Similarly firms with lower levels of dedicated institutional ownership have 1.40 times and 1.05 times higher discretionary accruals and total managed portion of earnings after the paycut, respectively.

The coefficient estimates for the control variables are similar in sign and significance to those reported in Table 4. Hence, for the sake of brevity, we do not discuss them here.

4.4. Effect of paycut on future performance and risk

To examine the implications of paycuts for long-run future profitability, stock returns, and firm risk, we estimate the following model:

$$PERFORMANCE_{t+1} = \mu_0 + \mu_1 TREAT_t + \mu_2 POST_t + \mu_3 POST_t * TREAT_t + \mu_4 LOEM_t + \mu_5 HIEM_t + \mu_6 POST_t * TREAT_t * LOEM_t + \mu_7 POST_t * TREAT_t * HIEM_t + \mu_8 SIZE + \mu_9 BM_t + \varepsilon \quad (9)$$

where $PERFORMANCE_{t+1}$ is measured as one-year-ahead *ROA*, *CFO* and *XRET* under three different specifications of this model; $LOEM_t$ is an indicator variable that equals one if the total earnings management proxy $TOTALEM_t$ for the firm is below the 25th percentile of the industry-year grouping, and zero otherwise; $HIEM_t$ is an indicator variable that equals one if the $TOTALEM_t$ of the firm is above the 75th percentile of the industry-year grouping, and zero otherwise.[13] Hence we expect positive (negative) estimates for μ_4 and μ_6 (μ_5 and μ_7).

We present the results of estimating Eq. (9) in Table 6. One-year-ahead *ROA*, *CFO*, and *XRET* are the dependent variables in columns (1)–(3), respectively. In column (1), consistent with the findings of Gao et al. (2012), the coefficient estimate on $POST * TREAT$ is positive and significant (p-value $<$ 10%), suggesting that the future ROA improves after the paycut. Specifically, we find that after the

[13] We use a dummy variable for extent of total earnings management in the interaction term to facilitate interpretation of the coefficient. The implications remain unchanged even if we include a continuous measure for earnings management (i.e., the three ways interaction term has a negative and significant coefficient).

paycut the one year ahead ROA of the treatment firms exceeds the one year ahead ROA of the control firms by 0.71% of total assets. Further, the interaction term *POST * TREAT * LOEM* also has a positive and significant (p-value < 1%) coefficient, suggesting that improvement in future ROA after the paycut is more pronounced in firms that have lower levels of earnings management. In contrast, the coefficient on the interaction term *POST * TREAT * HIEM* is negative and significant (p-value < 1%). In terms of the economic significance, the change in one year ahead ROA is 5.55 times higher (2.44 times lower) in treatment firms with low (high) levels earnings management, compared to change in one year ahead ROA for treatment firms with average levels of earnings management.

These results suggest that earnings management after a paycut can work only in the short-run. In the long-run firms relying on earnings management to show a quick turnaround are likely to experience a decline in profitability. These results also rule out the possibility that the earnings management proxies capture genuine operational changes that a CEO might undertake after a paycut to improve future operating profitability. In such a scenario, we would have observed a positive coefficient on the interaction term *POST * TREAT * HIEM*. The coefficient estimates on the other variables are consistent with expectations. The coefficient on *LOEM* is positive and significant (p-value < 5%), whereas the coefficient on *HIEM* is negative and significant (p-value < 10%). The findings are similar in columns (2) and (3) when we consider CFO and stock returns as performance measures.

In our additional analysis (untabulated), we also examine the relation between earnings management and two year ahead and three years ahead performance. Consistent with our earlier results, we find that firms with low (high) levels of earnings management experience an increase (decrease) in future ROA (two year and three year ahead). Taken together, these results suggest that performance improvement based on managed earnings is only short-lived.

