International Journal of Disclosure and Governance
https://doi.org/10.1057/s41310-025-00343-x

ORIGINAL ARTICLE

Effect of earnings management on abnormal compensation of CEOs

Xia Li[1] · Jairaj Gupta[2] · André Aroldo Freitas De Moura[3]

Received: 24 August 2025 / Accepted: 5 December 2025

Abstract
Agency theory suggests that monetary incentives are effective mechanisms to align managers' and shareholders' interests. Hence, value-maximising managerial decisions are positively related to their compensation levels, and vice versa. Several studies confirm that the practice of earnings management could be detrimental to a firm's value; however, the literature examining the relation between CEOs' total compensation and earnings management remains inconclusive. This may be due to the unobserved determinants of executive compensation. In line with the predictions of agency theory, this study provides conclusive evidence of this relation by documenting a negative relation between abnormal compensation (the proportion of pay that known factors cannot accurately determine) and earnings management. Thus, suggesting that CEOs involved in earnings management are penalised in the form of reduced excess compensation. Additionally, we find that the negative association between earnings management and abnormal compensation persists in both high and low-governance firms, and is robust to the presence of both internal and external corporate governance mechanisms as additional control variables. Since real earnings management is arguably more value-destructive in the long run, our results also confirm that CEOs involved in higher levels of real earnings management are penalised more severely than CEOs involved in higher levels of accrual earnings management.

Keywords Executive compensation · Abnormal compensation · Earnings management · Corporate governance · Financial stress

JEL Classification M12 · M41 · G34

Introduction

Executives are concerned with financial reporting as financial disclosures reflect upon their managerial ability, which in turn affects their compensation levels and structure (Zhang et al. 2008; Gul et al. 2017; Harris et al. 2019). Several studies examined the link between the total compensation of executives and earnings management (accrual and real) and report a positive association (Cheng and Warfield 2005; Bergstresser and Philippon 2006; Efendi et al. 2007; Peng and Roell 2008; Johnson et al. 2009; Adut et al. 2013; Demerjian et al. 2020). This is surprising, as a positive relation implies that executives are being rewarded for their beguiling behaviour, which contradicts the effectiveness of monetary incentives (Aktas et al. 2019) as monitoring mechanisms, as suggested by the agency theory. Executives in firms with weak corporate governance are also found to be rewarded for earnings manipulation activities (Edmans et al. 2017). However, under appropriate monitoring mechanisms, agency theory suggests that such manipulation activities should be penalised due to the interest alignment effect. Although few studies report a negative or no association between earnings management (*EM*) and the CEO's total compensation (Burns and Kedia 2006; O'Connor et al. 2006; Armstrong et al. 2010; Yan-Xin 2018). Broadly, these

✉ Xia Li
x.li40@aston.ac.uk

Jairaj Gupta
jairaj.gupta@york.ac.uk

André Aroldo Freitas De Moura
andre.moura@fgv.br

1 Aston University Birmingham, Birmingham, UK

2 University of York, York, England

3 FGV-EAESP, São Paulo, Brazil

Published online: 19 January 2026

findings on the relation between the total compensation of executives and *EM* collectively remain inconclusive.

Intuitively, executives' total compensation should reflect their ability, effort, risk premium, and other determinants (Core and Guay 2010; Armstrong et al. 2012), but it's hard to define a generally acceptable compensation level for all executives. Moreover, some executives may not like to disclose the actual level of their compensation to investors and regulators (Robinson et al. 2011). Prior studies and regulations support the idea that the compensation structure has not been appropriately determined and discuss the possible determinants (Chalmers et al. 2006; Core and Guay 2010; Armstrong et al. 2012).[1] Core and Guay (2010) point out that those proposals and findings reflect the framework's failure to determine an appropriate compensation level.

Thus, prior studies exploring the relation between the total compensation of executives and *EM* might have been confounded by unobserved determinants of executive compensation. Also, when CEOs receive excessive pay, they will likely omit or obfuscate the total compensation disclosures (Robinson et al. 2011). Therefore, to shed light on these mixed findings, in this study, we use abnormal compensation (*ACOMP*) rather than total compensation to explore whether *EM* is one of the unobserved determinants that affect executives' *ACOMP*. Unlike total compensation, *ACOMP* refers to the proportion of pay that cannot be explained by an executive's experience, risk premium, or other determinants (Armstrong et al. 2012; Core and Guay 2010). We also explore whether financial stress moderates the relation between *EM* and *ACOMP*.

We begin by investigating the impact of accrual earnings management *(AEM*) and real earnings management (*REM*) on CEOs' *ACOMP*. According to the monitoring mechanisms in the context of the agency theory, if the interests of the principal and agents are aligned, then there must be a negative relation between *ACOMP* and *EM*. Therefore, we expect that the more the CEOs engage in *EM*, the more they are likely to have reduced or negative *ACOMP*.

We investigate this relation using financial data of publicly listed firms in the United States (U.S.) from 1993 to 2021. Following Core et al. (2008), we measure the *ACOMP* of CEOs using the difference between their actual total compensation and expected total compensation. For *REM*, we use the measures proposed by Roychowdhury (2006), which are the abnormal production costs, discretionary expense, and operating cash flows, and add them according to Zang (2012). As for *AEM*, we use the model proposed by Collins et al. (2017), which is an improvement over the models proposed by Jones (1991), Dechow et al. (1995), and Kothari et al. (2005). We also use Dechow et al. (1995) and Srivastava (2019) as additional metrics for *AEM* and *REM*, respectively. We use standard OLS regressions with fixed effects for industry and year, as well as entropy-balanced matching regression analysis to validate our results further.

In line with the predictions of agency theory, we find a negative relation between *EM* metrics and CEOs' *ACOMP*. We also find that *REM* has higher economic effects on *ACOMP* than *AEM*. A one-standard-deviation increase in *REM* is associated with a decrease of around 5.66% in the CEO's *ACOMP*, and the corresponding decrease for *AEM* is about 1.97%. This negative relation indicates that CEOs involved in *EM* are likely to receive reduced excess compensation or lower-than-expected pay. Notably, the negative association provides evidence supporting the efficiency of incentives as a monitoring mechanism in aligning the interests of agents with those of the principal.

Our findings remain resilient to potential endogeneity concerns through various robustness checks. Firstly, by incorporating firm-fixed effects into our model, we account for potential biases stemming from firm-specific time-invariant omitted variables. Secondly, to address endogeneity concerns, we utilise the Sarbanes–Oxley Act (SOX) of 2002 as an exogenous shock on *EM*. Employing a difference-in-differences regression approach over the three years preceding and following SOX, we observe a negative impact of *REM* on *ACOMP*. This aligns with Cohen et al.'s (2008) findings that post-SOX, firms decreased the use of *AEM*, increased *REM*, and garnered heightened attention from board members toward *REM*. Thirdly, by applying a two-stage least squares (2SLS) regression analysis, our results maintain their interpretation and significance. Additionally, employing alternative measures of *EM* (Dechow et al. 1995; Srivastava 2019) yields qualitatively similar results. Overall, these robustness tests support and reinforce our primary findings.

Next, as we find a negative association between *EM* and *ACOMP*, we investigate how this association differs for different levels of *AEM* and *REM*. Considering the differences between *REM* and *AEM*, executives often face a trade-off between these two forms of *EM* based on their associated costs and benefits (Ewert and Wagenhofer 2005; Cohen et al. 2008; Cohen and Zarowin 2010). Some executives substitute *AEM* with *REM* to avoid easily detectable manipulations and punishment (Zang 2012). In addition, executives may apply different *EM* strategies to achieve the earnings objective. We still find a statistically negative effect of *EM* with high *REM* and high *AEM* or high *REM* and low *AEM*, suggesting that even though CEOs use different combinations of *EM*, they are still likely to receive reduced *ACOMP* due to the interest alignment effect. In light of the mixed

[1] For example, U.S. Treasury Department has proposed standards for regulating compensation on the Troubled Asset Relief Program to avoid high cash pay to top executives in 2009; European Union has proposed a firm's remuneration policy in 2015.

results of prior literature on the relation between *EM* and executives' compensation (e.g., Cheng and Warfield 2005; Bergstresser and Philippon 2006; Johnson et al. 2009; Armstrong et al. 2010; Yan-Xin 2018; Demerjian et al. 2020), our use of *ACOMP* to disentangle these findings thus confirms that there is indeed a negative effect, and it is more pronounced for *REM* than *AEM*.

We also conduct four additional tests. First, we use the bias correction procedures from Chen et al. (2018). Second, we test whether the corporate governance mechanisms are driving the negative relation between *EM* and *ACOMP*. Third and fourth, we investigate the moderating effect of financial stress and firm-level political risk, respectively. We find that our results are qualitatively unchanged after Chen et al.'s (2018) correction, and the negative relation is significant regardless of the strength of internal and external corporate governance mechanisms, or in the presence of both internal and external corporate governance mechanisms as additional control variables. We also find a negative moderating effect of financial stress and a positive moderating effect of firm-level political risk on the relation between *AEM* and *ACOMP*.

Our contribution lies in shedding light on the mixed results of prior literature on the effect of earnings management on executive compensation by using *ACOMP* to disentangle these findings (e.g., Cheng and Warfield 2005; Bergstresser and Philippon 2006; Johnson et al. 2009; Demerjian et al. 2020). Taken together, the evidence reported in this study shows that the current monitoring mechanisms in place in U.S. companies are effective in curbing CEOs' *ACOMP* when they engage either in *AEM* or *REM*. For firms facing high financial stress and high political risk, we suggest that the creditors and analysts pay more attention to the *AEM* to understand the actual financial performance of firms and reduce the information asymmetry.

Literature review and hypothesis development

Theoretical background

"Managerial power" theories argue that executives have a great deal of control over shareholders and that CEOs may use their power to achieve higher compensation levels. The pay packages are not always in shareholders' best interest, which leads to potential interest conflicts between CEOs and shareholders (Ataullah et al. 2014). To avoid conflicts, agency theory suggests firms use outcome-based incentives to align their interests with those of executives. Firms may choose stocks, options, or bonuses to direct CEOs toward making value-enhancing decisions (Coles et al. 2006; Kini and Williams 2012; Mohanram et al. 2020). Such outcome-based incentives directly link managerial compensation to firms' performance, encouraging CEOs to make financial decisions in the best interest of shareholders. In light of the agency theory, monitoring mechanisms are another way to mitigate conflicting interests, which aim to align the firm's and CEOs' interests and encourage managers to make value-maximising business decisions.

However, these governance mechanisms are difficult to implement due to relatively higher costs and some executives' unobserved behaviour (Zhang et al. 2008). As a result, firms may use long-term outcome-based incentives to avoid conflicts. Stocks and options are the most common mechanisms in such contracts (Kuo et al. 2013; Mohanram et al. 2020; Mamatzakis and Bagntasarian 2020), which link executives' interest and firms' performance closely with sustainable levels of compensation (Zhang et al. 2008). However, such incentives may bring compensation risks to CEOs because the direct link increases the inherent uncertainty of their future wealth, thus increasing their likelihood of managing earnings. However, according to the agency theory, CEOs' interests align with those of firms, so in the long run, value-erosion business decisions like *EM* should also adversely affect their personal wealth.

Overall, CEOs can use their discretion to manage earnings and increase firms' performance for their benefit. However, sustaining such practices can damage firms' future performance. Therefore, based on the managerial power and agency theory, there is a relationship between managing earnings and the compensation of CEOs. As the compensation and earnings management levels differ across firms, the level of earnings management is theoretically related to a CEO's excessive pay.

Impact of *EM* on *ACOMP* of CEOs

Despite clear theoretical motivations, most prior literature reports a positive association between executive compensation and *EM*. Cheng and Warfield (2005) find that executives with high equity incentives are more likely to engage in *EM* activities to meet analysts' forecasts. A similar result is reported by Bergstresser and Philippon (2006) that the level of discretionary *AEM* is positively associated with managers' overall compensation. Other studies investigating the link between *EM* and executive compensation also show a positive association (Efendi et al. 2007; Peng and Roell 2008; Kuang 2008; Johnson et al. 2009).

