CLAWBACK ADOPTIONS, MANAGERIAL COMPENSATION INCENTIVES, CAPITAL INVESTMENT MIX AND EFFICIENCY*

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ABSTRACT: We present evidence that managerial responses to voluntary clawback adoptions depend on compensation incentives that can induce capital investment mix shifts and reduce capital investment efficiency. Specifically, we find that managers incentivized by high levels of performance-based pay and equity-linked compensation respond to clawback adoptions by shifting capital investments away from R&D and toward capex, thereby lowering capital investment efficiency and contravening purported financial reporting quality and investment efficiency benefits found previously for clawback adoptions. These findings, which are robust to alternative explanations, extend prior evidence by documenting managerial compensation incentives as a channel by which clawback adoptions can influence capital investment mix and capital investment efficiency. These findings are also timely given pending SEC Rule 10D-1 that would make clawback provisions a pre-condition for U.S. exchange listing and which explicitly requests "comment on any effect the proposed requirements may have on efficiency, competition and capital formation" (SEC 2015, 103-104).

JEL classification: G18, G30, M41, M48

Keywords: compensation clawback provisions; capital investment mix; performance-based pay; equity incentives; real effects; capital investment efficiency

Data availability: All data used in the study are available from public sources.

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1. Introduction

Allegations of compensation enhancing earnings management by prominent financially distressed firms in the early 2000s motivated the U.S. Congress to sanction restitutive clawbacks of executive compensation in Sarbanes-Oxley Act Section 304 (SOX 304, U.S. House of Representatives, 2002). Similar allegations during the 2008-2009 financial crisis motivated Dodd-Frank Act Section 954 (DFA 954, U.S. House of Representatives, 2010) that bars U.S. exchange listings by companies lacking clawback provisions. Pending Security and Exchange Commission (SEC) Rule 10D-1 to implement DFA 954 observes that "while [clawback provisions] could result in high-quality financial reporting that would benefit investors, they may also alter operating decisions of executive officers."[1] Rule 10D-1 also explicitly requests "comment on any effect the proposed requirements may have on efficiency, competition and capital formation (SEC 2015, 103-104)." Congruent with this request, this study provides new evidence that in response to clawback provision adoptions, compensation incentives motivate capital investment mix shifts that reduce capital investment efficiency. This evidence thus extends prior findings by documenting a compensation incentive channel by which clawback adoptions induce real effects that offset financial reporting quality motivations for clawback adoptions.

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[1] Proposed SEC Rule 10D-1 authorizes recovery of excess incentive-based pay received by executive officers without regard to fault in the three fiscal years preceding the date a listed company is required to prepare an accounting restatement, where per Section 16 of the Exchange Act, executive officers include the company's president, principal financial officer, principal accounting officer, any vice-president in charge of a principal business unit, division or function, and any other person who performs policymaking functions for the company (Ackerman 2015; SEC 2015). It is estimated that Rule 10D-1 would apply to 4,845 registrants (SEC 2015, 108). Beyond the "Recovery of Erroneously Awarded Compensation" indicated in its title, the SEC anticipates that Rule 10D-1 will provide higher quality financial reporting by discouraging misreporting and "increased incentive to take steps to reduce the likelihood of inadvertent misreporting", for example by "devoting more resources to the production of high-quality financial reporting" (SEC 2015, 115).

Prior studies provide evidence that clawback adoptions enhance financial reporting quality, a purported benefit.[2] Prior studies further document that in response to clawback adoptions, managers take countervailing actions to preserve compensation using both accrual-based earnings management and "real" earnings management that is less subject to clawback-triggering financial restatements (Chan, Chen, Chen, and Yu 2015; Kyung, Marquardt, and Lee 2019; Kubick, Omer, and Wiebe 2019). Of particular interest are findings that clawback adoptions induce managers to reduce R&D expenses to increase reported net income (Chan, Chen, Chen, and Yu 2015). The use of R&D expense reductions to boost reported earnings is salient because R&D expenses are simultaneously R&D capital investments. This raises questions of whether and how clawback adoptions influence total capital investment, capital investment mix, and capital investment efficiency. This study addresses these questions by considering how differences in expense recognition and payback patterns of R&D, capital expenditure (hereafter, capex), and acquisition capital investments relate to managerial compensation incentives that may motivate capital investment mix and efficiency real effects.[3]

Specifically, we posit that managers more motivated by performance-based annual pay (i.e., annual bonus and equity grants) will more respond to clawback adoptions by shifting capital investment mix away from R&D and toward capex. Our reasoning reflects that R&D reductions boost earnings near term at a cost of reducing less predictable longer-term earnings, whereas by comparison, capex increases nearer term earnings by expanding extant businesses at the cost of

[2] Evidence of enhanced financial reporting quality includes fewer restatements, larger earnings response coefficients, fewer reported internal control weaknesses, lower audit fees, quicker audit reporting, lower borrowing costs, reduced loan collateral, longer loan terms, positive short-term share price reactions, and higher pay-earnings sensitivity (Chan, Chen, Chen, and Yu 2012; Chan, Chen, and Chen 2013; Chen, Green, and Owers 2014; Dehaan, Hodge, and Shevlin 2013; Iskandar-Datta and Jia 2013; Kroos, Schabus, and Verbeeten 2018).

[3] Prior studies documenting differing expense and payback patterns for capital investment components include Bhagat and Welch (1995), Kothari, Laguerre, and Leone (2002), Coles, Daniel, and Naveen (2006), and Canace, Jackson, and Ma (2018).

more predictable long-term depreciation.[4] Consequently, we test whether the composition of R&D and capex changes significantly following clawback adoptions and whether capital investment mix shifts away from R&D and toward capex are greater for managers who receive more performance-based relative to fixed compensation. We further posit and test whether managers with greater share holdings and options (hereafter, equity incentives),[5] and thus longer-run value creation incentives, are less likely to exhibit capital investment shifts away from R&D and toward capex.

Capital investment mix shifts by managers in response to clawback adoptions, if motivated by compensation incentives, also hold the potential to cause capital investments to deviate from expected levels based on investment opportunities. Potentially offsetting this effect is increased capital investment efficiency due to improved financial reporting quality arising from clawback adoptions as documented by prior research (e.g., Biddle, Hilary, and Verdi 2009). Applying this reasoning, we further test whether clawback adoption effects on capital investment efficiency arising from managerial compensation incentives offset those arising from improved financial reporting quality when conditioned on performance-based pay versus equity compensation. Thus, in comparison with prior studies of clawback provisions conditioned on adoptions, our design tests for capital investment mix and efficiency effects of clawback provision adoptions conditioned on managerial compensation incentives that motivate and explain these effects and that also help explain previously documented effects, as discussed further below.

We conduct our tests using a propensity-matched sample of 1,257 firm-years surrounding

[4] Managers also can shift R&D expenditures from R&D staffing costs (immediately expensed) to R&D laboratory equipment or property (capitalized and depreciated over useful life) that would bias against our findings. Alternatively, firms can acquire R&D. However, relative to capex, R&D acquisition requires sufficient enabling liquidity and lead time for integration and/or implementation. We reason that in the context of clawbacks, managers are less likely to boost short-term earnings by misclassifying R&D expenses into capex without changing actual R&D activities since such misclassifications could be subject to financial restatement that may trigger clawback provisions, if detected.
[5] As detailed below, short-term equity incentive is measured as equity delta (i.e., the dollar change in the value of CEO equity wealth due to 1% share price change) divided by the sum of equity delta and cash compensation.

136 voluntary clawback adoptions between 2005 when SOX 304 sanctioned clawbacks and 2012 when Dodd-Frank Act provisions intimated their requirement. Our sample selection criteria require clawback adopting firms from among the Russell 3000 constituents with propensity score matched controls, all observations for capital investment determinants three years pre- and post-adoption inclusive, at least one R&D expenditure observation pre- and post-adoption, and the exclusion of extreme outlier capital investment determinants beyond the sample top percentile (see Table 1, Panel A).

Our findings confirm significant reductions in R&D investments and significant increases in capex following clawback adoptions for firms with higher performance-based annual pay ratios and for firms with higher equity incentives. We further find that clawback adoptions are positively associated with R&D underinvestment for firms with higher performance-based annual pay ratios and higher equity incentives. Corroborating tests lend support to our findings. First, clawback adoptions have statistically insignificant effects on pay-earnings sensitivity, pay premium, performance-based pay ratios, equity incentives, and risk-tolerating incentives, suggesting no significant offsetting or anticipated effects of changes in compensation scheme design on capital investment mix and efficiency. Second, clawback adoptions have insignificant effects on firm performance volatilities and financial leverage, and clawback-adopters that do not report R&D expenses in the pre-adoption period do not reduce capex, acquisitions and total capital investment following clawback adoptions. These results suggest that, while R&D has been traditionally regarded as riskier investment than capex (e.g., Coles et al. 2006), shifts in capital investment mix from R&D to capex following clawback adoptions arise primarily from incentives to reduce firm performance volatility. Third, our results disappear when we reset the year of clawback adoption to be two or three years prior to the clawback adoption year, lending credence to an association between clawback adoptions and observed capital investment mix and efficiency shifts. Fourth, our results remain similar for a subsample of firms without CEO turnover over the pre- and post-adoption periods. Finally, changes in compensation schemes, corporate governance structure, and investment opportunities do not differ between clawback adopters and non-adopters, suggesting that observed capital investment mix and efficiency shifts are not due to these possible concurrent effects.

Our findings extend several research streams. First, we document managerial compensation incentives to be a channel by which clawback provision adoptions induce real effects on capital investment mix. More specifically, we find that managers motivated by performance-based annual pay and equity incentives respond to clawback adoptions by shifting capital investment mix away from R&D and toward capex consistent with managerial compensation incentives. These results both confirm and reinterpret the prior finding by Chan et al. (2015) of an association between clawback adoptions and R&D reductions to be part of a capital investment mix shift motivated by managerial compensation incentives. We further find no associations between clawback adoptions, capital investment mix shifts, and either firm or compensation risk.[6]

Our study also extends prior findings regarding clawback adoptions and capital investment efficiency. Whereas studies indicate that clawback adoptions enhance financial reporting quality, a purported benefit, and that higher financial reporting quality enhancing capital investment efficiency,[7] our findings indicate that countervailing actions taken by CEOs to clawback adoptions can decrease, rather than increase, capital investment efficiency even when financial reporting

[6] By comparison, Babenko, Bennett, Bijzak, and Coles (2017) report negative clawback effects on capex, R&D and firm performance volatility, arguing that clawback provisions reduce managers' excess risk taking. However, they do not use a propensity score matched sample and do not consider how clawback provisions interact compensation incentives.

[7] Representative studies include Biddle and Hilary (2006), McNichols and Stubben (2008), Hope and Thomas (2008), Biddle et al. (2009), Chen, Hope, Li, and Wang (2011), Cheng, Dhaliwal, and Zhang (2013), Chen, Young, and Zhuang (2013), Lo (2015), and Biddle, Callahan, Hong, Knowles (2018).

quality is enhanced by clawback adoptions. Considered altogether, our findings thus both extend prior research findings and will help to inform the SEC's consideration of pending Rule 10D-1 to require clawback provisions as a condition for US listing, as requested.

In Section 2 we present motivations and hypotheses. Section 3 details research design. Section 4 describes empirical results, and Section 5 summarizes and discusses our findings.