We next examine the implications of paycuts for firm risk by estimating the following model:

$$IDOVOL_{t+1} = \mu_0 + \mu_1 TREAT_t + \mu_2 POST_t + \mu_3 POST_t * TREAT_t + \mu_4 LOEM_t + \mu_5 HIEM_t + \mu_6 POST_t * TREAT_t * LOEM_t + \mu_7 POST_t * TREAT_t * HIEM_t + \mu_8 SIZE + \mu_9 BM_t + \varepsilon \tag{10}$$

where IDO_VOL_{t+1} is one-year ahead idiosyncratic stock return volatility, our proxy for firm risk. If CEOs become more risk-averse after a paycut they will adopt conservative financial and investment policies (Gao et al., 2012), leading to decline in firm risk. However, it is also possible that CEOs might increase risk taking after a paycut. CEOs might view a paycut as a signal from the board to quickly restore the firm's profitability, failing which they might be terminated. In such a case, CEOs might pick high-risk and high-return investments, compared to low-risk and low-return investments because such investment choices will lead to a faster restoration of profitability. Since the effect of a paycut on future risk-taking incentives is unclear, we make no predictions on the sign of the coefficient on the interaction term *POST * TREAT*. The relation between paycut and firm risk is also likely to be affected by the financial reporting quality (captured by earnings management proxies in our setting). Rajgopal and Venkatachalam (2011) argue that poor financial reporting can exacerbate information asymmetry about a firm's performance and thereby increase the volatility of stock prices. Hence, we expect a positive sign on the interaction term *POST * TREAT * HIEM*.

We present the results from estimating Eq. (10) in Table 7. In column (1) we estimate a reduced form of the Eq. (8) and find a

Table 7
Effect on CEO paycut on future idiosyncratic return volatility.

Dependent variable	(1) IDO_VOL_{t+1}		(2) IDO_VOL_{t+1}	
	Coeff.	t-stat	Coeff.	t-stat
TREAT	−0.0078	(−1.3365)	−0.0076	(−1.3113)
POST	0.0078	(1.2564)	0.0077	(1.2417)
*POST*TREAT*	−0.0148*	(−1.9382)	−0.0178**	(−2.1703)
*POST*TREAT*LOEM*			−0.0208*	(−1.8561)
*POST*TREAT*HIEM*			0.0276**	(2.2267)
LOEM			0.0023	(0.3476)
HIEM			0.0163**	(2.3956)
SIZE	−0.0394***	(−18.5996)	−0.0399***	(−18.6849)
BM	0.0691***	(7.4711)	0.0667***	(7.1572)
Industry dummies	Included		Included	
Year dummies	Included		Included	
N	11,456		11,456	
Adj. R^2	0.190			

This table presents the results from estimating Eq. (8).

$$IDOVOL_{t+1} = \mu_0 + \mu_1 TREAT_t + \mu_2 POST_t + \mu_3 POST_t * TREAT_t + \mu_4 LOEM_t + \mu_5 HIEM_t + \mu_6 POST_t * TREAT_t * LOEM_t + \mu_7 POST_t * TREAT_t * HIEM_t + \mu_8 SIZE + \mu_9 BM_t + \varepsilon.$$

The dependent variable IDO_VOL_{t+1} is one year ahead idiosyncratic return volatility. *LOEM* is a dummy variable that equals one if the *TOTALEM* is below the 25th percentile of the industry-year grouping, and zero otherwise. *HIEM* is a dummy variable that equals one if the *TOTALEM* is above the 75th percentile of the industry-year grouping, and zero otherwise. All variables are as defined in Appendix A. Heteroskedasticity consistent standard errors clustered at firm and year level are reported in parentheses. For brevity, we do not report the coefficient estimates for industry and year dummies.