A few studies, however, consider that equity-based compensation does not incentivise executives to manage earnings (Burns and Kedia 2006; O'Connor et al. 2006). In contrast, they hypothesise that equity compensation may lessen executives' desire for *EM* by aligning their interests with shareholders. Some studies support this argument. Larcker et al. (2007), for instance, find that there is actually no significant relation between executives' compensation and *EM*. In addition, Armstrong et al. (2010) document a modest negative association between CEOs' equity incentives and accounting regulations. Similarly, Leal et al. (2022) report no significant relation between executive compensation and earnings management, adding further evidence to the mixed nature of prior findings. Although the conclusion of prior literature is considered a consensus for this investigation, considerable differences across inferences are shown within these studies. Broadly, the relation between *EM* and executive compensation remains mixed and inconclusive. The lack of consistency may be due to some unobservable determinants of total compensation and inappropriate compensation structures.

Recent regulations and proposals also highlight the importance of aligning executives' compensation structure that requires their skin in the game. The U.S. Treasury Department issued a rule on the Troubled Asset Relief Program in 2009, which requires most of the compensation to be paid in the form of stock to restrict cash payments to top executives. Also, the Dodd-Frank Act led to the implementation of the say-on-pay vote for executives in 2011, which grants shareholders an advisory vote on executive pay. Although not legally binding, these votes exert substantial pressure on boards and often influence compensation decisions. In July 2015, the European Union also proposed that firms' remuneration policy should explain the performance criteria (including financial and non-financial) used to determine the executive's compensation level. Core and Guay (2010) argue that the concern mentioned by prior literature and the appearance of proposals is because of the failure to articulate an appropriate compensation framework. They propose that executive compensation should reflect a risk premium for their incentives in the contract. Recent work also shows that manager compensation frequently departs from fair levels (Leal and Anjos 2023). CEOs may participate in *EM* activities because they are likely to inflate firms' short-term performance to meet analysts' forecasts and obtain extra incentives (Edmans et al. 2017). Recent evidence also links CEO compensation structure to firm strategy, suggesting that firms following prospector strategies offer longer-duration pay to align with long-term innovation goals (Gu et al. 2024). However, stricter corporate governance and monitoring mechanisms increase the potential risk and difficulties of doing *EM* (Fernandes et al. 2013). Therefore, there is a trade-off between the potential risks that CEOs face and the expected additional incentives.

Following prior literature (Hooghiemstra et al. 2017), *ACOMP* is defined as the difference between observed compensation and the expected compensation calculated from several economic components (Core et al. 2008). Specifically, Core and Guay (2010) state that the level of compensation should be determined by executives' ability, effort, and risk premium. Compensation for ability should reflect the basic amount of pay to attract executives to the job. Also, compensation should increase with their level of effort. Moreover, as discussed above, a risk premium stems from performance-based incentive risk, and firms should consider the risk premium to compensate CEOs. The amount of pay that these determinants cannot explain is regarded as *ACOMP*. Therefore, executives may engage in earnings manipulation activities to boost firms' short-term financial performance to gain immediate excess compensation.

Turning to *EM*, there are typically two forms of manipulation, *AEM* and *REM* (Cohen and Zarowin 2010; Dechow et al. 2010; Badertscher 2011; Kothari et al. 2016). On the one hand, *AEM* refers to discretionary choices within the scope of the Generally Accepted Accounting Principles (GAAP) to achieve the earnings objective (Garel et al. 2021). On the other hand, managers do *REM* by altering operational transactions, such as cutting discretionary expenses, manipulating sales by offering larger discounts or overproducing to boost inventory and cut the costs of goods sold (Roychowdhury 2006). *REM* is more damaging than *AEM* (Graham et al. 2005; Kim and Sohn 2013) since it directly affects firms' cash flows and harms their long-term value (Gunny 2010; Braam et al. 2015).

Based on the above discussions, we expect that both types of *EM* should have a negative effect on the *ACOMP* of CEOs. Thus, our hypothesis is as follows:

H1 *There is a negative association between the ACOMP of CEOs and EM.*

Different *EM* strategies and *ACOMP*

Although both types of *EM* have a similar purpose behind manipulating earnings, there are differences between them. *AEM* is relatively easier to detect than *REM* since CEOs are more likely to be constrained to specific periods (accounting report dates) to do *AEM* (Braam et al. 2015). This reduced flexibility and easy detectability often encourage managers to switch to *REM* (Diri et al. 2020). Auditors can more easily detect firms' *AEM* behaviour using the generally accepted accounting principles and litigations based on GAAP (Diri et al. 2020). As a less damaging type, *AEM* retains firms' operating and investment policies but only adjusts the earnings reporting measure (Cohen and Zarowin 2010; Kothari et al. 2016). Compared to *AEM*, *REM* is more damaging to firms' long-term value (Graham et al. 2005; Gunny 2010; Kim and Sohn 2013; Braam et al. 2015) and is relatively harder to monitor since it changes firms' operating and investment policies to achieve firms' short-term earnings target (Edmans et al. 2017). Based on the interest alignment effect and that *REM* causes more severe damage to firms' value in the long run, we expect the association between *REM* and *ACOMP* to be more pronounced (economically stronger) than with *AEM*. Therefore, our hypothesis is as follows:

H2a *REM leads to a more pronounced effect on the ACOMP of CEOs than AEM.*

CEOs in different firms may employ different levels of *REM* and *AEM* to achieve their earnings targets (Cohen et al. 2008; Zang 2012). Considering the difference between *AEM* and *REM,* previous literature argues that executives often have a trade-off between *AEM* and *REM* based on their associated costs and benefits (Ewert and Wagenhofer 2005; Cohen et al. 2008; Cohen and Zarowin 2010). Although *AEM* is less damaging, considering *REM* is relatively more complex to monitor, some executives may switch to *REM* to avoid easily detectable manipulation and punishment (Cohen et al. 2008). Managers engage in fewer *AEM* and more *REM,* especially when firms have strong corporate governance mechanisms and are in highly concentrated markets (Diri et al. 2020). Therefore, even though executives realise *REM* has a more severe negative impact on the firms' long-term value (Cohen and Zarowin 2010; Kothari et al. 2016; Alodat et al. 2024), they may still use more *REM* to achieve desired levels of earnings (Zang 2012). Also, *AEM* is less damaging and time-consuming since it only changes the firm's short-term financial performance measures rather than its business plan and operations (Edmans et al. 2017). Managers strategically adjust their earnings management practices in response to heightened external scrutiny (Chen et al. 2024). Therefore, some executives may rely more on *AEM*. Executives may choose to engage in different levels of *REM* and *AEM* to achieve their earnings objectives, considering the distinct characteristics of *EM* activities. Although using a combination of different levels of *REM* and *AEM* may be complex, executives should still receive reduced *ACOMP*, especially for those using more *REM*. Therefore, we expect the *ACOMP* of these CEOs, who use a combination strategy for manipulating earnings, to be negatively affected as well. Our hypothesis is the following:

H2b *CEOs using a combination of different EM strategies receive reduced ACOMP.*

Data, variables, and descriptive statistics

Our sample includes all listed U.S. firms with available data on CEOs' compensation from the ExecuComp database. We obtain accounting data from Compustat and stock returns data from CRSP. The sample period covers fiscal years from 1993 to 2021. Appendix A lists and explains all variables used in our empirical analysis, and Appendix B presents the sample selection process.

Measurement of *ACOMP*

As discussed in Sect. "Theoretical background", prior literature shows that CEOs' compensation can be explained by their ability, effort, and risk premium. The amount of pay that these determinants cannot explain is regarded as *ACOMP*. We estimate *ACOMP* by subtracting the expected compensation from the actual total compensation of each CEO. We follow prior research in developing a benchmark model to estimate expected and unexplained *ACOMP* (Core et al. 2008; Robinson et al. 2011; Alissa 2015). These are calculated by regressing total compensation on variables for the firm's performance and the CEO's ability (Guest et al. 2022). We measure *Total Compensation* as the sum of salary, bonus, the value of restricted stock grants, the value of options granted during the year, and other annual pay (Core et al. 2008). Following Core et al. (2008), we estimate the expected compensation of a CEO by regressing the CEO's total compensation on proxies for several economic determinants in a given year and industry, as follows:

$$\begin{aligned} Log\left(Total\ Compensation_{i,t}\right) &= \beta_0 + \beta_1 Log\left(Tenure_{i,t}\right) \\ &+ \beta_2\left(S\&P500_{i,t-1}\right) + \beta_3 Log\left(Sales_{i,t-1}\right) \\ &+ \beta_4\left(BM_{i,t-1}\right) + \beta_5\left(RET_{i,t}\right) + \beta_6\left(RET_{i,t-1}\right) \\ &+ \beta_7\left(ROA_{i,t}\right) + \beta_8\left(ROA_{i,t-1}\right) + u_{i,t} \end{aligned} \tag{1}$$

where *i* indexes firm and *t* indexes year. *Total Compensation* is described above, and the remaining variables are defined in Appendix A. The above OLS model includes fixed effects for years and 2-digit SIC codes of industries to which respective firms belong. We separate the total compensation of CEOs into two parts: the *Expected Compensation* estimated from Eq. (1) and the *ACOMP* (the residual obtained from the same equation). We compute the *ACOMP* as:

$$ACOMP_{i,t} = TotalCompensation_{i,t} - ExpectedCompensation_{i,t} \tag{2}$$

Measurement of *EM*

Following previous literature (Huang et al. 2017; Ferri et al. 2018), we use Collins et al. (2017) model to measure *AEM*, which mitigates the effect of firms' growth and nonlinearities in accruals as well as reduces Type I and II errors compared to the traditional methods of Dechow et al. (1995) and Kothari et al. (2005). Specifically, we estimate the following equation:

$$\frac{ACC_{i,t}}{Assets_{i,t-1}} = \beta_0 + \beta_1 \frac{ACC_{i,t-1}}{Assets_{i,t-1}} + \beta_2 \frac{(\Delta Sales - \Delta AR)_{i,t}}{Assets_{i,t-1}} + \sum_k \beta_{3,k} \frac{ROA_{Dumk,i,t}}{Assets_{i,t-1}} + \sum_k \beta_{4,k} \frac{SG_{Dumk,i,t-1}}{Assets_{i,t-1}} + \sum_k \beta_{5,k} \frac{MB_{Dumk,i,t-1}}{Assets_{i,t-1}} + u_{i,t}\# \tag{3}$$

where *ACC* is total accruals, calculated as the sum of the change in accounts receivable, inventories, accounts payable, taxes, and other items from the cash flow statement. *Assets* is the book value of total assets, $\Delta Sales$ denotes the changes in sales, ΔAR denotes the changes in account receivables, dummy variables $ROA_{Dumk,i,t}$, $SG_{Dumk,i,t-1}$, $MB_{Dumk,i,t-1}$ equals one if the variable belongs to the k_{th} quintile in the aggregate data, and 0 otherwise.[2] Similarly, *i* indexes firm and *t* indexes year. Equation (3) is adapted from Collins et al. (2017) because their model focuses on the quarterly setting, whereas we focus on the annual setting. Therefore, following prior studies (Huang et al. 2017; Banker et al. 2020; Breuer and Schütt 2023), we remove the quarterly dummies in the model that are used to further detect nonlinearities (or seasonality) when dealing with quarterly data. Using Eq. (3), discretionary accruals are calculated as the residual from the regression estimated for each 2-digit SIC-industry-year group. Each industry-year group has at least 20 observations, as is common in the earnings management literature (see Dechow et al. 1995; Collins et al. 2017), otherwise discarded. Since CEOs may use either income-increasing or income-decreasing discretionary accruals to engage in *EM*, we use the absolute value of calculated discretionary accruals to proxy *AEM*. We also use the modified Jones model (Dechow et al. 1995) (*AEMMJ*) as an alternative measure to estimate our main baseline model. Appendix A presents the detailed variable construction.