2. Prior research and hypothesis development

2.1. Prior research evidence regarding clawback provisions

Prior research provides evidence that clawback adoptions enhance financial reporting quality across a range of research paradigms. Chan et al. (2012) and Dehaan et al. (2013) find that clawback adoptions are associated with reduced earnings restatements, reported material internal control weaknesses, and audit fees and hours. Dehaan et al. (2013) find that clawback adoptions decrease the frequency with which reported earnings meet or just beat consensus analysts' earnings forecasts. Dehaan et al. (2013), Iskandar-Datta and Jia (2013), Chan et al. (2013), Chen et al. (2014) and Babenko et al. (2017) find that investors respond favorably to voluntary clawback adoptions, consistent with a commitment to higher-quality financial reporting. Dehaan et al. (2013), Chen et al. (2014), and Kroos et al. (2018) document an increase in CEO annual pay sensitivity to reported earnings for clawback adopters, consistent with boards perceiving post-adoption earnings as more revealing regarding executive performance and effort.[8] Higher quality financial reporting also has been found to reduce information asymmetry regarding future payoffs and risks of investment projects (e.g., Healy and Palepu 2001; Leuz and Verrecchia 2000) which would help mitigate capital over- and under-investment (e.g., Biddle and Hilary 2006; McNichols and Stubben 2008;

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[8] Erkens, Gan, and Yurtoglu (2018) find that financial reporting quality increases more for "strong" versus "weak" clawback provisions as inferred from proxy disclosures, but that performance-based CEO pay increases less, thus providing offsetting inferences for capital investment efficiency examined here.

Hope and Thomas 2008; Biddle et al 2009; Chen et al. 2011; Cheng et al. 2013; Chen et al. 2013; Lo 2015; Biddle et al. 2018).

Other studies question whether clawback provisions enhance financial reporting quality. For example, Denis (2012) argues that the reduction in earnings restatements reported by Chan et al. (2012) may reflect managers' attempts to avoid clawback adoptions, and that observed reductions in audit efforts may reflect auditors' overconfidence in clawback provision effects on financial reporting quality. Fried and Shilon (2012) argue that clawback provisions are rarely enforced even when earnings restatements occur. Kyung et al. (2019) find that clawback adopters disclose lower-quality non-GAAP earnings more frequently than do non-adopters.

Prior studies documenting real effects of clawback adoptions include Chan et al. (2015) that managers reduce discretionary expenditures (defined as the sum of selling and general expense, R&D expense, and advertising expense) so as to boost short-term earnings, further reasoning that "real" versus accrual-based earnings management is less likely to be viewed as improper by boards, regulators, and auditors (Ewert and Wagenhofer 2005; Graham, Harvey, and Rajgopal 2005; Roychowdhury 2006; Cohen, Dey, and Lys 2008).[9] By comparison, Babenko et al. (2017) argues that managers reduce both R&D and capex expenditures (i.e., adopt a less risky investment policy) so as to lower performance volatility that can trigger compensation clawbacks. Chen and Vann (2017) find that clawback adoptions are associated with reduced capex and earnings volatility. Thus, whereas prior studies document real effects associated with clawback adoptions, they differ in findings for R&D and capex expenditures and do not consider whether managerial compensation incentives influence clawback provision adoption effects on total capital investment, capital investment mix (among R&D, capex and acquisition capital expenditures), and

[9] Consistent with this, Bao, Fung, and Su (2018) report an increase in share price crash risk following clawback adoptions that is more prominent for firms with more real activity manipulation and lower 10-K report readability.

capital investment efficiency.

Proposed Rule 10D-1 (SEC 2015) to implement Dodd-Frank Act Section 954 that would require clawback provisions for all U.S. publicly-listed firms explicitly warns of "an increased likelihood of an executive making inefficient operating decisions in order to affect specific financial reporting measures as a result of the decreased incentive to use accounting judgments to affect those financial reporting measures" (SEC 2015, 119). Rule 10D-1 (SEC 2015, 118) further conjectures that, "while the increased incentive to produce high-quality financial reporting and thus reduce the likelihood of material accounting errors should increase the informational efficiency of investment opportunities, it may also encourage managers to forgo value-enhancing projects if doing so would decrease the likelihood of a financial restatement," and it specifically requests related comments (SEC 2015, 103-104). This study provides responsive evidence regarding how managerial compensation incentives influence clawback adoption effects on capital investment mix and capital investment efficiency.

2.2. Hypothesis Development

To preserve and enhance their performance-linked compensation, managers can influence earnings via accruals or real transactions, depending on their relative benefits and costs (Ewert and Wagenhofer 2005). Because clawback provision adoptions increase the expected costs of accruals-based earnings management, managers may be motivated to increase real earnings management, for example by reducing R&D expenditures (Chan et al. 2015).[10] Managers may thus undertake real earnings management that benefits them personally at the expense of firm performance and

[10] Not all R&D expenditures are expensed, but US accounting principles (ASC 730) permit only limited exceptions; IFRS guidance (IAS 38) requires R&D capitalization under limited conditions, but foreign firms listed in the US, for which IFRS is a reporting option, constitute only 1.9% of our sample firm-years. In either case this would bias against our findings, and the untabulated result of a sensitivity test confirms that our results remain qualitatively identical with foreign U.S. listers excluded.

value depending on their compensation incentives.[11] Managers may also respond to clawback provision adoptions by undertaking less risky investment projects to mitigate compensation risk (e.g., Dehaan et al. 2013; Chen et al. 2014; Iskandar-Datta and Jia 2013). We apply these reasonings to examine whether clawback adoptions motivate mangers to alter capital investment mix as motivated by short-term earnings-linked pay and equity-linked incentives after controlling for risk, and related effects on capital investment efficiency.

Our first hypothesis considers capital investment mix shifts induced by clawback adoptions for managers more motivated by annual performance-based compensation incentives. Because R&D capital investments are generally expensed, they have the effect of reducing earnings immediately in exchange for generally delayed and uncertain earnings paybacks (Bhagat and Welch 1995; Kothari et al. 2002; Coles et al. 2006). Capex by comparison boosts earnings more predicably by expanding existing business operations net of formulaic amortization and depreciation charges. Thus, when considered in terms of ability to substitute for accruals-based earnings management that is discouraged by clawback adoptions, capex holds the potential to enhance earnings sooner and with greater predictability than for R&D.[12] Following from this reasoning, we hypothesize that clawback adoptions will induce managers who are more motivated by annual performance-based compensation to alter the mix of their capital investments away from R&D and toward capex, expressed in alternate form as:

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[11] Managers also may rebalance the amounts and timings of R&D budgets between R&D staffing costs (expensed as incurred) and R&D laboratory equipment or property (capitalized and depreciated over useful lives) (Canace et al. 2018). Alternatively, managers can boost short-term earnings by misclassifying R&D expenses into capex. However, such misclassification may violate accounting standards and lead to clawback-triggering restatements, if detected.

[12] If clawback adoption leads to a higher sensitivity of annual pay to current earnings as found by prior research (e.g., Dehaan et al. 2013), this will further amplify incentives for "real" earnings management using capital investments. Despite the risk of potential future clawbacks, the increase in pay-performance sensitivity might lead to an increase in accrual manipulation to the degree that such increase will not trigger future earnings restatements. Beyond that level, managers may increase real transactions manipulation.

H1: *Clawback adoptions by firms with higher portions of managerial annual performance-based compensation will shift capital investment mix away from R&D and toward capital expenditures.*

Our second hypothesis considers capital investment mix shifts induced by clawback adoptions for managers more motivated by equity-based compensation incentives, where equity incentives are defined as a dollar change in the value of share and option holdings due to one percent change in share prices, namely, *delta* (Core and Guay 2002). Whereas managers more motivated by equity incentives will have incentives to preserve share prices reflected in their share and stock option holdings, share prices also reflect growth options as perceived by investors. Thus, clawback adoptions that discourage accruals-based earnings management may motivate managers compensated by equity incentives to project high earnings growth by reducing R&D expenses as argued by Benmelech et al. (2010) and offset the potential impact of R&D reductions on long-term firm value by shifting investment mix toward capex. By this reasoning we posit a second hypothesis expressed in alternate form as:

H2: *Clawback adoptions by firms with higher levels of managerial equity incentives will shift capital investment mix away from R&D investment and toward capital expenditures.*

Thus, we posit that clawback adoptions will induce both managers who are more compensated by annual performance-based pay *and* managers who are more compensated by equity incentives to reduce R&D and increase capex. These compensation incentive conditions are not mutually exclusive due to the presence of other compensation components, notably fixed salaries. Empirically, the Pearson correlation between the high performance-based annual pay and high equity incentive compensation conditions is 0.187 for our sample.

Our third hypothesis tests whether compensation incentivized capital investment mix shifts associated with clawback adoptions influence capital investment efficiency. Our reasoning reflects a tension wherein if investment opportunities do not change with the adoption of clawback provisions, countervailing shifts in capital investment mix reflecting managerial compensation incentives could cause capital investments to deviate from levels reflecting investment opportunities, thus reducing capital investment efficiency. If however, clawback adoptions enhance financial reporting quality as purported, these effects may on net serve to enhance capital investment efficiency. To discern that the effects of compensation incentivized investment mix shifts on capital investment efficiency are operative, we control for financial reporting quality and test the following hypothesis conditioned on managerial compensation condition and in null form as follows:

H3: *Compensation incentivized capital investment mix shifts induced by clawback adoptions do not change capital investment efficiency.*

3. Research design

3.1. Sample selection

Panel A of Table 1 summarizes our sample selection. Following prior studies (e.g., Chan et al. 2012), we use the GMI Ratings database to identify firms that voluntarily adopt clawback provisions, and exclude financial firms because many are subject to clawbacks mandated by the Troubled Asset Relief Program (TARP). From the statistics of cumulative adopters by year, we find that clawback adoptions generally increase year-on-year during our sample period 2005 to 2012, rising from 19 in 2005 to 209 in 2012, with 56% (588 / 1,032) of new clawback adopters (versus sample firm years that depend on data availability) between 2010 and 2012 inclusive. We examine clawback adoptions during fiscal years 2005 through 2012 inclusive, which comprise "voluntary" clawback adoptions during progressive adoptions of DFA 954 provisions.

We obtain accounting data from Compustat, share price data from CRSP, corporate governance data from RiskMetrics and GMI Ratings, analyst coverage data from I/B/E/S, and institutional ownership data from Thompson Financial. We merge these data with the clawback data from GMI Ratings.

To control for differences in firm characteristics that may influence clawback adoptions and capital investment decisions, we follow Chan et al. (2012) to create a propensity-matched sample of firms that have not adopted clawback provisions but with a similar probability of adopting as a matched adopting counterpart. We do so by estimating a probit regression of an indicator variable for clawback adopters ($Clawback_t$) on the ex-ante economic determinants of clawback adoptions identified in prior studies ($X_{t\text{-}1}$)[13]:

$$Clawback_t = \alpha_0 + \sum \alpha_i X_{t\text{-}1} + \varepsilon_t, \quad (1)$$

$Clawback_t$ equals one if a firm firstly adopts a clawback provision in year *t* and zero if a firm has not adopted a clawback provision over the *entire* sample period (i.e., the period 2002 to 2012). As in Chan et al. (2012), $X_{t\text{-}1}$ includes firm size (*LOGASSET*), market-to-book ratio (*MB*), financial leverage (*Lev*), accounting profitability (*ROA*), the number of segments (*LogSegment*), financial restatements during the three years preceding clawback adoption (*Restate_prior_3y*), board independence (*Independence*), the size of audit committee (*Auditsize*), the number of board meetings (*Boardmeeting*), institutional ownership (*Institutional*), insider ownership (*Insiderowen*), year-fixed effects, and industry-fixed effects (two-digit SIC codes).[14] Estimating Equation (1) yields a propensity score for each firm-year in the predicted value of *Clawback*.

[13] Appendix A provides detailed definitions of all variables used in this paper.

[14] Firm size and market-to-book ratio capture growth opportunities potentially related to managerial incentives and financial reporting. Insider ownership is directly related to managerial incentives and financial reporting. Prior restatements reflect firms' incentives to restore credibility to financial reporting. Firm size and the number of segments reflect operational complexity effects on the ability of external stakeholders to monitor managerial behavior. Corporate governance variables, ownership variables, and financial leverage reflect the intensity of monitoring and influence over managerial behavior.