*** 1% Significance level.

** 5 Significance level.

* 10% Significance level.

negative coefficient on the interaction term $POST * TREAT$ (p-value $< 10\%$). This is consistent with CEOs taking lower risk in the post-paycut period. In column (2) we estimate the full model that also considers the impact of financial reporting quality in the idiosyncratic return volatility. We find a negative coefficient on the interaction term $POST * TREAT * LOEM$ (p-value $< 5\%$) suggesting that the idiosyncratic return volatility decreases after a CEO paycut in firms with low levels of earnings management. In contrast, the positive sign on the interaction term $POST * TREAT * HIEM$ (p-value $< 5\%$) suggests that the idiosyncratic return volatility increases after a CEO paycut in firms with high levels of earnings management. In terms of economic significance of the results, we find that the one year ahead idiosyncratic return volatility (IDO_VOL_{t+1}) of the treatment firms is lower than the IDO_VOL_{t+1} of the control firms by 1.78% after the paycut. Further, this change in IDO_VOL_{t+1} is 2.04 times higher (1.46 times lower) in treatment firms with low (high) earnings management compared to change in DO_VOL_{t+1} in treatment firms with average levels of earnings management.

4.5. Robustness checks

We perform several sensitivity tests to check the robustness of our results to alternate measures of paycut, alternate measures of earnings management proxies, and impact of certain event such as SOX and financial crisis.

4.5.1. Alternate measures of paycut

We ascertain the sensitivity of our results to our proxy for paycut. Specifically, we define paycut in three alternate ways. First, we estimate Eq. (1) with $\Delta TOTALPAYt$ as the dependent variable. This measure of the paycut considers significant decline in the total CEO compensation as opposed to just decline in the incentive pay. Second following, Gao et al. (2012) we define paycut as more than 25% decline in total CEO compensation. This is the most parsimonious measure of the paycut. However, it can't disentangle reduction in CEO pay arising due to poor performance versus other reasons. Third, again following Gao et al. (2012) we estimate the following equation –

$$Ln(TOTALPAY)_{t+1} = \mu_0 + \mu_1 Stock\ Returns_t + \mu_2 ROA_t + \mu_3 Ln(Sales) + \mu_4 Volatility_t + \mu_5 CEO\ Tenure_t + Year\ Fixed\ Effects + Industry\ Fixed\ Effects + \varepsilon \tag{11}$$

The coefficient ε captures abnormal pay. We consider a more than 25% decline in abnormal pay as a pay cut.

In our untabulated analysis, we find that our primary measure of paycut is highly correlated with these alternate measures of paycut, with the coefficient of correlation ranging between 42% and 71%. Further we continue to find that there is upward earnings management in the year following the paycut, irrespective to how we define a paycut.

4.5.2. Alternate measures of earnings management

We then consider the sensitivity of our results to alternative earnings management proxies. First, following Kothari, Leone, and Wasley (2005), we consider performance matched discretionary accruals as our proxy for accruals management. To obtain performance matched discretionary accruals, we subtract the discretionary accruals of a matched-firm with same two-digit SIC code and with the closest return on assets in the current year from the discretionary accruals of a firm as estimated in Eq. (2). We then estimate Eq. (6) with performance matched discretionary accruals as the dependent variable. Consistent with our earlier results, the coefficient on $POST * TREAT$ is positive (0.0073) and significant (p-value $< 10\%$).

Then, we use a firm's tendency to just meet or beat earnings benchmarks as an outcome-based proxy for earnings management. Prior research (e.g., Graham et al., 2005) identifies three earnings benchmarks – avoiding a loss, showing an improvement over previous year's earnings, and meeting or beating analysts' forecasts. We create indicator variables $SUSPECT1_t$, $SUSPECT2_t$, and $SUSPECT3_t$, which equal one if income before extraordinary items scaled by total assets lies in the interval [0, 0.005], change in net income before extraordinary items scaled by total assets lies in the interval [0, 0.005], and forecast error is one cent per share or less ($0.00 ⇐ Actual EPS - Consensus forecast ⇐ $0.01), respectively, and zero otherwise. We re-estimate Eq. (6) with $SUSPECT1_t$, $SUSPECT2_t$, and $SUSPECT3_t$ as dependent variables using a logit model and present the results in Table 8, Panel A. Consistent with our earlier results, the coefficient on $POST * TREAT_t$ is positive and significant (p-value $< 1\%$) in columns (2) and (3), indicating that our results are not sensitive to the choice of earnings management proxy.