For *REM*, we follow previous literature (Cohen and Zarowin 2010; Kothari et al. 2016; Garel et al. 2021) that uses the model proposed by Roychowdhury (2006). Specifically, we use *Abnormal production costs*, *Abnormal discretionary expenses*, and *Abnormal operating cash flows* to measure *REM*. We estimate *Abnormal production costs* as follows:

$$\frac{PROD_{i,t}}{Assets_{i,t-1}} = \beta_0 + \beta_1 \frac{1}{Assets_{i,t-1}} + \beta_2 \frac{\Delta Sales_{i,t}}{Assets_{i,t-1}} + \beta_3 \frac{\Delta Sales_{i,t-1}}{Assets_{i,t-1}} + u_{i,t} \tag{4}$$

where *PROD* is the sum of the cost of goods sold and the change in inventory over a year. Equation (4) is regressed for each 2-digit SIC code industry-year group with at least 20 observations in each group.[3] We estimate *Abnormal production costs* using the regression residuals; higher values suggest higher *REM*. Then we estimate *Abnormal discretionary expenses* using the following equation:

$$\frac{DISX_{i,t}}{Assets_{i,t-1}} = \beta_0 + \beta_1 \frac{1}{Assets_{i,t-1}} + \beta_2 \frac{Sales_{i,t}}{Assets_{i,t-1}} + u_{i,t} \tag{5}$$

where *DISX* is the sum of R&D, advertising, and selling, general and administrative (SG&A) expenses. We replace missing values of R&D and advertising expenses with zero, as long as there is a valid value of SG&A (Roychowdhury 2006). Similarly, *Abnormal discretionary expenses* are defined as the residuals from the regressions for each industry-year group. Lower values of abnormal discretionary expenses suggest more *REM* since CEOs may cut the expenses on R&D, advertising, and SG&A to increase profits. Finally, we estimate *Abnormal operating cash flow* using the following equation:

$$\frac{CFO_{i,t}}{Assets_{i,t-1}} = \beta_0 + \beta_1 \frac{1}{Assets_{i,t-1}} + \beta_2 \frac{Sales_{i,t}}{Assets_{i,t-1}} + \beta_3 \frac{\Delta Sales_{i,t}}{Assets_{i,t-1}} + u_{i,t} \tag{6}$$

where *CFO* is the firm's operating cash flow. *Abnormal operating cash flow* is defined as the residual from Eq. (6) obtained from the regressions for each industry-year group. A lower value of *Abnormal operating cash flow* indicates higher *EM* since executives may provide temporary price discounts or relatively lenient credit terms to boost sales. Following Zang (2012), we use the sum of *Abnormal production costs*, *Abnormal discretionary expenses* times minus one, and *Abnormal operating cash flow* times minus one, to measure *REM*:

$$\begin{aligned} Real\ Earnings\ Management = {} & Abnormal\ production\ costs \\ & + Abnormal\ discretionary\ expenses \times (-1) \\ & + Abnormal\ operating\ cash\ flow \times (-1) \end{aligned} \tag{7}$$

As robustness, we also estimate two additional metrics (*SUREM* and *SAREM*) following Srivastava (2019). Appendix A provides detailed definition of these variables.

Control variables

Besides the variables of primary interest discussed above, our multivariate regression models include several firm-level control variables. Consistent with prior studies (Chaney et al. 2011; Zang 2012; Dah and Frye 2017), we select firm-level control variables including *Leverage (LVG)*, *SIZE, R&D expenditure (RDEXP)*, *advertising expense (ADEXP)*, *Total_Q (TQ)*, and *Volatility* (*VOL*). *LVG* is defined as the

[2] Following Collins et al. (2017), we rank the data into quintiles, and assign the value 1 or 0 for each quintile in a given year in the data.

[3] We follow the standard procedure in the *EM* literature that 20 observations are required to estimate industry-year regressions (e.g., Dechow et al. 1995; Collins et al. 2017).

Table 1 Summary statistics

Variables	Mean	Standard Deviation	Min	Median	Max	Observation
	(1)	(2)	(3)	(4)	(5)	(6)
ACOMP	0.004	0.580	−1.832	0.000	1.575	27,378
REM	−0.017	0.363	−1.190	−0.007	0.994	27,378
AEM	0.036	0.037	0.000	0.024	0.171	27,378
LVG	0.225	0.193	0.000	0.206	0.951	27,378
SIZE	7.241	1.593	3.350	7.129	11.433	27,378
RDEXP	0.039	0.065	0.000	0.008	0.368	27,378
ADEXP	0.013	0.031	0.000	0.000	0.183	27,378
TQ	1.540	2.196	−0.335	0.899	16.753	27,378
VOL	0.434	0.224	0.088	0.382	1.280	27,378

This table reports summary statistics for all variables used in the multivariate analysis. All variables are winsorized at their 1st and 99th percentiles. The sample is based on the annual data of U.S. firms from 1993 to 2021.

Table 2 Correlation matrix

Variables		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ACOMP	(1)	1.000								
REM	(2)	−0.088	−0.088							
AEM	(3)	−0.032	−0.032	−0.032						
LVG	(4)	0.030	0.030	0.030	0.030					
SIZE	(5)	0.085	0.085	0.085	0.085	0.085				
RDEXP	(6)	0.055	0.055	0.055	0.055	0.055	0.055			
ADEXP	(7)	−0.016	−0.016	−0.016	−0.016	−0.016	−0.016	−0.016		
TQ	(8)	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	
VOL	(9)	−0.004	−0.004	−0.004	−0.004	−0.004	−0.004	−0.004	−0.004	−0.004

This table reports the correlation matrix for all variables used in the multivariate analysis. All variables are winsorized at their 1st and 99th percentiles. The sample is based on the annual data of U.S. firms from 1993 to 2021 comprising 27,378 observations.

ratio of total debt to total assets, *SIZE* is firm size defined as the natural logarithm of a firm's total assets, *RDEXP* and *ADEXP* are scaled by total assets, *TQ* is calculated following Peters and Taylor (2017), and *VOL* is calculated as the standard deviation of the daily stock price over one year. We also include industry (2-digit SIC codes) and year dummies to control for the industrial sector and time-specific fixed effects.

Descriptive statistics

To eliminate the effect of outliers, we winsorize all continuous control variables, *ACOMP*, *REM, and AEM,* at their 1st and 99th percentile values. We present the descriptive statistics of all main variables, *ACOMP*, *REM*, and *AEM*, in Table 1. We report the mean, median, standard deviation, minimum value, and maximum value of all variables. The descriptive measures of all variables are as expected, with no extreme values or unexpected variations, as they have been winsorized. Descriptive statistics of the remaining control variables are also comparable to the previous literature (Core et al. 2008; Bugeja et al. 2016; Dah and Frye 2017), with some differences in a reasonable range due to the variations in samples.

Further, the correlation between those variables and all main variables of interest shows low or moderate correlation with each other, as reported in Table 2. An initial inspection of the correlation between *ACOMP* and *EM* shows a negative correlation; specifically, the correlation between *ACOMP* and *REM* is about −0.088, and a relatively smaller negative correlation of about −0.032 between *ACOMP* and *AEM*. Hence, there is some initial evidence to support our hypothesis that there is a negative relation between *ACOMP* and *EM*. Other control variables also exhibit a reasonable correlation with *ACOMP*, thus indicating their effectiveness as control variables. The correlation among all independent variables is either low or very low. Thus, we do not expect our results to be affected by multicollinearity.

Empirical results and discussions

Empirical model

The main objective of our empirical analysis is to investigate the effect of *EM* activities on CEOs' *ACOMP*. To examine this relation, we construct our baseline regression model as follows:

$$\begin{aligned} ACOMP_{i,t} = \beta_0 \ + \ \beta_1 \ Earnings\ Management_{i,t-1} \\ +\beta_2 \ LVG_{i,t-1} \ + \ \beta_3 \ SIZE_{i,t-1} + \ \beta_4 \ RDEXP_{i,t-1} \\ + \ \beta_5 \ ADEXP_{i,t-1} + \ \beta_6 \ TQ_{i,t-1} + \ \beta_7 VOL_{i,t} \\ + \ Year_t + \ Industry_j + \ u_{i,t} \end{aligned} \quad (8)$$

where i indexes firm, t indexes year, and j indexes the industry group classified by 2-digit SIC code. $EarningsManagement$ is either *AEM,* following Collins et al. (2017), or *REM*, as per Roychowdhury (2006). $Year_t$ indicates year-fixed effects, and $Industry_j$ indicates industry fixed effects based on 2-digit SIC codes. See Appendix A for definitions of all variables. Regression models are estimated using pooled cross-section ordinary least squares regressions with standard errors clustered at the firm level. Further, all dependent variables are lagged by one financial year (except *VOL*) in Eq. (8) because the current year's firm performance shapes the next year's compensation of executives. In addition, to test whether *REM* is more detrimental to CEOs' *ACOMP* than *AEM*, we use logit and multinomial logit regression techniques to establish empirical validation.

Table 3 Multivariate regressions of abnormal compensation

Variables	ACOMP			
	OLS		Entropy balanced OLS	
	(1)	(2)	(3)	(4)
REM	**−0.156*****		**−0.084*****	
	(−7.378)		(−6.636)	
AEM		**−0.532*****		**−0.020****
		(−3.683)		(−2.130)
LVG	0.114***	0.101**	0.101**	0.097*
	(2.709)	(2.368)	(2.212)	(1.955)
SIZE	0.041***	0.036***	0.042***	0.037***
	(5.405)	(4.825)	(6.835)	(3.489)
RDEXP	0.579***	0.943***	0.682***	0.878***
	(3.645)	(6.086)	(4.151)	(5.111)
ADEXP	−0.913***	−0.398	−0.427	−0.613*
	(−2.995)	(−1.305)	(−1.211)	(−1.763)
TQ	0.003	0.011**	0.003	0.008
	(0.668)	(2.332)	(0.697)	(1.326)
VOL	0.054	0.033	0.036	0.030
	(1.575)	(0.976)	(1.077)	(0.753)
Constant	−0.350***	−0.319***	−0.316***	−0.326***
	(−5.670)	(−5.057)	(−6.040)	(−3.879)
Industry-FE	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes
Observations	27,378	27,378	26,359	26,292
Adjusted R^2	0.021	0.016	0.019	0.012

This table reports multivariate regression results employing abnormal compensation (*ACOMP*) as the dependent variable and the variables of interest, real earnings management (*REM*), and accrual-based earnings management (*AEM*). Columns (1) and (2) show the results of our baseline model using OLS regression according to Eq. (8). Columns (3) and (4) display the entropy-balanced regression results. Control variables include Leverage (*LVG*), Firm size (*SIZE*), R&D expenditure (*RDEXP*), Advertising expenditure (*ADEXP*), Total Q (*TQ*), and Volatility (*VOL*). All variables are winsorized at their 1st and 99th percentiles. The sample is based on annual data of U.S. firms from 1993 to 2021. ***, **, * indicate significance at the 1, 5, and 10% levels, respectively.

The effect of *EM* on *ACOMP* (test of H1)

We start by examining the relation between *EM* and *ACOMP*. We rely on the coefficient β_1 from Eq. (8) to test H1. Table 3 presents these results. In Columns (1) and (2), we report the effect of *REM* and *AEM* on *ACOMP*, respectively.

Table 3, Column 1 shows that the estimated coefficient of *REM* is negative and significant at the 1% level, suggesting that CEOs receive less *ACOMP* when they engage in *REM*. Also, the effect of *REM* on *ACOMP* is economically significant. We measure the economic significance of a variable by multiplying its standard deviation with its regression coefficient.[4] The estimated coefficient in Column (2) implies that a one-standard-deviation increase in *REM* reduces CEOs' *ACOMP* by 5.66% (−0.156 × 0.363).

Likewise, the coefficient of *AEM* is negative and significant at the 1% level (see Column (2)). When there is one standard deviation increase in *AEM*, the expected decrease in *ACOMP* is 1.97% (−0.532 × 0.037). Thus, the empirical results support the hypothesis that *EM* leads to reduced *ACOMP* as predicted by the agency theory.