We match each adoption firm-year with the non-adopting firm-year with the closest score and within a distance of 0.01 from the adopting firm's propensity score. This matching process assigns a pseudo adoption year to control firms even though they have not adopted clawback clauses throughout the entire sample period. The pre- and post-adoption periods for each firm spans from *T*-3 to *T*+3 where *T* is the adoption year for a clawback adopter and the pseudo adoption year for its propensity-score-matched counterpart. We use this time horizon to allow a sufficient length of time for managers to adjust capital investment mix in response to clawback adoptions.[15] We keep companies that report R&D expenses in the pre-adoption period because our hypotheses require companies to regularly invest in R&D projects that managers could cut in response to clawback adoptions. To enable within-firm variations before and after clawback adoptions, we require all firms to have at least one observation for both pre- and post-adoption periods. To mitigate the influence of extreme outliers, we winsorize each continuous variable at the 1st and 99th percentiles and remove capital investment observations above the 99th percentile.[16] All these procedures result in a sample of 1,257 firm-year observations comprised of 697 observations for 136 clawback adopters and 560 observations for 107 non-adopters.

3.2. Relation between clawback adoptions and shift in capital investment mix

Relations between clawback adoptions and capital investment by type are estimated using the following regression model:

$$InvVar_{t+1} = \beta_1\, Post_t + \beta_2\, Clawback_t \times Post_t + \sum \beta_i\, Control_t + Fixed\ Effects + \varepsilon_t\,, \qquad (2)$$

where $InvVar_{t+1}$ refers to the investment policy variables: (a) $Investment_{t+1}$, defined as total capital investment (measured as the sum of R&D expenditures, capital expenditures and acquisitions less

[15] We believe that this time horizon is long enough to reveal how capital investments respond to clawback adoptions but not so long as to be confounded by other influences on capital investments.
[16] Capital investment variables are highly positively skewed, making large values highly influential unless deleted.

sales of property, plant and equipment) for year t+1 multiplied by 100 and scaled by total assets at the end of year t; (b) $R\&D_{t+1}$, defined as research and development expenditures for year t+1 times 100 deflated by total assets at the end of year t; (c) $Capex_{t+1}$, defined as capital expenditures for year t+1 multiplied by 100 deflated by total assets at the end of year t; (d) $R\&D + Capex_{t+1}$, defined as the sum of R&D and capital expenditures for year t+1 multiplied by 100 deflated by total assets at the end of year t; and (e) $Acquisition_{t+1}$, defined as acquisitions for year t+1 multiplied by 100 deflated by total assets at the end of year t. Coefficient β_1 on *Post* reflects the average difference in unexpected capital investment components of non-adopters between the pre- and post-adoption periods. Coefficient β_2 on *Clawback* × *Post* indicates the incremental average effect of clawback adoption on unexpected capital investment components.[17]

Following Biddle and Hilary (2006) and Biddle et al. (2009), we control for the following set of year t determinants for expected capital investments: (a) proxies for investment opportunities measured by sales growth (*SalesGrowth*) and Tobin's Q (*Q*); (b) indicators of financial constraints measured by operating cash flows (*CFOsale*), financial slack (*Slack*), firm- and industry-average capital structure (*K-structure* and *Ind-K-structure*, respectively), and dividend payout ratio (*Dividend*); (c) firm risk and cost measured by standard deviation of operating cash flows (*Std-cfo*), standard deviation of sales (*Std-sales*), Z-score (*Z-score*), tangibility (*Tangibility*), and an indicator for operating losses (*Losses*); (d) the intensity of internal and external monitoring proxied by the corporate governance index (*g-index*), an indicator for missing *g-index* values (*G-Dummy*), institutional ownership (*Institutions*), and analyst coverage (*Analysts*); (e) accrual quality (*AQ*),

[17] The variable $Clawback_t$ is omitted because firm-fixed effects are controlled. Controlling for year-fixed effects do not drop the variable $Post_t$ because firms have different adoption years.

and (f) other firm characteristics measured by firm size (*LogAsset*), firm age (*Age*), operating cycle (*OperatingCycle*), and standard deviation of total investment (*Std-Investment*).[18]

We further control for variations in future capital investment predicted by current-year capital investment mix (i.e., *R&D*, *Capex*, and *Acquisition*), an indicator variable for firms without R&D expenses (*MissR&D*), CEO performance-based pay ratio (*PerfPayRatio*), CEO equity incentive (*EquityIncentive*), CEO risk-tolerating incentive (*RiskTolerance*), and CEO tenure (*Tenure*). Current capital investment components are persistent and predict future capital investment components.[19] Koh and Reeb (2015) report that the non-existence of R&D expenses in a certain year is associated with past and future R&D activities. *PerfPayRatio* is measured as CEO total annual pay less salary. Equity incentive is measured as 100×*Delta* / (*Delta*+*Cash Compensation*) where *Delta* is a dollar change in CEO vested equity wealth due to 1% change in share prices (Core and Guay 2002; Coles et al. 2006). Equity incentive represents incentives to preserve share prices for sale of vested shares for diversification or trading profits. *RiskTolerance* is defined as compensation incentive to encourage CEOs to take risks and measured as 100×*Vega* / (*Vega*+*Cash Compensation*) where *Vega* is a dollar change in CEO vested equity wealth due to 0.01 change in share return volatility (Core and Guay 2002; Coles et al. 2006). If CEOs are risk averse and cannot diversify away their firm-specific wealth, a higher (lower) level of *Vega* relative to cash compensation will encourage them to undertake more (less) risky investment projects. Coles et al. (2006) find that *Vega* is negatively associated with capital expenditure (producing a less uncertain financial outcome) and positively with R&D expenditures (producing a more uncertain financial outcome). We allow for a tradeoff between CEO pay convexity (measured by

[18] Some of these control variables are used in prior studies to measure risk-taking. For example, firm size, the market-to-book ratio, capital structure, the standard deviations of cash flows and sale, an indicator variable for losses, and/or z-score are used by Coles et al. (2006) and Bargeron, Lehn, and Zutter (2010).

[19] For example, some investment projects may require a mix of capex and R&D expenditures next several years.

Vega), earnings management, and capital investment efficiency considered by Laux (2014). In the Laux's (2014) model, a shift to a more convex CEO pay induces value-enhancing efforts but reduces financial reporting quality and investment efficiency.

Firm-fixed effects capture cross-sectional variations in capital investment associated with omitted firm-specific factors (e.g., business model or governance) that do not vary significantly surrounding clawback adoptions. Year-fixed effects capture inter-temporal changes in capital investment associated with macroeconomic conditions and regulatory changes. We base our statistical inferences on regression coefficient *t*-statistics with robust standard errors clustered by firms.

Hypothesis H1 predicts that CEOs with higher performance-based pay ratios are more likely to reduce R&D and increase capex following clawback adoptions. To test H1, we estimate Equation (2) for subgroups partitioned by performance-based pay ratios. These regressions allow the coefficients on each variable to vary across the subsamples. *HighPerfPay* is equal to one if a firm's mean ratio of CEO performance-based pay to CEO total annual pay over the pre-adoption period is higher than the sample median during the pre-adoption period and zero otherwise. To identify a direct association between capex increases and R&D reductions between the pre-and post-adoption periods, we estimate Equation (2) for dependent variables *Capex*, *R&D*, and the sum of *Capex* and *R&D*, respectively, to test whether the coefficient on *Clawback* × *Post* is significantly negative for *R&D*, significantly positive for *Capex*, and insignificantly different from zero for the sum of *Capex* and *R&D*.

Hypothesis H2 predicts that CEOs with higher equity incentives will decrease R&D expenditures and increase *Capex* following clawback adoptions. To test H2, we estimate Equation (2) for two subgroups partitioned by CEO equity incentives. *HighEquityInc* is equal to one if a firm's mean equity incentive in the pre-adoption period is higher than the sample median for the pre-adoption period and zero otherwise.

3.3. Relation between clawback adoptions and capital investment efficiency

Following the reasoning of Section 2.2, we test hypothesis H3 regarding clawback adoption effects on capital investment efficiency in two steps. First, we estimate unexpected capital investment as the residual of the following regression for all Compustat non-financial firms with available data for our entire sample period:

$$InvVar_{t+1} = \gamma_0 + \gamma_1 \times SalesGrowth_t + \gamma_2 \times Tobin's\ Q_t + \gamma_3 \times Cash_t + \gamma_4 \times Lev_t + Fixed\ Effects + \varepsilon_t \quad (3)$$

where $InvVar_{t+1}$ refers to investment policy variables for year t+1; $SalesGrowth_t$ and $Tobin's\ Q_t$ (measured as the ratio of market value of total assets to book value of total assets) are proxies for firm-level investment opportunities for year t; $Cash_t$ and Lev_t (measured as the ratio of cash balance to total assets and the ratio of total debts to total assets) captures firm liquidity that enables capital investments to be readily performed; and *Fixed Effects* represent variations in capital investment associated with investment opportunities and enabling liquidity associated with changes in industry environment and structure (captured by loadings on industry-year indicator variables). We then estimate the residual of each regression and generate its quintiles. An indicator variable for overinvestment, $Overinvesting_{t+1}$ is equal to one if the residual is in the upper 20 percentile and zero otherwise. Similarly, an indicator variable for underinvesting, $Underinvesting_{t+1}$ is equal to one if the residual is in the lower 20 percentile and zero otherwise.[20]

Next, we assess the effects of clawback adoptions on capital investment efficiency by

[20] Measuring overinvesting (underinvesting) in this manner assumes that a high (low) level of unexpected investment far exceeding (far below) a normal level of investment that is explained by firm-level investment opportunity, enabling liquidity, and changes in industry environment and structure is likely to be over- (under-) investment.

estimating the following linear probability regression over the full sample and subgroups of firms partitioned by performance-based annual pay ratios and equity incentives, respectively:

$$\begin{aligned} &\mathit{Overinvesting}_{t+1} = \delta_0 + \delta_1 \times \mathit{Clawback}_t + \delta_2 \times \mathit{Post}_t + \delta_3 \times \mathit{Clawback}_t \times \mathit{Post}_t \\ &(\mathit{Underinvesting}_{t+1}) \quad + \sum \delta_i \times \mathit{Controls}_t + \mathit{Fixed\ Effects} + \varepsilon_t \end{aligned} \tag{4}$$

This linear probability model is estimated using least squares and controls for firm- and year-fixed effects, firm-clustering effects, and the same control variables as in Equation (2). The coefficient on *Clawback* × *Post*, δ_3, reflects an average incremental change in the probability of overinvesting (underinvesting) associated with the adoption of clawback provision. The linear probability model enables us to examine within-firm variations before and after clawback adoptions and directly compare its results with those of estimating Equation (2).

4. Empirical results

4.1. Descriptive statistics

Results of the probit regression for propensity score matching (Panel B of Table 1) indicate that the adoption of clawback provisions is positively associated with firm size, the number of segments, and the incidence of pre-adoption restatement, and negatively associated with insider ownership. Each determinant for the adoption of clawback provision does not significantly differ in the adoption year (Panel C of Table 1).

In Table 2, we present descriptive statistics for variables used in the capital investment regressions. These variables include capital investment components, investment opportunities, accrual quality, corporate governance, liquidity, capital structure, and compensation incentives. As shown in Panel A of Table 2, the difference in the mean of each variable at the year of adopting clawback provision is generally insignificantly different from zero, suggesting that the propensity score matching has identified control firms for each adopter with similar capital investment mix and firm characteristics at the adoption year.[21]

Panel B of Table 2 presents means, standard deviations, 25th percentiles, medians, and 75th percentiles of each variable over the entire sample period. The medians of *R&D* and *Capex* are 3.06% and 3.45% of lagged total assets, respectively. Because the sample includes firms with positive R&D expenditures in the pre-adoption period, *R&D* mostly has a positive value. The median and 75th percentile of *Acquisition* are 0.35% and 2.89% of lagged total assets, respectively, suggesting that our sample firms do not frequently engage in large scale acquisitions surrounding the adoption of clawback provisions. The 25th percentiles of institutional ownership (*Institution*) and analyst coverage (*Analysts*) are 65% and 6, respectively, suggesting that managerial behaviors of our sample firms are generally monitored by institutional investors and analysts. The performance-based annual pay ratio (*PerfPayRatio*) has the 25th percentile of 72.9% and equity incentive (*EquityIncentive*) has the 25th percentile of 10.56%, suggesting that managers of our sample firms receive a significant portion of CEO compensation as share-based or non-equity incentives.[22] Compared with *EquityIncentive* (reflecting share and option delta), *RiskTolerance* (reflecting option vega) has relatively small magnitudes in our sample (75th percentile = 3.74%).