4.5.3. Impact of SOX and financial crisis

We also consider the impact of Sarbanes-Oxley Act (SOX) and Financial crisis on our analysis as these events are known to have an impact on earnings management and paycuts. Cohen et al. (2008) report that earnings management via accruals management has declined and real activities management has increased after the Sarbanes-Oxley Act (SOX). Further, the relations between discretionary accruals and various measures of CEO cash and CEO equity incentives have also declined in the post-SOX period. Chen et al. (2015) find that pay performance sensitivity has increased in the post SOX period. We therefore examine the impact of SOX on our results by estimating Eq. (6) for the post-SOX period. The results presented in Table 8, panel B indicate that SOX has little impact on our analysis. Both accruals-based and real activities manipulation are high in the year after a CEO paycut.

Finally, our paycut sample has some clustering during the 2002–03 and 2008–09 periods, which are periods of recession and financial crisis. Therefore, we conduct additional analysis to check whether our results are driven by observations from these periods. In particular, we re-estimate Eq. (6) after excluding firm-year observations from these periods. The results presented in Table 8, panel C show that our primary findings are not driven by the economic conditions in 2002–03 and 2008–09.

Table 8
Robustness tests.

	(1) *SUSPECT1*		(2) *SUSPECT2*		(3) *SUSPECT3*	
	Coeff.	z-stat	Coeff.	z-stat	Coeff.	z-stat
Panel A: Alternate measures of earnings management						
TREAT	−0.1209	(−0.8381)	−0.0518	(−0.7057)	−0.0776	(−1.0929)
POST	−0.0858	(−0.5089)	−0.0510	(−0.6557)	0.1535*	(1.9180)
*POST * TREAT*	0.2931	(1.3661)	0.6343***	(5.0618)	1.1040***	(9.1598)
Controls	Included		Included		Included	
Industry dummies	Included		Included		Included	
Year dummies	Included		Included		Included	
N	12,080		12,080		12,080	
Adj. R^2	0.069		0.078		0.117	

	(1) *DACC*		(2) *RPROD*		(3) *RDISX*		(4) *TOTALEM*	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Panel B: Post SOX sub-sample								
TREAT	0.0009	(0.3285)	0.0029	(0.2899)	−0.0045	(−0.5486)	−0.0002	(−0.0155)
POST	−0.0018	(−0.6721)	−0.0045	(−0.7220)	−0.0104*	(−1.9173)	−0.0166*	(−1.9375)
*POST * TREAT*	0.0078*	(1.6465)	0.0008	(0.0842)	0.0107*	(1.6531)	0.0203**	(1.9880)
Controls	Included		Included		Included		Included	
Industry dummies	Included		Included		Included		Included	
Year dummies	Included		Included		Included		Included	
N	7280		7280		7280		7280	
Adj. R^2	0.035		0.091		0.146		0.110	

	(1) *DACC*		(2) *RPROD*		(3) *RDISX*		(4) *TOTALEM*	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Panel C: Sub-sample excluding recession years								
TREAT	0.0024	(1.1024)	0.0051	(0.5497)	−0.0056	(−0.8255)	0.0029	(0.2218)
POST	−0.0034	(−1.3133)	−0.0010	(−0.1154)	−0.0090**	(−1.9892)	−0.0128	(−1.0863)
*POST * TREAT*	0.0099**	(1.9963)	−0.0023	(−0.1814)	0.0155***	(2.6053)	0.0232**	(1.9856)
Controls	Included		Included		Included		Included	
Industry dummies	Included		Included		Included		Included	
Year dummies	Included		Included		Included		Included	
N	9077		9077		9077		9077	
Adj. R^2	0.030		0.098		0.154		0.119	