In addition, compared to the economic significance of *REM*, the value of *AEM* is significantly lower. Such results suggest that *REM* may have more severe consequences for a firm's long-term value than *AEM* since it involves negative business operations, leading to an unexpected decline in further profitability and valuation (Cohen and Zarowin 2010; Kothari et al. 2016). The results are consistent with prior literature that *REM* changes the firms' operating and investment plans (Edmans et al. 2017) and inhibits firms' long-term value (Achleitner et al. 2014). Therefore, severe *REM* activities are penalised by a greater amount of declines in *ACOMP*. Consistent with our expectations, the coefficients of control variables show expected signs. *LVG*, *SIZE*, and *RDEXP* are positively related to *ACOMP*; in contrast, a firm's *ADEXP* decreases with the level of *ACOMP*.

Furthermore, to ensure that our results are not confounded by possible sample selection bias, we conduct entropy-balanced regression analysis to adjust for inequalities in the sample distributions of firms doing a high level (above the median) of *EM* with firms doing a low level (below the median) of *EM*. We separate our sample based on the median *EM* level in a given year and industry. The

[4] If a regressor X is normally distributed, replacing x with its standardized counterpart [x-mean(x)]/std(x) in the regression results in a new coefficient estimate that equals the original estimated x multiplied by its standard deviation, without changing its statistical significance. Based on this, it is common to measure economic significance of a variable in terms of a one standard deviation change in that variable, i.e. coefficient(x) × std(x) (Douglas et al. 2016).

entropy balancing procedure accurately matches the three moments (mean, variance and skewness) between firms in control and treatment groups. Entropy balancing reduces model dependence for the estimation of treatment effects, here specifically, the level of *EM*. Compared to other adjustment techniques, for example, propensity score matching or pair matching, entropy balancing directly focuses on covariates balance. In practice, propensity score matching suffers from the drawback that the true propensity score is usually unknown and difficult to estimate accurately to produce the expected covariate balance (Smith and Todd 2001). Some of the balance metrics leave several covariates imbalanced or even decrease the balance in a few instances. Entropy balancing improves the metrics and matches exactly the specific moments (Hainmueller 2012). Recent studies also implement entropy balancing in empirical investigations to reduce the coefficient bias (e.g., McMullin and Schonberger 2020). Based on the superior performance of entropy balancing, we choose this reweighting method to avoid any sample selection bias.

Specifically, we classify *EM* as over-manipulation if the extent of *EM* exceeds the median level in any given industry and year. With the over-manipulation as treatment, we reweight the control group with respect to the first, second, and third moments of covariates distributions (Hainmueller 2012). That is, each observation in the control group receives a weight such that the mean, variance, and skewness of the distribution for each matched variable in the control group are similar to its counterpart in the treatment group. Appendix C presents the three moments of treatment and control samples before and after entropy balancing. Specifically, we match firms on *LVG*, *SIZE, RDEXP*, *ADEXP*, *TQ*, and *VOL*. After the reweighting, the treatment and control groups show almost identical distributions for the matching variables.

Columns (3) and (4) of Table 3 present the regression results with the weights from the entropy balancing procedure. We find qualitatively similar results, as both *REM* and *AEM* still have a negative and significant impact on *ACOMP*, indicating that our results retain their interpretation after entropy balancing.

Mitigating endogeneity concern

Omitted variables, measurement errors, and reverse causality are the common sources of endogeneity in the empirical accounting and finance literature. We conduct three different tests to address any potential endogeneity issues as follows:

OLS with firm-fixed effects First, we include firm-fixed effects to account for endogeneity arising from potentially omitted firm-specific time-invariant variables. Columns (1) and (2) of Table 4 present the regression results using Eq. (8) with firm-fixed effects. The estimated coefficient of *REM* is negative (−0.043) and significant at the 5% level. Similarly, the estimated coefficient of *AEM* also remains negative (−0.197) and significant at the 5% level. This confirms that our main results are robust to endogeneity concerns related to firm-specific time-invariant omitted variables.

DiD (difference-in-differences) regression Second, we conduct a difference-in-differences (DiD) analysis by using the Sarbanes–Oxley Act (SOX) of 2002 as an exogenous shock on *EM* activities. Prior literature (Cohen et al. 2008) has documented a significant change in *EM* activities due to the passage of SOX. *REM*, which is not only relatively harder to detect (Graham et al. 2005) but also more costly to the firm, has increased significantly after the passage of SOX, and *AEM* became less used as an *EM* strategy than *REM*. To estimate the impact of *EM*, we consider the 3 years before and after SOX, following a DiD analysis:

$$\begin{aligned} ACOMP_{i,t} = \beta_0 \ + \ \beta_1 PSOX_{i,t} \ + \beta_2 \ TREM/TAEM_{i,t} \\ + \ \beta_3 PSOX_{i,t} \ \times TREM/TAEM_{i,t} + \ \beta_4 Controls \\ + Year_t + \ Industry_j + \ u_{i,t} \end{aligned} \tag{9}$$

In Eq. (9), $PSOX_{i,t}$ is an indicator variable that equals one for the years 2002, 2003 and 2004 indicating the post-SOX period, and zero for the years 1999, 2000 and 2001. We created the treatment group by identifying the firms which were engaging in high *REM*/*AEM* before the passage of SOX. Thus, we consider the year 2000 to create the treatment group because firms could have anticipated the enactment of SOX in 2001, which represents a clear period before SOX. We define $TREM_{i,t}$ as the treatment group variable that equals one if the firm was engaging in high *REM*/*AEM* (top 1/3rd percentile subsample in a given industry and year) in 2000, and zero if the firm was engaging in low *REM*/*AEM* (bottom 1/3rd percentile subsample in a given industry and year) in 2000. For this analysis, we do not consider the other intermediary subgroups (e.g., the middle 1/3rd subsample in a given industry and year). Columns (3) and (4) of Table 4 present the results. The interaction term *PSOX*× *TREM* is negative (−0.077) and significant at the 5% level, suggesting that an increase in *REM* has a negative effect on *ACOMP*. We find that the coefficient of the interaction term *PSOX*× *TAEM* is not significant, indicating that SOX either did not have any material impact on the relation between *AEM* and *ACOMP*, or executives shifted from *AEM* to *REM*.

One should note that DiD regression is a statistical technique commonly used in observational studies to estimate

Table 4 Multivariate regressions of abnormal compensation – addressing endogeneity

Variables	ACOMP							
	Firm fixed effect		SOX DID		Instrument			
					First Stage		2SLS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
REM	**−0.043****						**−0.215*****	
	(−2.155)						(−7.267)	
AEM		**−0.197****						**−1.869****
		(−1.966)						(−2.472)
L2REM					0.735***			
					(76.060)			
L2AEM						0.205***		
						(19.300)		
PSOX			0.119	0.102				
			(1.493)	(1.123)				
TREM			−0.032					
			(−0.706)					
TAEM				−0.005				
				(−0.098)				
PSOX × TREM			**−0.077****					
			(−1.966)					
PSOX × TAEM				**0.073**				
				(1.641)				
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap rk Wald F statistic							5785.571***	372.663***
Kleibergen-Paap rk LM statistic							395.222***	213.095***
Observations	27,234	27,234	3,789	3,692	24,729	24,729	27,234	27,234
Adj/Centered R^2	0.339	0.339	0.022	0.014	–	–	0.025	0.014

This table reports the results of robustness checks employing abnormal compensation (*ACOMP*) as the dependent variable and the variables of interest, real earnings management (*REM)* and accrual-based earnings management (*AEM*). Columns (1) and (2) show the results of including firm fixed effect. Columns (3) and (4) show the difference-in-differences analysis. Columns (5) to (8) show the results employing 2-years lagged earnings management as instrument variables. The underidentification test (Kleibergen-Paap rk LM statistic) and the weak identification test (Kleibergen-Paap rk Wald F statistic) are reported. Control variables include Leverage (*LVG*), Firm size (*SIZE*), R&D expenditure (*RDEXP*), Advertising expenditure (*ADEXP*), Total Q (*TQ*), and Volatility (*VOL*). All variables are winsorized at the 1st and 99th percentiles. The sample is based on annual data of U.S. firms from 1993 to 2021. ***, **, * indicate significance at the 1, 5, and 10% levels, respectively.

the causal effect of a treatment, policy, or exogenous intervention by comparing the changes in outcomes over time between a treatment group and a control group. While DiD is a powerful method, it may not completely control for endogeneity on its own. Similar to the pooled cross-sectional OLS with firm-fixed effects, DiD attempts to control for only time-invariant unobserved factors that may affect both the treatment and control groups by differencing them, but it may not address time-varying unobserved factors or other sources of endogeneity.

Instrumental variables regression Third, we re-estimate our baseline model with 2-year lagged *REM* and *AEM* as instrument variables.[5] In the absence of a valid instrument, using lagged variables as instruments in a regression model can be a strategy to address endogeneity, especially when there is concern about contemporaneous correlation between the explanatory variable and the error term. This approach falls under the broader category of Instrumental Variables (IV) estimation. The basic idea is to use lagged values of the explanatory variable as instruments under the assumption that they are uncorrelated with the current error term but are correlated with the current value of the explanatory variable. This approach can help address endogeneity concerns arising from omitted variables, reverse causality or measurement errors. Prior literature reports that dynamic models with the inclusion of a lagged variable partially resolve the endogeneity problem (Chang and Zhang 2015; Hu 2021; Kim et al. 2016). Thus, we employ this method in our setting as an additional test of endogeneity. In Table 4, while columns (5) and (6) report the first-stage IV regres-

[5] We incorporate a lag of 2 years, as the main results use 1-year lag of *AEM* and *REM*. We avoid extending the lag beyond two years to maintain the relevance of the variables.

sion results, columns (7) and (8) report the second-stage regression results. We find that the coefficients of *REM* and *AEM* remain negative and significant. This further supports that our findings are robust to endogeneity concerns.

In general, we find credible evidence supporting the robustness of our primary findings in the face of potential endogeneity issues.

Testing robustness to alternative definitions of *EM*

In this section, we re-estimate our results using alternative measures of *EM*. Srivastava (2019) argues that a firm's distinctive competitive strategy is an omitted factor in previous models. To address this issue, Srivastava proposes a set of corrective steps to improve the measure of *REM* initially proposed by Roychowdhury (2006); this measure is what we consider the cohort unadjusted *REM* (*SUREM*). Additionally, the response of firms to a new business environment shock may vary based on their respective life-cycle stages (Srivastava 2019), thus we also consider cohort-adjusted *REM* (*SAREM*).

SUREM is calculated by adding a set of additional control variables. Specifically, additional controls include market-to-book ratio, lagged return on assets (*ROA*), firm size (market value of equity), forward revenues (the ratio of forward year-end sales to last year-end total assets), and the firm's own past expenses (lagged value of *Abnormal production cost*, *Abnormal discretionary expenses*, and *Abnormal operating cash flow*, respectively). Additionally, cohort-adjusted *REM*, *SAREM*, is estimated by subtracting the average *SUREM* (of the same industry-age group of firms) from the *SUREM* of the given firm. See Appendix A for additional computational details. Columns (1) and (2) of Table 5 report the results. We find that the coefficients of *SUREM* and *SAREM* remain negative (−0.169 and −0.169, respectively) and significant at the 0.01 level.

Table 5 Multivariate regressions of abnormal compensation – alternative measures

Variables	ACOMP		
	(1)	(2)	(3)
SUREM	**−0.169*****		
	(−2.944)		
SAREM		**−0.169*****	
		(−2.945)	
AEMMJ			**−0.158*****
			(−4.041)
Controls	Yes	Yes	Yes
Constant	Yes	Yes	Yes
Industry-FE	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes
Observations	24,576	24,576	27,352
Adjusted R^2	0.013	0.013	0.014

This table reports multivariate regression results employing abnormal compensation (*ACOMP*) as the dependent variable and alternative measure of earnings management: Cohort unadjusted real earnings management following Srivastava (2019) (*SUREM*), cohort adjusted real earnings management (*SAREM*), and modified-jones accrual earnings management (*AEMMJ*). Control variables include Leverage (*LVG*), Firm size (*SIZE*), R&D expenditure (*RDEXP*), Advertising expenditure (*ADEXP*), Total Q (*TQ*), and Volatility (*VOL*). All variables are winsorized at their 1st and 99th percentiles. The sample is based on annual data of U.S. firms from 1993 to 2021. ***, **, * indicate significance at the 1, 5, and 10% levels, respectively.