4.2. Effects of clawback adoptions on next-period capital investment mix

Table 3 presents the results of estimating Equation (2) relating capital investment in total and by type to clawback adoption for the combined 1,257 firm-year sample of clawback adopters and non-adopters. This regression is not conditional on CEO annual pay and equity incentives. The

[21] Among these variables, the mean of firm age, slack, and CEO tenure are significantly different between control firms and treatment firms. However, these variables can be largely controlled for the difference in differences design with firm-fixed effects and firm-clustering effects. We also find that our main results remain identical for the subsample of firms that do not experience CEO turnover.

[22] In other words, the median of equity delta times one standard deviation of one year daily share returns is equal to 19.5% of CEO total annual pay, suggesting that manages have a significant equity exposure to share price changes.

coefficient on *Clawback* × *Post* for *R&D* (= -0.487% of lagged total assets) is significantly negative, while the coefficient on *Clawback* × *Post* for *Capex* (= 0.405% of lagged total assets) is significantly positive.[23] The sum of *Capex* and *R&D* has an insignificant coefficient on *Clawback* × *Post* (= -0.07% of lagged total assets). Taken together, the effects of clawback adoptions on *R&D* reductions and capex increases lend support to hypothesis H1. The shift away from R&D toward capex suggests that clawback adoptions motivate managers to enhance performance-based compensation by shifting capital investments from R&D to capex without significantly changing the size of operations under their control. In contrast, for total capital investment and acquisition, the coefficients on *Clawback* × *Post* are negative and insignificantly different from zero, indicating that, relative to non-adopters, clawback adopters exhibit similar total capital investments and acquisitions following clawback adoptions.

Table 4 presents estimates for Equation (2) relating capital investment in total and by type when applied to sub-samples partitioned by high versus low performance-based pay ratio (Panel A) and by high versus low equity incentive (Panel B). Panel A indicates that, as in Table 3, significant reductions in R&D expenditures (equivalent to -1.094% of lagged total assets), significant increases in capital expenditures (equivalent to 0.825% of lagged total assets) after clawback adoptions, but only for the high performance-based pay ratio partition. As a result, there is no significant effect of clawback adoptions on the sum of *Capex* and *R&D* for both subsamples of firms with *high* and *low* performance-based pay. Results of the chi-square tests for the differences in coefficients on *Clawback* × *Post* between two subgroups with high versus low performance-based pay ratios confirm the subsample regression results.

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[23] Column (5) of Table 3 indicate that the coefficient on *Clawback* × *Post* for acquisition capital investment is positive and insignificant. It is also insignificant for subsamples examined in other tables.

Similarly, Panel B shows significant reductions in R&D (= -0.751% of lagged total assets) and significant increases in capex (= 0.661% of lagged total assets) only for the high equity incentive partition. Clawback effects on the sum of *Capex* and *R&D* are insignificant for both the high and low equity incentive partitions consistent with chi-square test results for the differences in coefficients on *Clawback* × *Post* between two subgroups. These results lend support to H2 that clawback adoptions create greater incentives for managers to preserve the value of their equity wealth by shifting capital investment mix.

4.3. Effects of clawback adoptions on capital investment efficiency

This section presents results of testing null hypothesis H3 that capital investment mix shifts motivated by managerial compensation incentives do not influence capital investment efficiency. Table 5 presents estimates using the linear probability model (i.e., Equation (4)) to examine whether the shift in capital investment mix increases the probability of overinvesting or underinvesting in *R&D*, *Capex*, and *R&D* + *Capex*.[24] Only for column (2) (i.e., the incidence of underinvesting in R&D, *UnderR&D*) is the coefficient on *Clawback* × *Post* significantly positive, indicating that clawback-adopting firms tend to underinvest in R&D following clawback adoptions.

Table 6 presents the results of estimating Equation (4) over subsamples partitioned by CEO performance-based pay ratios (Panel A) and equity incentives (Panel B). Panel A indicates a propensity to under-invest in R&D following clawback adoptions only for the high performance-based pay subgroup. Panel B indicates propensities to underinvest in *R&D* and to overinvest in

[24] The results for overinvesting and underinvesting in total investment and acquisitions are largely insignificant and not tabulated for the sake of brevity.

Capex following clawback adoptions only for the high equity incentive subsample.[25] Combined, the results in Tables 5 and 6 lend support to a positive association between clawback adoptions and capital underinvestment in *R&D* via a managerial compensation incentive channel.

5. Additional tests and robustness checks

5.1. Effects of clawback adoptions on CEO compensation

Prior studies document that the boards of firms that adopt clawback provisions tighten pay-weights on earnings in anticipation of the enhanced earnings reliability (Dehaan et al. 2013; Chen et al. 2014; Kroos et al. 2018), and that the resulting increased pay-earnings sensitivity may induce managers to make value-enhancing efforts but also manage earnings to preserve performance-based pay. In relation to H1, we thus allow that changes in pay-performance sensitivity can influence the firms' substitution between R&D and capex. On the other hand, as clawback adoption makes incentive pay riskier, boards may reduce the use of incentive-based compensation (Denis 2012) or pay risk premium (Dehaan et al. 2013; Chen et al. 2014) in order to keep risk averse, competent managers.[26] The incremental pay premium may mitigate shifting in capital investment mix. Moreover, compensation committees may adjust performance-based compensation using earnings before R&D expense as a performance measure in order to prevent myopic R&D investment decisions or they may place a higher weight on ROA (i.e., shield managerial pay from R&D expenses to a lesser degree) in order to curb excessive R&D investment.

[25] In Table 6, the chi-square test results indicate insignificant differences in coefficients on *Clawback*Post* between high versus low performance-based pay partitions and between high versus low equity incentive partitions. We conjecture that the insignificant coefficients are partially due to the small number of observations of the intersections of overinvesting (or underinvesting), clawback, post, and high versus low managerial incentives.

[26] Prior research reports mixed evidence on whether boards pay risk premia to offset increased compensation risk due to clawback adoptions. Dehaan et al. (2013) and Chen et al. (2014) find positive risk premium paid to the CEOs of clawback adopters after controlling for the economic determinants for expected CEO pay. In contrast, Iskandar-Datta and Jia (2013) find no reliable evidence that indicates such risk premium.

We control for these effects in two ways. First, we estimate changes in the sensitivities of CEO annual pay flow to accounting-based performance and any pay premium by running the following regression model:

$$
\begin{aligned}
TotalPay_{t+1} = {} & \delta_1\, Post_t + \delta_2\, Clawback_t \times Post_t + \delta_3\, ROA_{t+1} + \delta_4\, Clawback_t \times ROA_{t+1} \\
& + \delta_5\, Post_t \times ROA_{t+1} + \delta_6\, Clawback_t \times Post_t \times ROA_{t+1} + \delta_7\, R\&D_{t+1} \\
& + \delta_8\, Clawback_t \times R\&D_{t+1} + \delta_9\, Post_t \times R\&D_{t+1} + \delta_{10}\, Clawback_t \times Post_t \times R\&D_{t+1} \\
& + \sum \delta_i\, Controls_{t+1} + \sum \delta_i\, Controls_{t+1} \times Clawback_t + \sum \delta_i\, Controls_{t+1} \times Post_t \\
& + \sum \delta_i\, Controls_{t+1} \times Clawback_t \times Post_t + Fixed\ Effects + \varepsilon_t \qquad (5)
\end{aligned}
$$

$TotalPay_{t+1}$ is the logarithm of one plus inflation-adjusted CEO annual total pay for year t+1.[27] ROA_{t+1} is accounting return on assets for year t+1. Coefficient δ_3 indicates the base sensitivity of CEO annual total pay to *ROA*. Coefficient δ_6 for interaction term *Clawback×Post×ROA* indicates the impact of clawback adoption on pay-earnings sensitivity. $R\&D_{t+1}$ is year t+1 R&D expense deflated by lagged total assets. Since the pay loading on R&D expense within ROA is δ_3, Coefficient δ_7 indicates how CEO annual total pay is shielded from *R&D* expense. Coefficient δ_{10} for interaction term *Clawback×Post×R&D* indicates the impact of clawback adoptions on the degree of compensation shielding from R&D. Control variables follow Core, Holthausen, and Larcker (1999) and Harford and Li (2007) to include 12-month market-adjusted share returns (RET_{t+1}) and sales growth ($SALECHG_{t+1}$) as other performance measures, standard deviations of *ROA* and *RET* estimated over the prior five years ($VOLROA_{t+1}$ and $VOLRET_{t+1}$); growth opportunities proxied by average market-to-book equity ratio (Q_{t+1}); demand for incremental efforts and ability required to manage a firm with a larger firm size measured by the logarithm of sales during year t+1 ($LOGSALE_{t+1}$). We further include CEO tenure (*TENURE*) to control for

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27 The amount of bonus, share and option grants for year t is largely based on the CEO's performance for year t+1 and approved at the first shareholders meeting following the end of year t+1. In contrast, base salary and other compensation (e.g., pension) are determined at the employment contract date and rarely adjusted based on performance. Replacement of CEO annual total pay with CEO annual performance-based pay in Equation (2) does not change results qualitatively.

variations in annual pay due to the CEO's ability or entrenchment associated with his or her tenure and control for cross-sectional differences in CEO annual pay associated with omitted time-invariant firm characteristics and inter-temporal changes in CEO annual pay associated with macroeconomic conditions and regulatory changes, respectively. We include the lagged dependent variable to control for the persistence of CEO annual pay. Finally, we control for heteroscedasticity due to errors clustered within a firm.

Second, we check whether clawback adoptions influence performance-based pay ratio, equity incentives, and risk-taking incentives by estimating the following regression model:

$$IncentiveVar_{t+1} = \delta_1 Post_t + \delta_2 Clawback_t \times Post_t + + \sum \delta_i Controls_{t+1} + Fixed\ Effects + \varepsilon_t \quad (6)$$

where $IncentiveVar_{t+1}$ refers to the compensation incentive variables: (a) $PerfPayRatio_{t+1}$, (b) $EquityIncentive_{t+1}$, and (c) $RiskTolerance_{t+1}$. *Controls* and *Fixed effects* in Equation (5) are the same as those in Equation (6), include lagged dependent variables, and are not interacted with indicator variables *Post*, *Clawback*, and *Clawback* × *Post.*

Table 7 reports the results of estimating Equations (5) and (6). Panel A confirms that in our measure of CEO annual total pay is not more sensitive to return on assets following clawback adoptions. Panel A also shows an insignificant coefficient on *Clawback* × *Post,* indicating that the boards of clawback firms do not provide a significant incremental risk premium to CEOs. The coefficient on *Clawback* × *Post* × *R&D* is insignificantly different from zero, suggesting that after clawback adoptions, compensation committees do not rewrite managerial compensation contracts to influence R&D investment.

Panel B reports estimated effects of clawback adoptions on CEO performance-based pay, equity incentives, and risk-taking incentives. The results indicate that clawback adoptions do not significantly affect these variables. Overall, the results in Table 7 suggest that clawback adoptions do not significantly influence managerial compensation and incentive structures and therefore are unlikely to induce counter-factual effects.[28]

5.2. Effects of clawback adoptions on firm performance volatility and financial leverage

Babenko et al. (2017) document reduction in capital investment and reduction in firm performance volatility and argue that their findings indicate reductions in excessive risk-taking given clawback adoptions because firm performance volatility conveys information about managerial misbehavior such as financial fraud and restatements. Because clawback provisions increase the cost of financial fraud and restatements and R&D has been deemed as riskier than capex, our finding of capital investment mix shifts can be alternatively interpreted as managerial endeavor to reduce excessive risk-taking. In addition, if managers of clawback firms are concerned about firm performance risk, they may also reduce debt instead of increasing capital investment, leading to the decrease in financial leverage.