This table presents the results from estimating Eq. (6) under various sensitivity checks.
$EM_t = \beta_0 + \beta_1 TREAT_t + \beta_2 POST_t + \beta_3 POST_t * TREAT_t + \sum_{j=1}^{n} \beta_j * CONTROL_j + \varepsilon.$

In panel A, we measure earnings management as the propensity of a firm to just meet or beat the three earnings benchmarks and use a logit model. Indicator variables *SUSPECT1, SUSPECT2*, and *SUSPECT3* equal to one if a firm marginally avoids loss ($0 \Leftarrow ROA \Leftarrow 0.005$), shows marginal improvement over previous year's ROA ($0 \Leftarrow \Delta ROA \Leftarrow 0.005$), and just meets or beats analysts' earnings forecast by one cent, respectively. In panel B and panel C, the dependent variable EM is discretionary accruals *(DACC)*, abnormal production (*RPROD*), abnormal discretionary expenditure *(RDISX)*, and total earnings management (*TOTALEM*) proxy in columns 1–4, respectively. *DACC* is calculated using modified Jones model. *RPROD* and *RDISX* are calculated following Roychowdhury (2006). *TOTALEM = DACC + RPROD + RDISX.* In panel B, we restrict the sample to post-SOX period. In panel C, we drop observations from the recession years. For brevity, we do not report the coefficient estimates for intercept, control variables, industry and year dummies. Control variables include all the other independent variables used in Tables 3 and 4. All other variables are as defined in Appendix A. Heteroskedasticity consistent standard errors clustered at firm and year level are reported in parentheses.

*** 1% Significance level.
** 5 Significance level.
* 10% Significance level.

5. Conclusion

In this study, we examine whether a paycut is an effective strategy to stimulate CEO effort in the wake of poor performance. We find that while performance as measured by reported *ROA* certainly improves after a paycut, such improvement is primarily driven by accruals and real activities management. We argue that in the year following a paycut, CEOs are more likely to engage in earnings management because it will lead to a faster improvement in the reported performance and a speedier restoration of CEO pay to earlier levels. We also show that, in the absence of more effective monitoring in the form of greater institutional holding, CEOs tend to engage more in such earnings management activities. We find improvement in long-term performance measures after a paycut only in those firms with lower levels of earnings management.

We posit that this agency problem is consistent with the CEO power hypothesis. Entrenched and powerful CEOs can exert influence over the pay-setting process (Bertrand and Mullainathan, 2001; Bebchuk and Fried, 2004). Such CEOs accept a paycut in the wake of poor performance to placate stakeholders, but then rely on earnings management to boost profitability as well as their pay. Overall, our results show that paycuts can have unintended consequences in the absence of strong monitoring mechanisms and therefore suggest caution before considering a CEO paycut as a strategy to induce greater CEO effort.