Further, we consider the modified Jones model (Dechow et al. 1995) as an alternative way of calculating discretionary accruals. Detailed variable calculation of modified Jones *AEM* (*AEMMJ*) is provided in Appendix A. Column (3) of Table 5 presents the results. We find that the coefficient remains negative (−0.158) and significant at the 0.01 level.

Overall, we find credible evidence that our primary findings are robust to alternative metrics of *REM* and *AEM*.

Test of H2a and H2b

The effect of *EM* on *ACOMP* – multinomial logit regression (test of H2a)

To test the effect of *REM* and *AEM* on *ACOMP* further, we focus on the group of CEOs who are most active in *EM*. Specifically, we classify firms in our sample into four groups based on their relative position in the quartile distribution of *REM* or *AEM* in a given year and industry. CEOs in the top quartile *(Q1_REM* or *Q1_AEM)* firms are most likely to engage in *REM* or *AEM*, indicating they may have better control over firms compared to their peers. Similarly, we classify firms into four groups based on their relative position in the quartile distribution of *ACOMP* in a given year and industry (*Q1_ACOMP*, *Q2_ACOMP, Q3_ACOMP,* and *Q4_ACOMP,* respectively). CEOs of firms in the top quartile (*Q1_ACOMP*) are the ones with the highest *ACOMP*, and the rest are denoted in declining order (*Q2_ACOMP > Q3_ACOMP > Q4_ACOMP*). *Q4_ ACOMP* is set as the benchmark category. Equation (10) shows our model, where we rely on β_1 to test H2a:

$$\begin{aligned} Q1/Q2/Q3\_ACOMP_{i,t} &= \beta_0 + \beta_1\, Q1\_Earnings\ Management_{i,t-1} \\ &+ \beta_2\, LVG_{i,t-1} + \beta_3\, SIZE_{i,t-1} + \beta_4\, RDEXP_{i,t-1} + \beta_5\, ADEXP_{i,t-1} \\ &+ \beta_6\, TQ_{i,t-1} + \beta_7\, VOL_{i,t} + Year_t + Industry_j + u_{i,t} \end{aligned} \tag{10}$$

where *Q1_Earnings Management* equals *Q1_REM* or *Q1_AEM*.

Table 6 shows the results using the multinomial logit regression technique. It shows both *REM* and *AEM* remain negative and significant among different quartiles of *ACOMP*, as expected. Notably, we find that the magnitude of *Q1_REM* shows a decreasing trend; it has statistically significant coefficients of −0.532, −0.261, and

Table 6 Multinomial logit regression

Variables	ACOMP					
	Q1	Q2	Q3	Q1	Q2	Q3
	(1)	(2)	(3)	(4)	(5)	(6)
Q1_REM	**−0.178***** (−3.284)	**−0.261***** (−4.432)	**−0.532***** (−7.665)			
Q1_AEM				**−0.079*** (−1.790)	**−0.125***** (−2.792)	**−0.131***** (−2.804)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Industry-FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	27,378	27,378	27,378	27,378	27,378	27,378
Pseudo R^2	0.015	0.015	0.015	0.014	0.014	0.014

This table reports multivariate regression results employing the categorical variable *Q_ACOMP* as the dependent variable (from quarter one (Q1) to quarter three (Q3)) and the variables of interest, the dummy variable *Q1_REM* and *Q1_AEM,* which indicates the top quartile of *REM* and *AEM*, respectively. The regression results show the trend of *ACOMP* of the CEOs who engage in the highest level of earnings management in a given year and industry using multinomial logistic regression according to Eq. (10). Control variables include Leverage (*LVG*), Firm size (*SIZE*), R&D expenditure (*RDEXP*), Advertising expenditure (*ADEXP*), Total Q (*TQ*), and Volatility (*VOL*). All variables are winsorized at the 1st and 99th percentiles. The sample is based on annual data of U.S. firms from 1993 to 2021. ***, **, * indicate significance at the 1, 5, and 10% levels, respectively.

−0.178, respectively (see Columns (1) to (3)). The negative and decreasing magnitude of coefficients suggests that the CEOs who engage in more *REM* are more likely to witness a greater reduction in their *ACOMP*. The message is clear that, although CEOs receive high *ACOMP* using greater control over firms and high managerial entrenchment, they are penalised by a greater amount of reduced *ACOMP*. Compared to *REM*, *AEM* also has a decreasing magnitude of negative coefficients of −0.131, −0.125, and −0.079, significant at 0.01, 0.01, and 0.10 levels, respectively (see Columns (4) to (6)). It shows a decreasing trend similar to *REM*. Overall, we find that the magnitude of the coefficients in all quartiles is greater for *REM* than for *AEM*, which suggests higher levels of *REM* are associated with lower *ACOMP*.

The effect of *EM* on *ACOMP* – combination of *EM* STRATEGY (test of H2b)

As discussed in Sect. "Different EM strategies and ACOMP", executives are likely to use a combination of *AEM* and *REM* to manage their earnings. To capture their varying preferences, we generate two variables to estimate executives' use of both *EM* strategies (Braam et al. 2015; Cohen et al. 2008; Cohen and Zarowin 2010). The first dummy variable, *REM_H*, indicates a relatively higher use of *REM*, which equals one if the calculated *REM* of each firm-year observation is above the median of the industry-year, and zero otherwise. A firm having *REM_H* equalling one suggests that it uses a relatively higher level of *REM* than its industry peers, while zero suggests the opposite. The second dummy variable, *AEM_H*, indicates the use of *AEM*, which equals one if *AEM* for firm *i* in year *t* is above the median of industry-year, and zero otherwise. Similarly, a value of one indicates that the CEO tends to use a relatively higher level of *AEM* than its industry peers. Then, we classify our sample into four groups based on different levels of *EM* to reflect various combinations of *EM* strategies. Specifically, firms with both relatively high use of *REM* and *AEM* are assigned to the first group, $REM_H\_AEM_H$ (*REM_H* equals one and *AEM_H* equals one). Firms using relatively high *REM* and low *AEM* are assigned to the second group, $REM_H\_AEM_L$ (*REM_H* equals one and *AEM_H* equals zero). Firms using relatively low *REM* and simultaneously high *AEM* are assigned to the third group, $REM_L\_AEM_H$ (*REM_H* equals zero and *AEM_H* equals one). Finally, firms using both relatively low *REM* and *AEM* are assigned to the fourth group, $REM_L\_AEM_L$ (*REM_H* equals zero and *AEM_H* equals zero), which is also the benchmark category. These variables indicate the trade-off between alternative forms of *EM* strategies adopted by firms.

$$\begin{aligned} ACOMP_{i,t} = \beta_0 \ + \ \beta_1 Combined\ Earnings\ Management_{i,t-1} \\ +\beta_2\ LVG_{i,t-1}\ +\ \beta_3 SIZE_{i,t-1} +\ \beta_4\ RDEXP_{i,t-1} \\ +\ \beta_5 ADEXP_{i,t-1} +\ \beta_6 TQ_{i,t-1} +\ \beta_7 VOL_{i,t} \\ +\ Year_t +\ Industry_j +\ u_{i,t} \end{aligned} \tag{11}$$

where *Combined Earnings Management* includes $REM_H\_AEM_H$, $REM_H\_AEM_L$, and $REM_L\_AEM_H$ ($REM_L\_AEM_L$ is the baseline category).

Finally, to test H2b, which expects that a combination of *EM* strategy involving different levels of *AEM* and *REM* still has a negative effect on CEOs' *ACOMP*. Thus, we include the above categorical variable involving varying combinations of *REM* and *AEM* into the regression model. Table 7 reports the results where $REM_L\_AEM_L$ is absorbed by the constant, therefore serving as the reference category. We find that the two most detrimental combinations, $REM_H\_AEM_H$ and $REM_H\_AEM_L$, show statistically significant negative coefficients of −0.102 and −0.082 at the 0.01 level, respectively. Such results suggest that even though firms use different combinations of *REM* and *AEM* strategies, CEOs are still likely to receive reduced *ACOMP*. In addition, the magnitude of $REM_H\_AEM_H$ is higher than that of $REM_H\_AEM_L$, indicating that CEOs are penalised more than their peers due to the use of the highest level of *EM***.** We also find that $REM_L\_AEM_H$ shows an insignificant effect, indicating that there may not be a significant difference in the amount of reduced *ACOMP* for CEOs using low *REM* and high or low *AEM*. Such results are consistent with our expectation that firms' monetary incentives in contracts align managers' and shareholders' interests effectively, even though CEOs employ different combinations of *EM* strategies. In addition, it confirms that CEOs are more likely to be penalised for using *REM* due to its more damaging consequences to a firm's value. Therefore, firms may still use the incentives effectively to encourage CEOs to follow shareholders' interests (Gayle et al. 2016). The remaining control variables retain their expected sign and explanatory power.

Overall, our main results are consistent with the hypothesis that CEOs' *ACOMP* is affected adversely by *EM*. If CEOs make value-maximising managerial decisions, their compensation levels are expected to increase as well due to the interest alignment effect. This is in line with agency theory, showing that a firm's monetary incentives align managers' interests with the firm's interests. Also, *REM* is more likely to result in negative *ACOMP* due to its potential to cause severe damage to a firm's value. And even though CEOs use different combinations of *EM* strategies, they are still penalised by reduced *ACOMP*. Our results remain robust to endogeneity and correction for sample selection bias.

Table 7 Multivariate regressions of abnormal compensation – combination of EM strategies

Variables	ACOMP
	(1)
$REM_H\_AEM_H$	**−0.102*****
	(−6.949)
$REM_H\_AEM_L$	**−0.082*****
	(−5.702)
$REM_L\_AEM_H$	**−0.014**
	(−1.347)
Controls	Yes
Constant	Yes
Industry-FE	Yes
Year-FE	Yes
Observations	27,378
Adjusted R^2	0.016

This table reports multivariate regression employing abnormal compensation (*ACOMP*) as the dependent variable and different combinations of *EM* strategies, including high *REM* and high *AEM* ($REM_H\_AEM_H$), high *REM* and low *AEM* ($REM_H\_AEM_L$), low *REM* and high *AEM* ($REM_L\_AEM_H$), and low *REM* and low *AEM* ($REM_L\_AEM_L$), as independent variables. We set $REM_L\_AEM_L$ as the base group. The regression results follow Eq. (11). Control variables include Leverage (*LVG*), Firm size (*SIZE*), R&D expenditure (*RDEXP*), Advertising expenditure (*ADEXP*), Total Q (*TQ*), and Volatility (*VOL*). All variables are winsorized at the 1st and 99th percentiles. The sample is based on annual data of U.S. firms from 1993 to 2021. ***, **, * indicate significance at the 1, 5, and 10% levels, respectively.

Additional tests

Correction when using regression residuals as dependent variables

Previous literature has addressed potential empirical concerns associated with employing regression residuals derived from an OLS regression as the dependent variable in the second stage (Chen et al. 2018). Considering our dependent variable *ACOMP* is calculated as the residual components using OLS regression, we follow the correction procedure in Chen et al. (2018) by including the regressors used to derive *ACOMP* in our baseline model to reduce the potential Type I and Type II errors. We check the correlation among those variables first and find that the correlation of all variables is low and moderate. We re-estimate our models and find qualitatively unchanged results, as both *REM* and *AEM* remain negatively significant in explaining *ACOMP*.

Corporate governance mechanisms, *EM*, and *ACOMP* of CEOs

In this section, we focus on the potential metrics that drive the negative association between *EM* and *ACOMP*. Prior literature shows empirically that the degree of a CEO's opportunistic behaviour is likely to be mitigated by a strong governance structure (Gompers et al. 2003; Wahid 2018; Diri et al. 2020; Natto and Mokoaleli-Mokoteli 2025). Earnings management is sensitive to external monitoring pressures and enforcement environments like judicial independence (Jiang and Jia 2024). Governance mechanisms have the potential to prevent unintended consequences linked to incentive compensation, such as rewarding CEOs for luck (Bertrand and Mullainathan 2001; Johnson et al. 2009). Therefore, the negative relation between *EM* and *ACOMP* could be primarily driven by firms with strong corporate governance.