We consider this alternative explanation for our results by testing whether firm performance volatility (measured as standard deviations of one-year industry-adjusted daily share returns and industry-adjusted return on assets) and financial leverage diminishes after clawback adoption. Table 8 shows that clawback adoptions do not have significant influences on firm performance volatilities and financial leverage. This finding indicates that our results are unlikely to arise from managerial risk-taking reductions.[29]

To further allow for a risk-reduction hypothesis, we reexamine whether clawback adoptions affect capital expenditures for clawback-adopting companies not reporting R&D expenses in the

[28] Our findings also differ from a criticism of Dodd-Frank Section 954 mandatory clawback provisions that they make incentive-based pay riskier and may induce firms to reduce the use of incentive-based compensation and the incentive-alignment benefits of such compensation (Denis 2012).

[29] Unlike the other prior studies on the consequences of clawback adoptions, Babenko et al. (2017) do not use the propensity-score matched sample to mitigate bias arising from differences in firm characteristics that may be potentially associated with both clawback adoptions and capital investment.

pre-adoption period. The reasoning for this test is that if clawback provisions generally increase the demand for reducing firm performance risk through the choice of less risky capital investments, the managers of non-R&D firms should respond to clawback adoptions by reducing capex or acquisitions. Inconsistent with the risk-taking reduction hypothesis, untabulated results indicate no significant impacts of clawback adoptions on total investment, capex, and acquisitions for the non-R&D firm subsample.

Concurrent changes in governance, compensation schemes, and investment opportunities

We next test whether concurrent changes in governance structure, compensation schemes, and investment opportunities other than clawback adoptions could explain our results for several reasons. First, if clawback provisions are adopted as part of a broader plan to enhance overall corporate governance, our results may be confounded by effects of concurrent changes in other governance mechanisms. Second, if boards pay incremental fixed salaries to mitigate the increased compensation risk associated with clawback adoptions, managers might not have to change their course of actions. Third, concurrent changes in investment opportunities may have confounding effects on the shift in capital investment mix. Following prior studies, Table 9 presents the *t*-test results that relative to non-adopters, clawback adopters do not experience significantly greater changes in these variables prior to clawback adoptions, suggesting that clawback adoptions do not significantly associate with changes in governance structure, other compensation schemes, and investment opportunities for our sample.

5.3. Beating or just meeting earnings thresholds

Prior studies suggest that managers meet/beat earnings targets by cutting R&D expenses. We control for this effect using the subsample of firms with and without beating or just meeting (a) consensus analysts' forecasts of earnings per share (2 cents), (b) prior-year ROA (0.5%), or (c) zero ROA (0.5%) in a given year. Untabulated results indicate that the capital investment mix shifts occur for both groups of firms with and without beating or just meeting earnings targets, indicating that meeting or beating earnings thresholds is not a necessary condition for managers to shift capital investment mix in response to the adoption of clawback provisions.

5.4. Use of firms without CEO turnover prior to clawback adoptions

Hiring a new CEO may be the motive for adopting a clawback provision in a particular year and a new CEO may have a new vision of investment strategy. Our results are based on the regression models that include CEO tenure, firm fixed effects, and firm-clustering effects, but our research design might not completely capture the confounding effects of CEO turnover. When we re-estimate our regressions using firms that do not experience CEO turnover throughout our sample period we obtain qualitatively similar results.

Falsification tests

Following Roberts and Whited (2013), we perform falsification tests by creating pseudo-clawback adoption events. Our results disappear when we reset the year of clawback adoption to two to three years prior to the actual adoption year, thus lending support to observed effects of clawback adoptions on capital investment mix and capital investment efficiency.

6. Conclusion

This study documents that clawback provision adoptions induce capital investment mix and capital investment efficiency shifts related to managerial compensation incentives that countervail their purported benefits. Specifically, we find that clawback adoptions induce managers to shift capital investment mix away from R&D and toward capex for firms with high performance-based pay and equity incentives as hypothesized, and that these compensation incentivized capital investment mix shifts are associated with reductions in capital investment efficiency. These findings thus reveal unintended consequences of a widely adopted corporate governance provision purported and previously documented to enhance improving financial reporting quality. Robustness checks addressing pay-performance sensitivity, performance volatility, leverage, meet or beat earnings incentives, CEO turnover, event date falsification, R&D presence, and changes in governance, compensation schemes and investment opportunities lend support to these findings.

These results extend prior findings in several regards. First, they extend prior evidence regarding the real effects of clawback adoptions to capital investment decisions. Second, they clarify prior evidence that clawback adoptions induce managers to reduce R&D expenses to enhance earnings performance to reveal that R&D reductions are part of a broader set of capital investment adjustments away from R&D and toward capex conditional on managerial compensation incentives. Third, we provide evidence that the financial reporting quality effects of clawback adoptions, a purported and documented benefit, are offset in their effects on capital investment efficiency consistent with, and conditional on, managerial compensation incentives. Finally, our findings help to inform pending SEC Rule 10D-1 that would make clawback provisions a pre-condition for U.S. exchange listing and that explicitly requests "comment on any effect the proposed requirements may have on efficiency, competition and capital formation" (SEC 2015, 103-104).

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Appendix A
Variable definitions

Variables	Descriptions
Propensity score matching variables	
Clawback	An indicator variable for the first adoption of clawback provision (measured as 1 for the year of adopting clawback provision and 0 otherwise)
LogAsset	Natural logarithm of book value of total assets
Lev	Leverage ratio (measured astotal debts deflated by total assets)
ROA	Return on total assets (measured asincome before ordinary items deflated by lagged book value of total assets)
MB	Market to book ratio for common equity (measured asthe market value of common equity deflated by book value of common equity)
LogSegment	Log of the number of business segments
Restate_prior_3y	An indicator variable for prior restatement (measured as1 if a firm's financial statements were restated from year *T*-3 to year *T*-1, where year *T* is the adoption year, and 0 otherwise)
Independence	Board independence (measured as the percentage of independent directors on the board of directors)
Institutional	Institutional ownership (measured as the percentage of institutional investors ownership to total shareholders ownership)
Boardmeeting	The number of board meetings held in a year
Auditsize	The number of directors on the audit committee of the board of directors
Insiderowen	Insider equity ownership
Capital investment regressions	
Clawback	An indicator variable for clawback adopters (measured as 1 if a firm is in the treatment group (clawback adopters) and 0 if a firm is in the control group (non-adopters)
Post	An indicator variable for the post-adoption period (measured as 1 for firm-years when clawback provisions are in place, and 0 otherwise. A pseudo-adoption year is assigned to a non-adopter).
Clawback × Post	An indicator variable for the post-adoption period for clawback adopters (measured as 1 for firm-years after a firm adopted clawback provisions in year *T* and 0 otherwise)
Investment	One-year-ahead net investment (capital expenditure – cash receipts from sale of property, plant, and equipment + acquisitions + research and development expenditure) multiplied by 100 and deflated by current-year total assets
Capex	One-year-ahead capital expenditure net of cash receipts from sale of property, plant, and equipment multiplied by 100 and deflated by current-year total assets
R&D	One-year-ahead research and development expenditure (i.e., the higher of R&D expenditure and zero) multiplied by 100 and deflated by current-year total assets

Acquisition	One-year-ahead acquisitions multiplied by 100 and deflated by current-year total assets
PerfPayRatio	The percentage ratio of CEO performance-based pay to CEO annual total compensation for current year. Performance-based pay is measured as annual total compensation minus annual salary.
EquityIncent	*Delta* times 100 divided by the sum of *Delta* and cash compensation for current year*, where Delta* is the sensitivity of CEO share and option portfolio value to share returns
HighPerfPay (LowPerfPay)	An indicator variable for firms paying relatively higher (lower) performance-based compensation. If a firm's mean *PerfPayRatio* for the three years immediately before the adoption year is higher (lower) than its median of the entire sample firms for the same pre-adoption period, the firm is classified as *HighPerfPay* (*LowPerfPay*).
HighEquityInc (LowEquityInc)	An indicator variable for firms paying relatively higher (lower) short-term equity incentive. If a firm's mean *EquityIncent* for the three years immediately before the adoption year is higher (lower) than its median of the entire sample firms for the same pre-adoption period, the firm is classified as *HighEquityInc* (*LowEquityInc*).
Institutions	Institutional ownership measured as a percentage of firm shares held by institutional investors
Analysts	Analyst coverage measured as the number of analysts following the firm as provided by I/B/E/S
G-Score	Governance score (measured as the strength of anti-takeover projection created by Gompers, Ishii, and Metrick (2003), multiplied by minus one)
G-Dummy	Indicator variable for firm-year observations with missing values of G-Score
AccrualQuality	Standard deviation of the firm-level residuals of working capital accruals from estimation of the Dechow and Dichev (2002) model for the years *t*-4 to *t* and multiplied by minus one
SalesGrowth	Percentage change in sales from year *t*–1 to year *t*
LogAsset	Firm size measured as log of book value of total assets
Q	A proxy for Tobin's Q measured as the market value of total assets deflated by the book value of total assets at the end of year *t*
StdCFO	Standard deviation of cash flows from operating activities deflated by average total assets from years *t*-5 to *t*-1
StdSale	Standard deviation of sales deflated by average total assets from years *t*-5 to *t*-1
StdInvestment	Standard deviation of total capital investment (*Investment*) from years *t*-5 to *t*-1
Z-Score	Proxy for bankruptcy risk based on the Altman (1968) Z-Score formula
Tangibility	Ratio of book value of property, plant, and equipment to book value of total assets
K-structure	Capital structure measured as book value of long-term debt/(book value of long-term debt + the market value of equity)
Ind-K-Structure	Industry capital structure measured as the average of K-structure for all Compustat firms in the same SIC 3-digit industry given a year

Slack	Ratio of cash and cash equivalents to total assets
CFOsale	Ratio of CFO to sales
Dividend	Indicator variable that takes the value of 1 if the firm paid a common or preferred dividend, and 0 otherwise
OperatingCycle	Log of receivables to sales plus inventory to cost of goods sold times 360
Losses	Indicator variable that takes the value of 1 if net income before extraordinary items is negative and 0 otherwise.
Age	Number of years that have been passed since the firm appears in CRSP
MissR&D	An indicator variable for firm-years with R&D expenses missing (Koh and Reeb 2015)
RiskTolerance	*Vega* times 100 divided by the sum of *Vega,* salary, and bonus for year *t, where Vega is the s*ensitivity of CEO share and option portfolio value to share return volatility
Tenure	Duration of employment as the permanent CEO of a given firm

Compensation regressions

TotalPay	One-year-ahead log of one plus inflation-adjusted CEO annual total compensation, with inflation adjustment based on Consumer Price Index
ROA	One-year-ahead accounting return on total assets (net income before extraordinary items and discontinued operations deflated by lagged total assets)
RET	One-year-ahead annual market-adjusted share returns
VOLROA	Standard deviation of return on assets over the prior five years
VOLRET	Standard deviation of share returns over the prior five years
Q	Firm year-end market value of total assets deflated by book value of total assets
Salechg	The percentage rate of sales growth from year *t* to year *t*+1
LogSale	Natural logarithm of sales revenue during year *t*+1
R&D	R&D expense deflated by total assets in year *t*+1

Firm performance volatility and financial leverage regressions

VOL	Volatility of firm performance in terms of industry-adjusted share return volatility and industry-adjusted ROA volatility in year *t*+1. (1) Share return volatility (RETVOL) is measured as the standard deviation of industry-adjusted daily share returns during a fiscal year by each firm. (2) ROA volatility (*ROAVOL*) is measured as the standard deviation of past five years of industry-adjusted return on assets from years *t*-3 to *t*+1 by each firm.
Leverage	Financial leverage measured as the book value of long-term and short-term debts deflated by book value of total assets

Table 1
Sample selection procedure and propensity score matching

Panel A: Sample selection

	Number of observations
All Russell 3000 constituents (excluding financial firms) adopting clawback provisions between 2005 and 2012 inclusive	1,032 firms
Subset matched with control firms using the propensity score matching	966 firms
Merged firm-year observations with all determinants for capital investment available between 2002 and 2012, omitting observations beyond *T*-3 to *T*+3	4,200
Firm-year observations omitted for firms with no R&D expenditure prior to the clawback adoption year	(2,680)
Firm-year observations omitted for firms without at least one R&D expenditure during the post-adoption period and with extreme outliers of capital investment variables beyond the top one percentile of the sample	(263)
Final firm-year sample	1,257

The final sample consists of 1,257 observations for 243 firms (697 observations for 136 clawback adopters and 560 observations for 107 non-adopters).