Appendix A. Variable definitions

Earnings management proxies	
DACC	The level of discretionary accruals calculated following modified Jones model (1991) suggested by Dechow, Sloan, and Sweeney (1995), as the residuals from the following industry-year regression: $\boldsymbol{ACCRUALS_t/A_{t-1}} = \alpha_0 + \alpha_1[1/\boldsymbol{A_{t-1}}] + \alpha_2[(\boldsymbol{\Delta SALE_t - \Delta AR_t})/\boldsymbol{A_{t-1}}] + \alpha_3[\boldsymbol{PPE_{t-1}/A_{t-1}}] + \varepsilon_{i,t}$ where $ACCRUALS_t$ is the earnings before extraordinary items and discontinued operations (*Compustat data code: IB*) minus the operating cash flows reported in the statement of cash flows in year *t (OANCF)*; A_{t-1} is the total assets in year $t-1$ *(AT)*; $\Delta SALE_t$ is the change in net sales from year $t-1$ to *t (SALE)*; ΔREC_t is the change in accounts receivables from year $t-1$ to *t (RECT)*; and PPE_t is the gross property, plant, and equipment in year *t (PPEGT)*. The estimated residuals (*DACC*), capturing discretionary accruals, are our proxy for accrual-based earnings management
RPROD	The level of abnormal production costs calculated following Roychowdhury (2006), as the residuals from the following industry –year regression: $\boldsymbol{PROD_t/A_{t-1}} = \alpha_0 + \alpha_1[1/\boldsymbol{A_{t-1}}] + \alpha_2[\boldsymbol{SALE_t/A_{t-1}}] + \alpha_2[\boldsymbol{\Delta SALE_t/A_{t-1}}] + \alpha_3[\boldsymbol{\Delta SALE_{t-1}/A_{t-1}}] + \varepsilon_{i,t}$ where $PROD_t$ represents production costs in period *t*, defined as the sum of cost of goods sold in the year *t* (*COGS*) and change in inventory from the year $t-1$ to *t (INVCH)*; A_{t-1} is the total assets in year $t-1$; $SALE_t$ is the net sales in year *t*; and $\Delta SALE_t$ is the change in net sales from year $t-1$ to *t*
RDISX	The level of abnormal discretionary expenditure calculated following Roychowdhury (2006), as the residuals from the following industry –year regression: $\boldsymbol{DISX_t/A_{t-1}} = \alpha_0 + \alpha_1[1/\boldsymbol{A_{t-1}}] + \alpha_2[\boldsymbol{SALE_{t-1}/A_{t-1}}] + \varepsilon_{i,t}$ where DISXt is the discretionary expenditures i.e., the sum of R&D (*XRD*), advertising (*XAD*), and SG&A (*XSGA*) expenditures in year t; At-1 is the total assets in year t − 1; and $SALE_{t-1}$ is the net sales in year t − 1
TOTALEM	*DACC* + *RPROD* + *RDISX*
HIEM	An indicator variable that equals one if *TOTALEM* is above the 75th percentile of the industry-year grouping, and zero otherwise
LOEM	An indicator variable that equals one if *TOTALEM* is below the 25th percentile of the industry-year grouping, and zero otherwise
PREEMROA	*ROA* – *TOTALEM*
SUSPECT1	An indicator variable that equals one if the income before extraordinary items (*IB*) scaled by total assets (*AT*) that lies in the interval [0, 0.005], and zero otherwise
SUSPECT2	An indicator variable that equals one if the change in the income before extraordinary items (*IB*) scaled by total assets (*AT*) lies in the interval [0, 0.005], and zero otherwise
SUSPECT3	An indicator variable that equals one if $0.00 ⇐ Actual EPS - Consensus forecast ⇐ $0.01, and zero otherwise
Compensation variables	
INCENTIVEPAY	Sum of the CEO's bonuses, long-term incentive plans, the grant-date value of restricted stock awards, and the Black–Scholes value of granted options
ΔINCENTIVEPAY	$(\text{INCENTIVEPAY}_t - \text{INCENTIVEPAY}_{t-1})/\text{INCENTIVEPAY}_{t-1}$
PAYCUT	An indicator variable that equals one if there is a CEO paycut during the year, and zero otherwise. To identify CEO paycuts we first estimate the following industry-year regression: $\Delta INCENTIVEPAY_t = \alpha_1\Delta ROA_t + \alpha_2 HI\Delta ROA_t + \alpha_3 LO\Delta ROA_t + \alpha_4\Delta ROA_t{*}HI\Delta ROA_t + \alpha_5\Delta ROA_t{*}LO\Delta ROA_t + \alpha_6 XRET_t + \alpha_7 HIXRET_t + \alpha_8 LOXRET_t + \alpha_9 XRET_t{*}HIXRET_t + \alpha_{10} XRET_t{*}LOXRET_t + \varepsilon \quad (1)$ where $INCENTIVEPAY_t$ is the incentive compensation of the CEO for the year *t*; *ROA* is income before extraordinary items divided by total assets for the year *t*; and *XRET* is market- adjusted, one-year, buy-and-hold stock returns for the firm for the year *t*. We identify firm-years with significant CEO paycuts based on the following criteria: (i) the same individual is the CEO from year −2 to +1; (ii) there is a decline in CEO's total pay and the residual term $\varepsilon_t < -0.25$; (iii) the lagged residual term $\varepsilon_{t-1} < 0.25$; and (iv) the CEO did not take a voluntary paycut