Prior literature suggests various proxies for the firm's internal and external corporate governance mechanisms. To test the robustness of our findings, we conduct a subsample analysis by categorising our sample into high and low-governance groups according to the industry-year median of respective governance variables. Specifically, we have explored the indicators of internal board monitoring, including board size (Diri et al. 2020), board independence (Ryan and Wiggins 2004), frequency of meetings (Adams et al. 2021; Brick and Chidambaran 2010), director tenure (Kim et al. 2014), director qualification (Diri et al. 2020), gender diversity (Garel et al. 2021), board co-option (Coles et al. 2014), and CEO duality (Johnson et al. 2009). In untabulated results, we find that broadly, there are no significant differences in the association between *EM* and *ACOMP* across respective subsamples of high and low-governance firms. The negative effect of *EM* on *ACOMP* persists in both subsamples across various board characteristics.

We also conduct the subsample analysis using the indicator of external corporate governance mechanisms, such as the takeover index (Cain et al. 2017), analyst coverage (Garel et al. 2021), institutional investor ownership (Elyasiani et al. 2017), and corporate governance score from Refinitiv and MSCI (KLD) databases. Similarly, in untabulated results, we find that the negative association between *EM* and *ACOMP* persists in both high and low-governance firms. The lack of differences in the high-low subsamples indicates that corporate governance mechanisms do not generate differences in the negative effect of *EM* on *ACOMP*.

To further deal with the concern of omitted variable bias, we also incorporate the variables related to corporate governance mechanisms as additional control variables in our baseline regression.[6] We find that the negative relation between *EM* and *ACOMP* remains significant after controlling for these corporate governance mechanisms. Thus, our results indicate that the negative and significant effect of *EM* on *ACOMP* is robust to firms' corporate governance mechanisms.

The moderating role of financial stress

Firms facing financial stress or constraints are more likely to perform differently than healthy ones. Financially stressed firms are subject to greater scrutiny by creditors and analysts, who may monitor their *EM* activities more effectively (Brown and Hugon 2009). However, prior literature also documents that managers in financially stressed firms are more likely to manage their earnings since they may face career and reputation concerns (Habib et al. 2013). To conceal their distress, firms may employ income-increasing *EM* (Rosner 2003). Chen et al. (2010) also show managers are likely to use income-increasing *AEM* while facing delisting threats. In addition, due to the high scrutiny around financial stress, executives may engage in more *EM* before covenant violation (Franz et al. 2014). Furthermore, *AEM* could go both ways (positive or negative). Charitou et al. (2007) show that executives may shift earnings downwards in firms with financial stress.

To test the moderating role of financial stress, we use two proxies for financial stress (*FS*), the *KZ* index (Farre-Mensa and Ljungqvist 2016; Kothari et al. 2016; Lamont et al. 2001) and the *WW* index (Whited and Wu 2006). Detailed definitions are provided in Appendix A. A higher index value indicates a firm is more financially constrained. Therefore, we classify firms into two groups based on the *KZ* (*WW*) index in a given year and industry. A dummy variable *FSKZ* (*FSWW*) equals one if a firm is in the top quartile, indicating its financial stress condition, and zero otherwise.

In untabulated results, we find negative and significant coefficients of the interaction terms *AEM* × *FSKZ* and *AEM* × *FSWW*, indicating that executives in firms with financial stress who engage in *AEM* receive lower *ACOMP*. As discussed above, executives in financially distressed firms are more likely to face additional scrutiny from creditors and outsiders; to avoid losing their reputation and increased pressure, CEOs may choose to manage firms' earnings, especially *AEM,* to satisfy the creditors and analysts. We do not find significant results of the interaction terms of *REM*. The insignificant coefficients suggest that there is no significant difference in the degree of *REM* for financially stressed firms. The plausible explanation is that CEOs are more likely to overstate earnings or strategically time a firm's information releases to manipulate the firm's performance through *AEM* than *REM*, as *AEM* is timelier (Edmans et al. 2017). Thus, managers are more likely to engage in *AEM* to avoid immediate unsatisfactory financial reporting in times of financial stress. Additionally, these firms might not have enough time or room to engage in *REM* under financial stress.

The moderating role of firm-level political risk

Finally, we investigate whether firm-level political risk moderates the relation between *EM* and *ACOMP*. Political risk is considered one of the major risk factors faced by managers. Prior literature suggests that high political risk is likely to affect firms' investments (Jens 2017) and equity issuance (Çolak et al. 2017) negatively, and increase stock price volatility (Pástor and Veronesi 2012), which increases earnings volatility. On the one hand, executives may engage in *EM* to mitigate the increased risk (Gupta et al. 2021). Additionally, firms facing high political risk are more likely to be under greater scrutiny of outsiders (Gupta et al. 2021),

[6] Results are available upon the request.

which increases the costs of manipulation activities, leading to less *EM*.

Considering the effect of political risk on *EM,* we re-estimate our baseline model with the interaction of *EM* with the firm-level political risk measure proposed by Hassan et al. (2019). Firm-level political risk is calculated following Hassan et al. (2019) and Gupta et al. (2021). We include a dummy variable, *FLPR*, which indicates a relatively higher firm-level political risk, equalling one if the firm-level political risk is above the median of industry-year, and zero otherwise. We find that the coefficient of *REM*×*FLPR* is insignificant, and the coefficient of *AEM*×*FLPR* is positively significant. Suggesting that, faced with higher political risk, CEOs engage in higher *AEM* to boost their *ACOMP.*

Conclusion

In this study, we investigate whether CEOs are penalised for engaging in earnings management activities. We find a negative relation between *EM* and *ACOMP*, and find the negative effect is more pronounced between *REM* and *ACOMP* due to its higher potential to cause damage to a firm's long-term value. Our results suggest that CEOs involved in *EM* are penalised by reduced excess compensation. We also find that the negative relation between *EM* and *ACOMP* prevails regardless of the internal and external corporate governance differences. Furthermore, we find that the effect of *AEM* on *ACOMP* is exacerbated in firms facing financial stress. Such results suggest that although CEOs engaging in *EM* are penalised by reduced *ACOMP*, financially stressed firms should mitigate and detect *AEM* activities further to avoid firms' value destruction. However, we find that the effect of *AEM* on *ACOMP* is positively moderated by firm-level political risk. This is the first study to provide comprehensive evidence of the association between *EM* and CEOs' *ACOMP*.

Our findings provide potential implications for different stakeholders. Our evidence generally supports the compensation-based monitoring mechanisms in U.S. firms, as CEOs engaging in *REM* or *AEM* receive lower *ACOMP*. However, CEOs in high-political risk firms who engage in *AEM* receive higher *ACOMP*. Illustrating, therefore, that the monitoring mechanisms of these firms may not be detecting this behaviour. Thus, we alert analysts and stakeholders of such firms. Overall, we expect our results to shed some light on shaping future regulations on executives' pay structure.

Appendix A: Variable description

Appendix B: Sample selection procedure

Appendix C: Summary statistics before and after entropy balanced matching

This table reports the summary statistics before and after entropy-balanced matching. Control variables include Leverage (*LVG*), Firm size (*SIZE*), R&D expenditure (*RDEXP*), Advertising expenditure (*ADEXP*), Total Q (*TQ*), and Volatility (*VOL*). All variables are winsorised at their 1st and 99th percentile values. The sample is based on annual data of U.S. firms from 1993 to 2021.

Declarations

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

References

Achleitner, A.-K., N. Günther, C. Kaserer, and G. Siciliano. 2014. Real earnings management and accrual-based earnings management in family firms. *The European Accounting Review* 23 (3): 431–461.

Adams, R. B., V. Ragunathan, and R. Tumarkin. 2021. Death by committee? An analysis of corporate board (sub-) committees. *Journal of Financial Economics* 141 (3): 1119–1146.

Adut, D., A. D. Holder, and A. Robin. 2013. Predictive versus opportunistic earnings management, executive compensation, and firm performance. *Journal of Accounting and Public Policy* 32 (3): 126–146.

Aktas, N., P. C. Andreou, I. Karasamani, and D. Philip. 2019. CEO duality, agency costs, and internal capital allocation efficiency. *British Journal of Management* 30 (2): 473–493.

Alissa, W. 2015. Boards' response to shareholders' dissatisfaction: The case of shareholders' say on pay in the UK. *European Accounting Review* 24 (4): 727–752.

Alodat, A. Y., H. Al Amosh, O. Alorayni, and S. F. Khatib. 2024. Does corporate sustainability disclosure mitigate earnings management: Empirical evidence from Jordan. *International Journal of Disclosure and Governance* 21 (1): 165–174.

Variable	Description
Total compensation	The sum of salary, bonus, long-term incentive plan payouts, value of restricted stock grants, proceeds from options exercised during the year, and any other annual pay
Log (Tenure)	The logarithm of the CEO's tenure (in years)
S&P500	Indicator variable equal to one for firms in the S&P500 index at the end of this fiscal year, and zero otherwise
Log (Sale)	Logarithm of the firm's sales
BM	Book-to-market ratio measured at the end of fiscal year
RET	Firm's buy-and-hold return
ROA	Return on assets (income before extraordinary items divided by average total assets)
Expected Compensation	$Log\left(TotalCompensation_{i,t}\right) = \beta_0 + \beta_1 Log\left(Tenure_{i,t}\right) + \beta_2\left(S\&P500_{i,t-1}\right) + \beta_3 Log\left(Sales_{i,t-1}\right) + \beta_4\left(BM_{i,t-1}\right) + \beta_5\left(RET_{i,t}\right) + \beta_6\left(RET_{i,t-1}\right) + \beta_7\left(ROA_{i,t}\right) + \beta_8\left(ROA_{i,t-1}\right) + u_{i,t}\#$
ACOMP	$AbnormalCompensation = TotalCompensation - ExpectedCompensation$
Abnormal production costs	The residual from $\frac{PROD_{i,t}}{Assets_{i,t-1}} = \beta_0 + \beta_1\frac{1}{Assets_{i,t-1}} + \beta_2\frac{\Delta Sales_{i,t}}{Assets_{i,t-1}} + \beta_3\frac{\Delta Sales_{i,t-1}}{Assets_{i,t-1}} + u_{i,t}\#$
Abnormal discretionary expense	The residual from $\frac{DISX_{i,t}}{Assets_{i,t-1}} = \beta_0 + \beta_1\frac{1}{Assets_{i,t-1}} + \beta_2\frac{Sales_{i,t}}{Assets_{i,t-1}} + u_{i,t}\#$
Abnormal operating cash flow	The residual from $\frac{CFO_{i,t}}{Assets_{i,t-1}} = \beta_0 + \beta_1\frac{1}{Assets_{i,t-1}} + \beta_2\frac{Sales_{i,t}}{Assets_{i,t-1}} + \beta_3\frac{\Delta Sales_{i,t}}{Assets_{i,t-1}} + u_{i,t}\#$
REM	$RealEarningsManagement = Abnormalproductioncosts + Abnormaldiscretionaryexpenses * (-1) + Abnormaloperatingcashflow * (-1)\#$
AEM	The residual from the regression: $\frac{ACC_{i,t}}{Assets_{i,t-1}} = \beta_0 + \beta_1\frac{ACC_{i,t-1}}{Assets_{i,t-1}} + \beta_2\frac{(\Delta SALES - \Delta AR)_{i,t}}{Assets_{i,t-1}} + \sum_k \beta_{3,k}\frac{ROA\_Dum_{k,i,t}}{Assets_{i,t-1}} + \sum_k \beta_{4,k}\frac{SG\_Dum_{k,i,t-1}}{Assets_{i,t-1}} + \sum_k \beta_{5,k}\frac{MB\_Dum_{k,i,t-1}}{Assets_{i,t-1}} + u_{i,t}\#$
LVG	The ratio of total debt to total assets at the end of fiscal year
SIZE	The natural log of the firm's assets as of the end of fiscal year
RDEXP	The ratio of R&D Expenditure over total assets at the end of fiscal year
ADEXP	The ratio of advertising Expenditure over total assets at the end of fiscal year
TQ	Download from Peters and Taylor (2017)'s website
VOL	The standard deviation of daily stock price over 1 year at the end of fiscal year
SUREM	Following Srivastava (2019), additional controls of market-to-book ratio, lagged return on assets (*ROA*), firm size (market value of equity), forward revenues (The ratio of forward year-end sales to last year-end total assets), and lagged value of the dependent variables (*Abnormal production cost*, *Abnormal discretionary expenses*, and *Abnormal operating cash flow*) are included in the respective equations of *REM* to calculate the cohort unadjusted measure
SAREM	Cohort-adjusted (in our case age-adjusted) *REM* is the difference between the average *SUREM* within a specific firm group and the *SUREM* of each firm. To determine the average *SUREM* for each firm group, we begin by classifying our sample into 20 groups based on the percentile distribution of firm size (market value of equity) within a given industry-age category. Subsequently, we compute the average *SUREM* for each of these 20 groups in respective industry-age categories. Companies within the same group share common characteristics – they operate in the same industry, have similar ages, and are of comparable size. Age, measured in years, is proxied by the duration since a firm first appears in the Compustat database. It's important to highlight that our approach differs slightly from Srivastava (2019) to simplify computations and ensure we capture deviations from the representative peer group, instead of a single firm. In contrast to our method, Srivastava (2019) matches firms in the same industry with the same listing vintage as a given firm. They designate the matched firm with the closest size as the control firm. The cohort-adjusted measure, *SAREM*, is computed by subtracting the *SUREM* of the control firm from that of the given firm
ACCMJ	The difference between income before extraordinary items and operating cash flows
AEMMJ	The residual from the regression: $\frac{ACCMJ_{i,t}}{Assets_{i,t-1}} = \beta_0 + \beta_1\frac{ACCMJ_{i,t-1}}{Assets_{i,t-1}} + \beta_2\frac{PPE_{i,t}}{Assets_{i,t-1}} + \beta_2\frac{(\Delta SALES - \Delta AR)_{i,t}}{Assets_{i,t-1}} + u_{i,t}\#$
POSTSOX	Indicator variable equals one for the years 2002, 2003 and 2004 indicating the post-SOX period, and zero for the years 1999, 2000 and 2001
TREATREM	Indicator variable equals one if the calculated *REM* in top 1/3rd subsample (in a given industry and year) in 2000. And it equals zero if the calculated *REM* in bottom subsample (in a given industry and year) in 2000
TREATAEM	Indicator variable equals one if the calculated *AEM* in top 1/3rd subsample (in a given industry and year) in 2000. And it equals zero if the calculated *AEM* in bottom subsample (in a given industry and year) in 2000
Q_ACOMP	Categorical variables indicating the firms' relative position in the industry-year quartile distribution of *ACOMP*. CEOs in firms in the top quartile (*Q1_ACOMP*) receive the highest *ACOMP*, and the following receive the decreasing amount of *ACOMP* (*Q2_ACOMP, Q3_ACOMP, Q4_ACOMP)*
Q1_REM	Indicator variable equals one if CEO engaging in the top industry-year quartile of *REM*, and zero otherwise
Q1_AEM	Indicator variable equals one if CEO engaging in the top industry-year quartile of *AEM*, and zero otherwise