Panel B: Logit regressions for propensity score matching

Dependent Variable = Clawback Adoption in Year *T*			
Determinants	Coefficient	*P*-value	
Intercept	-3.277	<.0001	***
LogAsset	0.132	<.0001	***
Lev	-0.076	0.526	
ROA	0.010	0.949	
MB	-0.002	0.739	
LogSegment	0.086	0.004	***
Restate_prior_3y	0.145	0.008	***
Independence	0.025	0.897	
Institutional	0.058	0.208	
Boardmeeting	0.002	0.764	
Auditsize	0.019	0.383	
Insiderowen	-0.820	<.0001	***
Industry-fixed Effect	Yes		
Year-fixed Effects	Yes		
Observations	12,893		
Pseudo R-squared	0.083		

Panel C: T-tests for the mean differences in the determinants for clawback adoptions at the adoption year

Variables	Clawback-adopting firms (1)	Non-adopting firms (2)	Mean difference ((3) = (1) – (2))	*t*-value
LogAsset	7.877	7.748	-0.129	-0.64
Lev	0.158	0.151	-0.007	-0.34
ROA	0.051	0.049	-0.002	-0.12
MB	3.138	3.247	0.109	0.30
LogSegment	1.622	1.65	0.028	0.22
Restate_prior_3y	0.169	0.14	-0.029	-0.43
Independence	0.731	0.733	0.002	0.61
Institutional	0.729	0.662	-0.067	-0.13
Boardmeeting	8.243	7.832	-0.411	-1.04
Auditsize	3.699	3.841	0.142	1.13
Insiderowen	0.06	0.073	0.013	1.09

Note: All variables are defined in the Appendix A. *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels for two-sided *t*-tests, respectively.

Table 2
Descriptive statistics for variables used in capital investment regression models

	N	Mean	*Standard deviation*	*P25*	*Median*	*P75*
Investment	1,257	12.75	9.39	6.29	10.16	16.62
R&D	1,257	3.83	2.94	1.79	3.06	4.88
Capex	1,257	5.67	5.65	1.45	3.45	8.54
Capex + R&D	1,257	3.28	7	0	0.35	2.9
Acquisition	1,257	9.48	6.28	4.87	7.7	12.45
Institutions	1,257	0.73	0.27	0.65	0.81	0.92
Analysts	1,257	13.52	9.94	6.00	12.00	20.00
G-Score	1,257	7.94	4.23	6.00	9.00	11.00
G-Dummy	1,257	0.16	0.37	0.00	0.00	0.00
AQ	1,257	-0.05	0.04	-0.06	-0.04	-0.03
SalesGrowth	1,257	9.65	20.62	-0.14	8.30	16.90
LogAsset	1,257	7.87	1.56	6.75	7.75	8.80
Q	1,257	1.97	0.94	1.33	1.71	2.35
Std-CFO	1,257	0.04	0.03	0.02	0.03	0.05
Std-Sale	1,257	0.12	0.09	0.06	0.09	0.15
Std-Inv	1,257	8.30	11.62	2.24	4.82	8.85
Z-score	1,257	-2.34	0.94	-2.97	-2.31	-1.78
Tangibility	1,257	0.46	0.31	0.23	0.38	0.62
K-Structure	1,257	0.13	0.14	0.02	0.10	0.20
Ind-K-Structure	1,257	0.14	0.09	0.07	0.12	0.19
Slack	1,257	0.19	0.17	0.05	0.13	0.28
CFOsale	1,257	0.13	0.11	0.07	0.12	0.18
Dividend	1,257	0.57	0.49	0.00	1.00	1.00
OperCycle	1,257	4.85	0.47	4.62	4.85	5.13
Losses	1,257	0.16	0.36	0.00	0.00	0.00
Age	1,257	30.16	21.39	13.00	23.00	41.00
MissR&D	1257	0.01	0.09	0.00	0.00	0.00
PerfPayRatio	1,257	78.28	15.54	72.89	83.13	88.50
EquityIncentive	1,257	25.46	20.17	10.56	19.48	34.92
RiskTolerance	1,257	12.80	11.34	4.06	9.57	18.03
Tenure	1,257	7.07	6.39	3.00	5.00	9.00

This table presents descriptive statistics for capital investment mix and its control variables. Panel A shows the differences in these variables at the adoption year. Panel B shows overall summary statistics for these variables over the entire sample. All variables are defined in the Appendix A. *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels for two-sided *t*-tests for the difference in firm-level change in each variable from *T*-3 to *T*-1, respectively, where *T* is the adoption year.

Table 3
Effects of clawback provisions on capital investment

	Dependent Variable =				
	(1)	(2)	(3)	(4)	(5)
VARIABLES	$Investment_{t+1}$	$R\&D_{t+1}$	$Capex_{t+1}$	$Capex+R\&D_{t+1}$	$Acquisition_{t+1}$
Post	-1.276	0.109	-0.310	-0.176	-1.148
	(-1.39)	(0.53)	(-1.36)	(-0.52)	(-1.33)
Clawback*Post	**-0.066**	**-0.487****	**0.405***	**-0.070**	**-0.033**
	(-0.07)	**(-2.00)**	**(1.94)**	**(-0.21)**	**(-0.04)**
Institutions	0.574	0.791	0.570	1.464*	-1.030
	(0.27)	(1.29)	(1.28)	(1.93)	(-0.53)
Analysts	0.079	-0.032	0.031**	-0.008	0.076
	(1.01)	(-1.59)	(2.04)	(-0.31)	(1.11)
G-Score	-0.988	0.188	-0.421**	-0.195	-0.734
	(-1.21)	(0.55)	(-1.97)	(-0.46)	(-1.10)
G-Dummy	-8.290	0.818	-2.736**	-1.532	-6.333
	(-1.00)	(0.28)	(-2.02)	(-0.45)	(-0.97)
AccrualQuality	-0.480	0.786	-0.532	0.336	-0.507
	(-0.05)	(0.37)	(-0.29)	(0.11)	(-0.05)
SalesGrowth	0.008	0.005	0.001	0.007	0.002
	(0.58)	(1.14)	(0.34)	(1.10)	(0.14)
LogAsset	-3.645**	-3.589***	-1.074***	-4.675***	0.876
	(-2.15)	(-5.44)	(-3.14)	(-6.25)	(0.55)
Q	0.490	0.272	0.772***	1.026***	-0.512
	(0.68)	(1.17)	(4.16)	(3.52)	(-0.79)
StdCFO	20.921	1.764	1.832	4.356	16.545
	(1.11)	(0.36)	(0.49)	(0.62)	(1.07)
StdSale	-10.095*	-2.811**	-1.853*	-4.683***	-5.499
	(-1.87)	(-2.21)	(-1.88)	(-2.68)	(-1.17)
StdInvestment	-0.100	0.011	0.015	0.027*	-0.125**
	(-1.64)	(0.94)	(1.54)	(1.66)	(-2.29)
Z-Score	-2.375***	-0.241	-0.125	-0.344	-2.071***
	(-3.21)	(-0.86)	(-0.67)	(-0.95)	(-3.12)
Tangibility	8.245**	2.987	-1.532	1.581	7.065**
	(2.24)	(1.65)	(-1.29)	(0.73)	(2.19)
K-structure	-8.139*	-0.866	-3.042**	-3.842**	-4.348
	(-1.90)	(-0.75)	(-2.31)	(-1.99)	(-1.10)
Ind-K-Structure	3.853	0.855	-0.420	0.453	3.453
	(0.80)	(0.74)	(-0.31)	(0.24)	(0.81)
Slack	14.274**	-0.840	-0.197	-0.908	15.760***
	(2.44)	(-0.60)	(-0.22)	(-0.56)	(3.00)
CFOsale	5.165	1.214	1.121	2.200	2.909
	(1.10)	(0.90)	(1.16)	(1.38)	(0.70)
Dividend	1.022	0.057	-0.092	-0.003	1.041
	(0.98)	(0.16)	(-0.30)	(-0.01)	(1.22)
OperatingCycle	4.139***	2.471***	0.823**	3.177***	0.941
	(2.80)	(2.76)	(2.09)	(2.98)	(0.83)
Losses	-0.001	0.269	-0.068	0.108	-0.167
	(-0.00)	(1.09)	(-0.36)	(0.31)	(-0.23)

Age	-0.815	0.032	0.575*	0.663	-1.445
	(-0.60)	(0.10)	(1.72)	(1.33)	(-1.24)
Lagged Capex	0.221*	-0.019	0.249***	0.237***	-0.016
	(1.68)	(-0.38)	(5.50)	(3.59)	(-0.15)
Lagged R&D	0.070	0.109***	0.024	0.136***	-0.062
	(0.73)	(2.69)	(1.34)	(2.74)	(-0.88)
Lagged AQC	-0.191***	-0.025**	-0.007	-0.031**	-0.157***
	(-4.58)	(-2.41)	(-0.86)	(-2.36)	(-4.13)
MissR&D	-7.782***	-3.334*	-1.516	-4.726*	-3.320**
	(-3.05)	(-1.69)	(-1.11)	(-1.80)	(-2.29)
PerfPayRatio	0.022	0.001	0.001	0.001	0.020
	(0.89)	(0.15)	(0.31)	(0.10)	(0.86)
EquityIncent	0.057*	-0.002	-0.011*	-0.013	0.067**
	(1.74)	(-0.27)	(-1.82)	(-1.23)	(2.21)
RiskTolerance	-0.065*	-0.002	0.017**	0.015	-0.079**
	(-1.71)	(-0.19)	(2.22)	(1.03)	(-2.40)
CEO tenure	-0.078	0.014	0.021	0.036	-0.113
	(-0.86)	(0.77)	(0.80)	(0.90)	(-1.53)
Observations	1,257	1,257	1,257	1,257	1,257
Adjusted R-squared	0.168	0.354	0.285	0.344	0.108
Firm Fixed Effects	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES
Firm Clustering Effects	YES	YES	YES	YES	YES

This table shows the results using OLS regression for Equation 4 with firm- and year-fixed effects and firm-clustering effects, resulting in the omission of the coefficient on the indicator variable *Clawback* and the intercept. The coefficients on *Post* reflect the average time path of dependent variables that would have happened in the absence of the treatment (i.e., the adoption of clawback provision). See Appendix A for variable definitions. T-statistics based on robust standard errors clustered by firms are reported in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% level in a two-tailed test, respectively.