TREAT	An indicator variable that equals one if the firm belongs to the treatment group (i.e. firm with a CEO pay cut, and zero otherwise
POST	An indicator variable that equals one if the year is after the CEO pay cut, and zero otherwise
DELTA	The dollar change in the CEO's equity portfolio value for 1% change in firm's stock price, calculated following Core and Guay (2002)
HIPAY	An indicator variable that equals one if the CEO's total pay in the previous year is above the industry median, and zero otherwise
Firm characteristics	
ROA	Income before extraordinary items (*IB*), scaled by total assets at the end of the fiscal year (*AT*)
LOROA	An indicator variable that equals one if the firm's *ROA* for the year is below the industry median, and zero otherwise
XRET	The market adjusted one year buy and hold stock returns for the firm
LORET	An indicator variable that equals one if the firm's *XRET* for the year is below the industry median, and zero otherwise
STRING	The frequency of meeting or beating analysts' earnings forecasts in the past four quarters (ranges from 0 to 4)
ANALYSTS	The number of analysts whose forecasts are included in the I/B/E/S consensus annual earnings forecast
ISSUE	An indicator variable that equals one if the firm issues equity in the next year, and zero otherwise. We assume that the firm has issued equity if the shares outstanding (*CSHO*) increase by 10% or more
ASSETS	Total assets at the end of fiscal year (*AT*)
SIZE	Log of market value of equity ($PRCC\_F * CSHO$)
MB	The ratio of the market value of equity ($PRCC\_F * CSHO$) to the book value of equity (*CEQ*) of the firm at the end of fiscal year
LEV	The ratio of total debt ($DLC + DLTT$) to the market value of equity ($PRCC\_F * CSHO$) of the firm at the end of fiscal year
IDO_VOL	The idiosyncratic stock return volatility calculated as the standard deviation of the daily stock returns of a firm during the year
MKT_VOL	The market volatility calculated as the standard deviation of the daily returns on CRSP value-weighted index
TENURE	The tenure of the CEO
BIG4	An indicator variable that equals one if the firm is audited by a Big4 auditor
DEDIOWN	The total number of shares held by dedicated institutional investors, scaled by total shares outstanding of the firm (*CSHO*)
HIDEDIOWN	An indicator variable that equals one if *DEDIOWN* is above the 75th percentile of the industry-year grouping
LODEDIOWN	An indicator variable that equals one if *DEDIOWN* is below the 25th percentile of the industry-year grouping
EINDEX	Entrenchment index based on Bebchuk et al. (2009)
CEO_CHAIR	An indicator variable that equals one if the CEO is also the Chairperson of the board of directors, and zero otherwise
BOARD_IND	Number of independent directors on the board/Board size
LITIGATION	An indicator variable that equals one if the firm is in the following industries: pharmaceutical/biotechnology (SIC codes 2833–2836, 8731–8734), computer (3570–3577, 7370–7374), electronics (3600–3674), or retail (5200–5961), and zero otherwise
NOA	Net operating assets ($CEQ - CHE + DLC + DLTT$) at the end of fiscal year, scaled by total assets (*AT*)
ICLAIMS	Implicit claims, proxied by labor intensity, calculated as 1 minus the ratio of gross property, plant, and equipment (*PPEGT*) scaled by total assets (*AT*)

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