Table (continued)

Variable	Description
REM_H	Indicator variable equals one if the calculated *REM* of each firm-year is above the median of industry-year, and zero otherwise
AEM_H	Indicator variable equals one if the calculated *AEM* of each firm-year is above the median of industry-year, and zero otherwise
REM_AEM	Categorical variable indicating the firms' relative *EM* strategy, specifically, it includes $REM_H\_AEM_H$, $REM_H\_AEM_L$, $REM_L\_AEM_H$, $REM_L\_AEM_L$
$REM_H\_AEM_H$	The first group of firms that equals one if *REM_H* equals one and *AEM_H* equals one
$REM_H\_AEM_L$	The second group of firms that equals two if *REM_H* equals one and *AEM_H* equals zero
$REM_L\_AEM_H$	The third group of firms that equals three if *REM_H* equals zero and *AEM_H* equals one
$REM_L\_AEM_L$	The benchmark group of firms that equals four if *REM_H* equals zero and *AEM_H* equals zero
FSKZ	Indicator variable equals one if a firm is in the top quartile of financial constraint following Kaplan and Zingales (1997), and zero otherwise The *KZ* index is constructed: −1.001909[(*ib*+*dp*)/lagged *ppent*]+0.2826389[(*at*+*prcc_f*×*csho*—*ceq*—*txdb*)/*at*]+3.139193[(*dltt*+*dlc*)/(*dltt*+*dlc*+*seq*)] − 39.3678[(*dvc*+*dvp*)/lagged *ppent*] − 1.314759[*che*/lagged *ppent*], where all variables in italics are Compustat data items
FSWW	Indicator variable equals one if a firm is in the top quartile of financial constraint following Whited and Wu (2006), and zero otherwise The *WW* index is constructed: −0.091 [(*ib*+*dp*)/*at*] − 0.062[indicator set to one if (*dvc*+*dvp*) is positive, and zero otherwise]+0.021[*dltt*/*at*] − 0.044[log(*at*)]+0.102[average industry sales growth, estimated separately for each three-digit SIC industry and each year, with sales growth defined as above] − 0.035[sales growth], where all variables in italics are Compustat data items
FLPR	Indicator variable equals one if the firm-level political risk following Hassan et al. (2019) of each firm-year is above the median of industry-year, and zero otherwise

Screening criteria	Observations
All firms in Compustat from 1992 to 2022	393,744
After excluding financial and regulation industries	294,958
After excluding firms with missing total asset	232,015
After excluding firms with fic code which is not USA	172,276
Keep sample at least 20 observations for each industry-year	163,050
Merge with Execucomp	40,678
Merge with calculated *VOL* using CRSP	39,578
Keep observations with non–missing control variables	37,402
Keep observations with non–missing *ACOMP*	34,111
Keep observations with non–missing *REM*	32,493
Keep observations with non–missing *AEM*	30,234
Keep observations with non–missing 1-year lagged control variables	27,378

Armstrong, C. S., A. D. Jagolinzer, and D. F. Larcker. 2010. Chief executive officer equity incentives and accounting irregularities. *Journal of Accounting Research* 48 (2): 225–271.

Armstrong, C. S., C. D. Ittner, and D. F. Larcker. 2012. Corporate governance, compensation consultants, and CEO pay levels. *Review of Accounting Studies* 17 (2): 322–351.

Ataullah, A., I. Davidson, H. Le, and G. Wood. 2014. Corporate diversification, information asymmetry and insider trading. *British Journal of Management* 25 (2): 228–251.

Badertscher, B. A. 2011. Overvaluation and the choice of alternative earnings management mechanisms. *The Accounting Review* 86 (5): 1491–1518.

Banker, R. D., D. Byzalov, S. Fang, and B. Jin. 2020. Operating asymmetries and non-linear spline correction in discretionary accrual models. *Review of Quantitative Finance and Accounting* 54:803–850.

Bergstresser, D., and T. Philippon. 2006. CEO incentives and earnings management. *Journal of Financial Economics* 80 (3): 511–529.

Bertrand, M., and S. Mullainathan. 2001. Are CEOs rewarded for luck? The ones without principals are. *The Quarterly Journal of Economics* 116 (3): 901–932.

Braam, G., M. Nandy, U. Weitzel, and S. Lodh. 2015. Accrual-based and real earnings management and political connections. *The International Journal of Accounting* 50 (2): 111–141.

Breuer, M., and H. H. Schütt. 2023. Accounting for uncertainty: An application of Bayesian methods to accruals models. *Review of Accounting Studies* 28 (2): 726–768.

Brick, I. E., and N. K. Chidambaran. 2010. Board meetings, committee structure, and firm value. *Journal of Corporate Finance* 16 (4): 533–553.

Brown, L. D., and A. Hugon. 2009. Team earnings forecasting. *Review of Accounting Studies* 14 (4): 587–607.

Bugeja, M., Z. Matolcsy, and H. Spiropoulos. 2016. The association between gender-diverse compensation committees and CEO compensation. *Journal of Business Ethics* 139 (2): 375–390.

Burns, N., and S. Kedia. 2006. The impact of performance-based compensation on misreporting. *Journal of Financial Economics* 79 (1): 35–67.

Cain, M. D., S. B. McKeon, and S. D. Solomon. 2017. Do takeover laws matter? Evidence from five decades of hostile takeovers. *Journal of Financial Economics* 124 (1): 464–485.

Chalmers, K., P.-S. Koh, and G. Stapledon. 2006. The determinants of CEO compensation: Rent extraction or labour demand? *The British Accounting Review* 38 (3): 259–275.

Chaney, P. K., M. Faccio, and D. Parsley. 2011. The quality of accounting information in politically connected firms. *Journal of Accounting and Economics* 51 (1): 58–76.

Chang, X., and H. F. Zhang. 2015. Managerial entrenchment and firm value: A dynamic perspective. *Journal of Financial and Quantitative Analysis* 50 (5): 1083–1103.

Charitou, A., N. Lambertides, and L. Trigeorgis. 2007. Earnings behaviour of financially distressed firms: The role of institutional ownership. *Abacus* 43 (3): 271–296.

Chen, Y., C. H. Chen, and S. L. Huang. 2010. An appraisal of financially distressed companies' earnings management: Evidence

Variables	Treat (*N* = 13,446)			Control (*N* = 13,386)		
	Mean	Variance	Skewness	Mean	Variance	Skewness
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Entropy balanced matching sample (above median REM as treatment)						
Matching control variables before entropy balancing						
LVG	0.247	0.034	0.714	0.203	0.038	1.132
SIZE	7.442	2.427	0.223	7.185	2.543	0.368
RDEXP	0.023	0.002	4.277	0.055	0.006	1.843
ADEXP	0.008	0.000	4.320	0.018	0.001	2.766
TQ	1.039	2.140	5.409	1.954	6.149	3.308
VOL	0.434	0.052	1.444	0.426	0.046	1.381
Matching control variables after entropy balancing						
LVG	0.247	0.034	0.714	0.247	0.034	0.715
SIZE	7.442	2.427	0.223	7.441	2.427	0.223
RDEXP	0.023	0.002	4.277	0.023	0.002	4.240
ADEXP	0.008	0.000	4.320	0.008	0.000	4.331
TQ	1.039	2.140	5.409	1.040	2.150	5.405
VOL	0.434	0.052	1.444	0.434	0.052	1.443
Variables	Treat (*N* = 13,297)			Control (*N* = 13,520)		
	Mean	Variance	Skewness	Mean	Variance	Skewness
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B: Entropy balanced matching sample (above median AEM as treatment)						
Matching control variables before entropy balancing						
LVG	0.218	0.039	0.987	0.233	0.035	0.832
SIZE	7.148	2.578	0.334	7.476	2.370	0.275
RDEXP	0.044	0.005	2.397	0.034	0.003	2.674
ADEXP	0.013	0.001	3.372	0.013	0.001	3.486
TQ	1.580	5.218	3.784	1.409	3.500	4.272
VOL	0.448	0.052	1.331	0.412	0.045	1.510
Matching control variables after entropy balancing						
LVG	0.218	0.039	0.987	0.218	0.039	0.987
SIZE	7.148	2.578	0.334	7.149	2.579	0.334
RDEXP	0.044	0.005	2.397	0.044	0.005	2.398
ADEXP	0.013	0.001	3.372	0.013	0.001	3.372
TQ	1.580	5.218	3.784	1.580	5.216	3.785
VOL	0.448	0.052	1.331	0.448	0.052	1.331

from listed companies in China. *Pacific Accounting Review* 22:22–41.

Chen, W. E. I., P. Hribar, and S. Melessa. 2018. Incorrect inferences when using residuals as dependent variables. *Journal of Accounting Research* 56 (3): 751–796.

Chen, X., M. Li, D. Nduakoh, and L. N. B. Yau. 2024. Mandatory disclosure of key audit matters and the choice of earnings management. *Accounting and Finance*. https://doi.org/10.1111/acfi.13331.

Cheng, Q., and T. D. Warfield. 2005. Equity incentives and earnings management. *Accounting Review* 80 (2): 441–476.