Table 4
Differences in clawback effects on capital investment with regard to pre-adoption managerial incentives

Panel A: High versus low CEO performance-based pay prior to clawback adoption

	Dependent Variable =					
	R&D$_{t+1}$		*Capex$_{t+1}$*		*Capex+R&D$_{t+1}$*	
VARIABLES	HighPerfPay	LowPerfPay	HighPerfPay	LowPerfPay	HighPerfPay	LowPerfPay
	(1)	(2)	(3)	(4)	(5)	(6)
Post	0.717**	-0.231	-0.625	-0.073	0.092	-0.252
	(2.17)	(-0.87)	(-1.42)	(-0.26)	(0.15)	(-0.58)
Clawback*Post	**-1.094*** **	**-0.126**	**0.825** **	**-0.003**	**-0.266**	**-0.105**
	(-3.19)	**(-0.42)**	**(2.22)**	**(-0.01)**	**(-0.49)**	**(-0.22)**
Control variables	Included	Included	Included	Included	Included	Included
Observations	587	670	587	670	587	670
Adjusted R-squared	0.430	0.424	0.282	0.308	0.369	0.375
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Firm Clustering Effects	YES	YES	YES	YES	YES	YES
High- vs. Low-PerfPay						
Difference in *Clawback*Post*	-0.968***		0.828*		-0.161	

Panel B: High versus low CEO equity incentives prior to clawback adoption

	Dependent Variable =					
	R&D$_{t+1}$		*Capex*$_{t+1}$		*Capex+R&D*$_{t+1}$	
VARIABLES	HighEquity	LowEquity	HighEquity	LowEquity	HighEquity	LowEquity
	(1)	(2)	(3)	(4)	(5)	(6)
Post	0.305	-0.382	-0.496	-0.194	-0.190	-0.527
	(1.10)	(-1.48)	(-1.51)	(-0.74)	(-0.39)	(-1.28)
Clawback*Post	**-0.751****	**0.240**	**0.661****	**0.061**	**-0.093**	**0.341**
	(-2.32)	**(0.86)**	**(2.17)**	**(0.23)**	**(-0.20)**	**(0.82)**
Control variables	Included	Included	Included	Included	Included	Included
Observations	684	573	684	573	684	573
Adjusted R-squared	0.435	0.481	0.278	0.326	0.387	0.394
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Firm Clustering Effects	YES	YES	YES	YES	YES	YES
<u>High- vs. Low-Equity</u>						
Difference in *Clawback*Post*	-0.991***		0.600*		-0.434	

This table shows the results using OLS regression for Equation 4 with firm- and year-fixed effects and firm-clustering effects. The results for *Investment*$_{t+1}$ and *Acquistion*$_{t+1}$ are insignificant and omitted for the sake of brevity. See Appendix A for variable definitions. T-statistics based on robust standard errors clustered by firms are reported in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% level in a two-tailed test, respectively. The tests for differences in coefficients on *Clawback*Post* for high vs. low performance-based pay (panel A) and for high vs. low equity incentive (panel B) are based on chi-square tests.

Table 5
Effects of clawback provisions on overinvesting and underinvesting in R&D and Capex

	Dependent Variable =					
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	*OverR&D*$_{t+1}$	*UnderR&D*$_{t+1}$	*OverCapex*$_{t+1}$	*UnderCapex*$_{t+1}$	*OverCapex+R&D*$_{t+1}$	*UnderCapex+R&D*$_{t+1}$
Post	0.010	-0.065**	-0.035	0.027	-0.031	-0.009
	(0.38)	(-2.17)	(-1.00)	(0.91)	(-0.91)	(-0.24)
Clawback*Post	**-0.028**	**0.066****	**0.038**	**-0.025**	**0.023**	**0.025**
	(-0.91)	**(2.18)**	**(1.16)**	**(-0.81)**	**(0.77)**	**(0.74)**
Institutions	-0.037	-0.105	0.076	-0.050	0.181**	-0.127
	(-0.54)	(-1.61)	(0.85)	(-0.90)	(2.44)	(-1.49)
Analysts	0.001	0.010***	-0.001	-0.003	0.000	0.001
	(0.43)	(3.19)	(-0.52)	(-1.24)	(0.15)	(0.49)
G-Score	0.021	0.005	-0.052*	0.031	0.003	0.042
	(0.64)	(0.21)	(-1.78)	(1.05)	(0.09)	(0.82)
G-Dummy	0.018	0.051	-0.258	0.226	0.098	0.287
	(0.07)	(0.27)	(-1.46)	(0.67)	(0.46)	(0.54)
AccrualQuality	-0.508	-0.110	0.194	0.090	0.343	0.335
	(-1.64)	(-0.45)	(0.51)	(0.27)	(1.16)	(1.06)
SalesGrowth	-0.000	0.001	-0.000	0.001**	-0.000	0.001
	(-0.31)	(1.10)	(-0.69)	(2.26)	(-0.40)	(1.44)
LogAsset	-0.249***	0.126**	-0.029	0.032	-0.199***	0.120**
	(-4.53)	(2.40)	(-0.61)	(0.64)	(-4.03)	(2.25)
Q	-0.037	0.024	0.036	0.048**	-0.024	0.024
	(-1.50)	(0.83)	(1.45)	(2.14)	(-1.15)	(0.82)
StdCFO	1.093*	0.061	0.773	0.120	-0.049	-0.897**
	(1.95)	(0.14)	(1.54)	(0.29)	(-0.09)	(-1.99)
StdSale	-0.348**	0.200	-0.353**	0.166	-0.207*	0.543***
	(-2.15)	(1.06)	(-2.13)	(1.25)	(-1.70)	(2.82)
StdInvestment	-0.001	-0.001	0.001	-0.002	0.001	-0.003**
	(-0.64)	(-0.45)	(0.61)	(-1.46)	(0.79)	(-2.10)
Z-Score	0.009	0.028	0.003	-0.014	0.033	0.024
	(0.37)	(1.27)	(0.10)	(-0.55)	(1.50)	(1.00)
Tangibility	0.036	0.087	0.019	-0.128	-0.085	-0.140

	(0.25)	(0.68)	(0.12)	(-0.95)	(-0.69)	(-1.02)
K-structure	-0.012	0.129	-0.331*	0.225	-0.248*	0.038
	(-0.09)	(0.88)	(-1.75)	(1.58)	(-1.74)	(0.26)
Ind-K-Structure	0.001	-0.209	-0.186	-0.317*	-0.201	-0.303
	(0.01)	(-1.13)	(-0.88)	(-1.87)	(-1.49)	(-1.36)
Slack	-0.972***	1.302***	0.076	-0.419***	-0.596***	0.817***
	(-5.63)	(6.19)	(0.47)	(-2.97)	(-4.28)	(4.66)
CFOsale	0.189	0.373**	0.139	-0.051	0.409***	0.142
	(1.14)	(2.24)	(1.01)	(-0.36)	(3.25)	(0.92)
Dividend	0.039	-0.004	-0.012	-0.158***	0.014	-0.065
	(1.07)	(-0.08)	(-0.23)	(-2.77)	(0.33)	(-1.22)
OperatingCycle	0.102*	-0.068	0.091	-0.041	0.047	-0.147**
	(1.84)	(-1.17)	(1.43)	(-0.67)	(0.90)	(-2.38)
Losses	0.039	0.003	0.014	0.002	0.003	0.041
	(1.15)	(0.15)	(0.40)	(0.08)	(0.10)	(1.38)
Age	-0.021	-0.025	0.013	0.026	0.026	-0.016
	(-0.39)	(-0.73)	(0.35)	(1.21)	(0.73)	(-0.64)
Lagged Capex	0.000	0.001	0.032***	-0.012***	0.011**	-0.005
	(0.04)	(0.46)	(5.28)	(-3.47)	(2.53)	(-0.93)
Lagged R&D	0.006*	-0.005	0.003	0.003	0.005*	-0.005**
	(1.72)	(-1.41)	(1.17)	(0.77)	(1.82)	(-2.10)
Lagged AQC	-0.002	0.000	-0.001	0.001	-0.001	-0.000
	(-1.23)	(0.23)	(-0.91)	(0.60)	(-0.58)	(-0.04)
MissR&D	-0.009	0.086	0.034	0.074	0.094	0.098
	(-0.16)	(1.33)	(0.23)	(1.00)	(1.55)	(1.23)
PerfPayRatio	0.001	0.000	0.001	0.000	0.000	0.001*
	(0.89)	(0.43)	(0.82)	(0.02)	(0.15)	(1.77)
EquityIncent	0.001	0.002*	-0.002**	0.000	-0.000	0.001
	(0.76)	(1.68)	(-2.37)	(0.39)	(-0.62)	(0.91)
RiskTolerance	-0.001	-0.001	0.002	-0.000	0.001	-0.001
	(-0.70)	(-0.52)	(1.42)	(-0.36)	(0.58)	(-0.29)
CEO tenure	-0.002	0.002	0.006*	0.001	0.003*	0.000
	(-0.60)	(1.06)	(1.89)	(0.48)	(1.72)	(0.11)
Observations	1,257	1,257	1,257	1,257	1,257	1,257
Adjusted R-squared	0.137	0.213	0.089	0.071	0.093	0.116

Firm Fixed Effects	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES
Firm Clustering Effects	YES	YES	YES	YES	YES	YES

This table shows the results using the linear probability regressions of overinvesting (vs. non-overinvesting) and of underinvesting (vs. non-underinvesting). The results for total investment and acquisitions are insignificant and omitted for the sake of brevity. See Appendix A for variable definitions. These regressions control for firm- and year-fixed effects and firm-clustering effects, resulting in the omission of the coefficient on the indicator variable *Clawback* and the intercept. The coefficients on *Post* reflect the average time path of dependent variables that would have happened in the absence of the treatment (i.e., the adoption of clawback provision). *T*-statistics based on robust standard errors clustered by firms are reported in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% level in a two-tailed test, respectively.

Table 6
Differences in clawback effects on underinvesting in R&D and overinvesting in Capex with regard to pre-adoption managerial incentives

Panel A: High versus low CEO performance-based pay prior to clawback adoption

	Dependent Variable =			
	UnderR&D$_{t+1}$		*OverCapex*$_{t+1}$	
	(1)	(2)	(3)	(4)
VARIABLES	*HighPerfPay*	*LowPerfPay*	*HighPerfPay*	*LowPerfPay*
Post	-0.109**	-0.044	-0.043	-0.038
	(-2.40)	(-1.10)	(-0.84)	(-0.74)
Clawback*Post	**0.093****	**0.052**	**0.030**	**0.068**
	(2.00)	**(1.22)**	**(0.67)**	**(1.39)**
Control variables	Included	Included	Included	Included
Observations	587	670	587	670
Adjusted R-squared	0.268	0.211	0.081	0.108
Industry Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Firm Clustering Effects	YES	YES	YES	YES
High- vs. Low-PerfPay				
Difference in Clawback*Post	0.041		-0.038	

Panel B: High versus low CEO equity incentives prior to clawback adoption

	Dependent Variable =			
	UnderR&D$_{t+1}$		*OverCapex*$_{t+1}$	
	(1)	(2)	(3)	(4)
VARIABLES	*HighEquity*	*LowEquity*	*HighEquity*	*LowEquity*
Post	-0.058	-0.068	-0.091**	0.003
	(-1.52)	(-1.39)	(-2.03)	(0.05)
Clawback*Post	**0.076***	**0.047**	**0.104****	**-0.034**
	(1.76)	**(1.14)**	**(2.45)**	**(-0.64)**
Control variables	Included	Included	Included	Included
Observations	684	573	684	573
Adjusted R-squared	0.198	0.266	0.148	0.110
Firm Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Firm Clustering Effects	YES	YES	YES	YES
<u>High- vs. Low-Equity</u>				
Difference in Clawback*Post	0.029		0.138	

This table shows the results using the linear probability regressions of underinvesting (vs. non-overinvesting) for *R&D* and of overinvesting (vs. non-underinvesting) for *Capex*. In this table, we present only focal variables and omitted results for control variables for the sake of brevity. See Appendix A for variable definitions. The coefficients on *Post* reflect the average time path of dependent variables that would have happened in the absence of the treatment (i.e., the adoption of clawback provision). *T*-statistics based on robust standard errors clustered by firms are reported in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% level in a two-tailed test, respective.

Table 7
Effects of clawback provisions on managerial compensation incentives

Panel A: Effects of clawback provisions on CEO annual compensation

	Dependent Variable =		
VARIABLES	$TOTALPAY_{t+1}$ (1)	$TOTALPAY_{t+1}$ (2)	$TOTALPAY_{t+1}$ (3)
POST	0.024	-0.199	-0.235
	(0.56)	(-0.83)	(-0.99)
Clawback*POST	**0.052**	**0.403**	**0.450**
	(1.31)	**(1.19)**	**(1.33)**
Lagged TOTALPAY	-0.016	-0.020	-0.028
	(-0.43)	(-0.53)	(-0.70)
ROA	0.004**	0.001	0.001
	(2.02)	(0.59)	(0.54)
*ROA*Clawback*		0.007	0.007
		(1.46)	(1.55)
*ROA*Post*		0.001	0.001
		(0.27)	(0.28)
ROA*Clawback*Post		**-0.003**	**-0.004**
		(-0.50)	**(-0.67)**
R&D			-0.017*
			(-1.86)
*R&D*Clawback*			0.017
			(1.15)
*R&D*Post*			0.005
			(0.74)
R&D*Clawback*Post			**-0.010**
			(-1.06)
RET	0.072**	0.122***	0.121***
	(2.35)	(2.72)	(2.87)
*RET*Clawback*		-0.137*	-0.140*
		(-1.76)	(-1.81)
*RET*Post*		-0.017	-0.013
		(-0.23)	(-0.18)
*RET*Clawback*Post*		0.091	0.088
		(0.83)	(0.80)
ROAVOL	-0.230	0.064	0.119
	(-0.75)	(0.15)	(0.29)
*ROAVOL*Clawback*		-0.128	-0.200
		(-0.21)	(-0.34)
*ROAVOL*Post*		0.050	-0.277
		(0.13)	(-0.81)
*ROAVOL*Clawback*Post*		-0.912	-0.564
		(-1.54)	(-0.93)
RETVOL	0.130	0.103	0.112
	(0.22)	(0.09)	(0.11)
*RETVOL*Clawback*		-0.460	-0.566
		(-0.37)	(-0.46)

*RETVOL*Post*		0.863	0.928
		(0.96)	(1.04)
*RETVOL*Clawback*Post*		-0.370	-0.345
		(-0.30)	(-0.27)
SALECHG	0.002**	0.000	0.001
	(2.11)	(0.31)	(0.94)
*SALECHG*Clawback*		0.003	0.002
		(1.52)	(1.09)
*SALECHG*Post*		0.000	-0.000
		(0.30)	(-0.14)
*SALECHG*Clawback*Post*		0.000	0.001
		(0.08)	(0.32)
Q	0.020	0.016	0.021
	(0.91)	(0.56)	(0.76)
*Q*Clawback*		0.004	-0.009
		(0.08)	(-0.17)
*Q*Post*		0.015	0.011
		(0.42)	(0.31)
*Q*Clawback*Post*		-0.041	-0.024
		(-0.83)	(-0.42)
LogSale	0.214**	0.337***	0.307**
	(2.42)	(2.87)	(2.48)
*LogSale *Clawback*		-0.345**	-0.314*
		(-2.23)	(-1.97)
*LogSale *Post*		0.010	0.014
		(0.53)	(0.74)
*LogSale*Clawback*Post*		-0.013	-0.020
		(-0.49)	(-0.73)
Tenure	0.002	0.003	0.003
	(0.55)	(0.51)	(0.48)
*Tenure *Clawback*		0.003	0.003
		(0.32)	(0.32)
*Tenure *Post*		-0.003	-0.003
		(-0.61)	(-0.55)
*Tenure *Clawback*Post*		-0.000	-0.001
		(-0.05)	(-0.12)
Observations	1,267	1,267	1,267
Adjusted R-squared	0.089	0.094	0.097
Firm FE	YES	YES	YES
Year FE	YES	YES	YES
Firm Clustering Effects	YES	YES	YES

Panel B: Effects of clawback provision on performance-based pay ratio, equity incentive, and risk-taking incentive

	Dependent Variable =		
VARIABLES	*PerfPayRatio*$_{t+1}$ (1)	*EquityIncent* $_{t+1}$ (2)	*RiskTolerance* $_{t+1}$ (3)
POST	-0.353	-1.801	-0.621
	(-0.27)	(-1.28)	(-0.69)
Clawback*POST	**2.658****	**2.350**	**1.105**
	(2.16)	**(1.59)**	**(1.07)**
PerfPayRatio	-0.054	0.034	0.032
	(-1.32)	(1.18)	(0.68)
EquityIncent	0.046	0.033	0.018
	(1.09)	(0.98)	(0.57)
RiskTolerance	-0.097*	-0.038	0.059
	(-1.80)	(-0.48)	(0.71)
ROA	0.180**	-0.016	-0.025
	(2.17)	(-0.42)	(-0.99)
RET	2.985**	1.825**	-0.047
	(2.50)	(2.17)	(-0.07)
ROAVOL	-9.275	-4.623	2.853
	(-0.91)	(-0.58)	(0.46)
RETVOL	10.309	34.893**	32.362***
	(0.49)	(2.02)	(3.09)
SALECHG	0.051*	0.019	-0.025***
	(1.93)	(1.12)	(-2.61)
Q	-0.549	-0.150	-0.091
	(-0.68)	(-0.20)	(-0.14)
LogSale	2.965	-0.469	2.868**
	(1.49)	(-0.22)	(2.00)
TENURE	-0.173	0.652***	0.069
	(-1.62)	(4.98)	(0.93)
Observations	1,233	1,232	1,233
Adjusted R-squared	0.072	0.162	0.056
Firm FE	YES	YES	YES
Year FE	YES	YES	YES
Firm Clustering Effects	YES	YES	YES

This table shows results of OLS regression with firm- and year-fixed effects and firm-clustering effects. See Appendix A for variable definitions. T-statistics based on robust standard errors clustered by firms are reported in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% level in a two-tailed test, respectively.

Table 8
Clawback effects on firm performance volatility and financial leverage

	Dependent Variable =		
	$RETVOL_{t+1}$	$ROAVOL_{t+1}$	$Leverage_{t+1}$
VARIABLES	(1)	(2)	(2)
POST	0.000	0.001	-0.013
	(0.64)	(0.30)	(-1.30)
CLAWBACK*POST	**-0.001**	**-0.001**	**-0.003**
	(-0.89)	**(-0.49)**	**(-0.31)**
Lagged RETVOL	-0.028		
	(-0.81)		
Lagged ROAVOL		0.514***	
		(10.49)	
Leverage			-0.118
			(-0.80)
Institutions	0.001	0.003	0.028
	(0.32)	(0.34)	(1.46)
Analysts	0.000	0.000	0.001
	(0.87)	(0.32)	(1.25)
G-Score	-0.002***	-0.001	-0.004
	(-2.86)	(-0.44)	(-0.31)
G-Dummy	-0.011**	-0.015	-0.041
	(-2.52)	(-0.59)	(-0.49)
AccrualQuality	0.012	0.001	0.121
	(1.18)	(0.03)	(1.18)
SalesGrowth	0.000	-0.000	-0.001
	(0.19)	(-1.64)	(-1.62)
LogAsset	-0.003***	0.001	0.046**
	(-2.72)	(0.17)	(2.11)
Q	0.000	-0.001	-0.003
	(0.13)	(-0.36)	(-0.47)
StdCFO	-0.020*	-0.048	0.018
	(-1.96)	(-0.77)	(0.11)
StdSale	0.000	-0.004	-0.054
	(0.04)	(-0.16)	(-0.95)
StdInvestment	-0.000	0.000	-0.000
	(-0.24)	(0.62)	(-0.12)
Z-Score	-0.001	0.006**	0.013
	(-1.36)	(2.58)	(0.55)
Tangibility	-0.002	-0.009	0.015
	(-0.71)	(-0.80)	(0.27)
K-structure	0.020***	-0.010	0.299***
	(4.78)	(-0.61)	(5.64)
Ind-K-Structure	0.001	-0.018	0.034

	(0.13)	(-1.10)	(0.32)
Slack	-0.004	-0.005	-0.017
	(-1.56)	(-0.35)	(-0.25)
CFOsale	-0.005	-0.000	-0.138*
	(-1.59)	(-0.03)	(-1.97)
Dividend	-0.001	0.000	-0.002
	(-1.08)	(0.16)	(-0.17)
OperatingCycle	0.001	-0.004	-0.137
	(1.37)	(-0.55)	(-1.36)
Losses	0.001	-0.001	-0.018
	(1.62)	(-0.30)	(-1.44)
Age	0.001	0.008	0.030
	(0.48)	(0.98)	(1.19)
Lagged Capex	-0.000	0.000	0.006***
	(-0.22)	(0.23)	(2.62)
Lagged R&D	0.000	0.001	-0.000
	(0.46)	(1.41)	(-0.46)
Lagged Acquisition	-0.000	0.000*	0.001
	(-0.92)	(1.90)	(1.61)
MissR&D	0.009***	0.019	0.202
	(4.87)	(1.32)	(1.24)
PerfPayRatio	-0.000	-0.000	-0.000
	(-0.03)	(-0.44)	(-0.76)
EquityIncent	0.000**	0.000	0.001*
	(2.17)	(0.86)	(1.67)
RiskTolerance	-0.000**	-0.000	-0.000
	(-2.30)	(-0.81)	(-0.27)
CEO tenure	-0.000	0.000	-0.001
	(-0.18)	(1.47)	(-1.27)
Observations	1,267	1,267	
Adjusted R-squared	0.487	0.387	
Firm Fixed Effects	YES	YES	
Year Fixed Effects	YES	YES	
Firm Clustering Effects	YES	YES	

This table shows the results using OLS regression with firm- and year-fixed effects and firm-clustering effects. The coefficients on *Post* reflect the average time path of dependent variables that would have happened in the absence of the treatment (i.e., the adoption of clawback provision). See Appendix A for variable definitions. T-statistics based on robust standard errors clustered by firms are reported in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% level in a two-tailed test, respectively.

Table 9
Concurrent changes in governance structure, other compensation schemes, and investment opportunities in the pre-adoption period

	Non-adopters			Adopters			Non-adopters	Adopters	
	Mean T-3	Mean T-2	Mean T-1	Mean T-3	Mean T-2	Mean T-1	Mean of change from T-3 to T-1	Mean of change from T-3 to T-1	Difference in mean of change from T-3 to T-1
Governance structure									
Institutions	0.72	0.70	0.73	0.70	0.72	0.74	0.03	0.05	0.01
Analysts	11.60	11.64	12.16	13.54	13.25	13.46	0.88	0.23	-0.65
G-Score	7.50	7.17	7.40	8.28	8.25	8.03	0.30	0.06	-0.24
G-Dummy	0.19	0.23	0.20	0.14	0.14	0.15	-0.03	-0.02	0.02
Tenure	7.90	8.06	7.75	6.60	6.43	6.43	0.16	0.15	-0.01
Other compensation schemes									
PerfPayRatio	74.37	76.10	78.43	76.91	77.10	77.06	0.021	0.005	0.015
EquityIncentive	16.55	16.23	15.37	14.15	10.14	9.90	0.59	-8.09	-8.68
RiskTake	4.18	3.72	3.29	4.34	3.61	3.32	-1.05	-0.80	0.26
Investment Opportunities									
SalesGrowth	11.95	12.08	11.21	12.83	7.92	8.17	-0.46	-3.29	-2.83
Q	2.20	2.20	2.10	2.06	1.88	1.90	-0.18	-0.21	-0.03

This table presents concurrent changes in corporate governance structure, other compensation schemes, and investment opportunities for the three years immediately before the adoption of clawback provisions. These variables are controlled in the capital investment regressions. See Appendix A for variable definitions. *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels for two-sided *t*-tests for the difference in firm-level change in each variable from *T*-3 to *T*-1, respectively, where *T* is the adoption year.