Cohen, D. A., and P. Zarowin. 2010. Accrual-based and real earnings management activities around seasoned equity offerings. *Journal of Accounting and Economics* 50 (1): 2–19.

Cohen, D. A., A. Dey, and T. Z. Lys. 2008. Real and accrual-based earnings management in the pre- and post-sarbanes-oxley periods. *Accounting Review* 83 (3): 757–787.

Çolak, G., A. Durnev, and Y. Qian. 2017. Political uncertainty and IPO activity: Evidence from U.S. gubernatorial elections. *Journal of Financial and Quantitative Analysis* 52 (6): 2523–2564.

Coles, J. L., N. D. Daniel, and L. Naveen. 2006. Managerial incentives and risk-taking. *Journal of Financial Economics* 79 (2): 431–468.

Coles, J. L., N. D. Daniel, and L. Naveen. 2014. Co-opted boards. *Review of Financial Studies* 27 (6): 1751–1796.

Collins, D. W., R. S. Pungaliya, and A. M. Vijh. 2017. The effects of firm growth and model specification choices on tests of earnings management in quarterly settings. *Accounting Review* 92 (2): 69–100.

Core, J. E., and W. R. Guay. 2010. Is CEO pay too high and are incentives too low? A wealth-based contracting framework. *Academy of Management Perspectives* 24 (1): 5–19.

Core, J. E., W. Guay, and D. F. Larcker. 2008. The power of the pen and executive compensation. *Journal of Financial Economics* 88 (1): 1–25.

Dah, M. A., and M. B. Frye. 2017. Is board compensation excessive? *Journal of Corporate Finance* 45:566–585.

Dechow, P. M., R. G. Sloan, and A. P. Sweeney. 1995. Detecting earnings management. *Accounting Review* 70 (2): 193–225.

Dechow, P., W. Ge, and C. Schrand. 2010. Understanding earnings quality: A review of the proxies, their determinants and their consequences. *Journal of Accounting and Economics* 50 (2): 344–401.

Demerjian, P., M. Lewis-Western, and S. McVay. 2020. How does intentional earnings smoothing vary with managerial ability? *Journal of Accounting, Auditing & Finance* 35 (2): 406–437.

Diri, M. E., C. Lambrinoudakis, and M. Alhadab. 2020. Corporate governance and earnings management in concentrated markets. *Journal of Business Research* 108:291–306.

Douglas, A. V., A. G. Huang, and K. R. Vetzal. 2016. Cash flow volatility and corporate bond yield spreads. *Review of Quantitative Finance and Accounting* 46 (2): 417–458.

Edmans, A., X. Gabaix, and D. Jenter. 2017. Executive compensation: A survey of theory and evidence. *The Handbook of the Economics of Corporate Governance* 1:383–539.

Efendi, J., A. Srivastava, and E. P. Swanson. 2007. Why do corporate managers misstate financial statements? The role of option compensation and other factors. *Journal of Financial Economics* 85 (3): 667–708.

Elyasiani, E., Y. Wen, and R. Zhang. 2017. Institutional ownership and earning management by bank holding companies. *Journal of Financial Research* 40 (2): 147–178.

Ewert, R., and A. Wagenhofer. 2005. Economic effects of tightening accounting standards to restrict earnings management. *The Accounting Review* 80 (4): 1101–1124.

Farre-Mensa, J., and A. Ljungqvist. 2016. Do measures of financial constraints measure financial constraints? *The Review of Financial Studies* 29 (2): 271–308.

Fernandes, N., M. A. Ferreira, P. Matos, and K. J. Murphy. 2013. Are U.S. CEOs paid more? New international evidence. *Review of Financial Studies* 26 (2): 323–367.

Ferri, F., R. Zheng, and Y. Zou. 2018. Uncertainty about managers' reporting objectives and investors' response to earnings reports: Evidence from the 2006 executive compensation disclosures. *Journal of Accounting and Economics* 66 (2–3): 339–365.

Franz, D. R., H. R. Hassabelnaby, and G. J. Lobo. 2014. Impact of proximity to debt covenant violation on earnings management. *Review of Accounting Studies* 19:473–505.

Garel, A., J. M. Martin-Flores, A. Petit-Romec, and A. Scott. 2021. Institutional investor distraction and earnings management. *Journal of Corporate Finance*. https://doi.org/10.1016/j.jcorpfin.2020.101801.

Gayle, G. L., C. Li, and R. A. Miller. 2016. Was sarbanes-oxley costly? Evidence from optimal contracting on CEO compensation. *Journal of Accounting Research*.

Gompers, P., J. Ishii, and A. Metrick. 2003. Corporate governance and equity prices. *The Quarterly Journal of Economics* 118 (1): 107–156.

Graham, J. R., C. R. Harvey, and S. Rajgopal. 2005. The economic implications of corporate financial reporting. *Journal of Accounting and Economics* 40 (1): 3–73.

Gu, Z., R. Ding, W. Ding, and Y. Yu. 2024. Business strategy and CEO pay duration. *Accounting and Finance*. https://doi.org/10.1111/acfi.13384.

Guest, N., S. Kothari, and R. Pozen. 2022. Why do large positive non-GAAP earnings adjustments predict abnormally high CEO pay? Non-GAAP earnings adjustments predict abnormal CEO pay. *The Accounting Review*.

Gul, F. A., M. Khedmati, E. K. Lim, and F. Navissi. 2017. Managerial ability, financial distress, and audit fees. *Accounting Horizons* 32 (1): 29–51.

Gunny, K. A. 2010. The relation between earnings management using real activities manipulation and future performance: Evidence from meeting earnings benchmarks. *Contemporary Accounting Research* 27 (3): 855–888.

Gupta, J., Kushwaha, N. N., Li, X., and Ebrahimi, T. 2021. Does firm-level political risk influence earnings management? Available at https://ssrn.com/abstract=3994064.

Habib, A., B. Uddin Bhuiyan, and A. Islam. 2013. Financial distress, earnings management and market pricing of accruals during the global financial crisis. *Managerial Finance* 39 (2): 155–180.

Hainmueller, J. 2012. Entropy balancing for causal rffects: A multivariate reweighting method to produce balanced samples in observational studies. *Political Analysis* 20 (1): 25–46.

Harris, O., J. B. Karl, and E. Lawrence. 2019. CEO compensation and earnings management: Does gender really matters? *Journal of Business Research* 98:1–14.

Hassan, T. A., S. Hollander, L. van Lent, and A. Tahoun. 2019. Firm-level political risk: Measurement and effects. *The Quarterly Journal of Economics* 134 (4): 2135–2202.

Hooghiemstra, R., Y. F. Kuang, and B. Qin. 2017. Does obfuscating excessive CEO pay work? The influence of remuneration report readability on say-on-pay votes. *Accounting and Business Research* 47 (6): 695–729.

Hu, J. 2021. Do facilitation payments affect earnings management? Evidence from China. *Journal of Corporate Finance*. https://doi.org/10.1016/j.jcorpfin.2021.101936.

Huang, K., B. Lao, and G. McPhee. 2017. Does stock liquidity affect accrual-based earnings management? *Journal of Business Finance & Accounting* 44 (3–4): 417–447.

Jens, C. E. 2017. Political uncertainty and investment: Causal evidence from U.S. gubernatorial elections. *Journal of Financial Economics* 124 (3): 563–579.

Jiang, E. J., and X. Jia. 2024. Judicial independence and earnings management. *Accounting and Finance*. https://doi.org/10.1111/acfi.13387.

Johnson, S. A., H. E. Ryan, and Y. S. Tian. 2009. Managerial incentives and corporate fraud: The sources of incentives matter. *Review of Finance* 13 (1): 115–145.

Jones, J. J. 1991. Earnings management during import relief investigations. *Journal of Accounting Research* 29 (2): 193–228.

Kaplan, S. N., and Zingales, L. 1997. Do investment-cash flow sensitivities provide useful measures of financing constraints? *The Quarterly Journal of Economics* 112(1): 169–215.

Kim, J.-B., and B. C. Sohn. 2013. Real earnings management and cost of capital. *Journal of Accounting and Public Policy* 32 (6): 518–543.

Kim, K., E. Mauldin, and S. Patro. 2014. Outside directors and board advising and monitoring performance. *Journal of Accounting and Economics* 57 (2–3): 110–131.

Kim, J.-B., Z. Wang, and L. Zhang. 2016. CEO overconfidence and stock price crash risk. *Contemporary Accounting Research* 33 (4): 1720–1749.

Kini, O., and R. Williams. 2012. Tournament incentives, firm risk, and corporate policies. *Journal of Financial Economics* 103 (2): 350–376.

Kothari, S. P., A. J. Leone, and C. E. Wasley. 2005. Performance matched discretionary accrual measures. *Journal of Accounting and Economics* 39 (1): 163–197.

Kothari, S. P., N. Mizik, and S. Roychowdhury. 2016. Managing for the moment: The role of earnings management via real activities versus accruals in SEO valuation. *The Accounting Review* 91 (2): 559–586.

Kuang, Y. F. 2008. Performance-vested stock options and earnings management. *Journal of Business Finance & Accounting* 35 (9–10): 1049–1078.

Kuo, C.-S., M.-Y.L. Li, and S.-E. Yu. 2013. Non-uniform effects of CEO equity-based compensation on firm performance – An application of a panel threshold regression model. *The British Accounting Review* 45 (3): 203–214.

Lamont, O., C. Polk, and J. Saaá-Requejo. 2001. Financial constraints and stock returns. *The Review of Financial Studies* 14 (2): 529–554.

Larcker, D. F., S. A. Richardson, and I. R. Tuna. 2007. Corporate governance, accounting outcomes, and organizational performance. *The Accounting Review* 82 (4): 963–1008.

Leal, P. H., V. Janiszewski, L. C. M. D. Anjos, and V. G. Martins. 2022. Measuring impacts of tax aggressinevess, earnings fluctuation and executive compensation on earnings management. *Contaduría y Administración* 68 (1): 207–234.

Leal, P. H., and L. C. M. D. Anjos. 2023. Do corporate governance and managerial power induce abnormal CEO compensation contracts? an analysis of the Brazilian market. *Contaduría y Administración*, *69*(4).

Mamatzakis, E., and A. Bagntasarian. 2020. The nexus between CEO incentives and analysts' earnings forecasts. *International Journal of Finance & Economics* 26 (4): 6205–6248.

McMullin, J. L., and B. Schonberger. 2020. Entropy-balanced accruals. *Review of Accounting Studies* 25 (1): 84–119.

Mohanram, P., B. White, and W. Zhao. 2020. Stock-based compensation, financial analysts, and equity overvaluation. *Review of Accounting Studies* 25 (3): 1040–1077.

Natto, D., and T. Mokoaleli-Mokoteli, 2025. Short-and long-term impact of governance on firm performance in emerging and developed economies: A comparative analysis. *International Journal of Disclosure and Governance*, 1–18.

O'Connor, J. P., R. L. Priem, J. E. Coombs, and K. M. Gilley. 2006. Do CEO stock options prevent or promote fraudulent financial reporting? *Academy of Management Journal* 49 (3): 483–500.

Pástor, L., and P. Veronesi. 2012. Uncertainty about government policy and stock prices. *Journal of Finance* 67 (4): 1219–1264.

Peng, L., and A. Roell. 2008. Manipulation and equity-based compensation. *The American Economic Review* 98 (2): 285–290.

Peters, R. H., and L. A. Taylor. 2017. Intangible capital and the investment-q relation. *Journal of Financial Economics* 123 (2): 251–272.

Robinson, J. R., Y. Xue, and Y. Yu. 2011. Determinants of disclosure noncompliance and the effect of the SEC review: Evidence from the 2006 mandated compensation disclosure regulations. *The Accounting Review* 86 (4): 1415–1444.

Rosner, R. L. 2003. Earnings manipulation in failing firms. *Contemporary Accounting Research* 20 (2): 361–408.

Roychowdhury, S. 2006. Earnings management through real activities manipulation. *Journal of Accounting and Economics* 42 (3): 335–370.

Ryan, H. E., and R. A. Wiggins. 2004. Who is in whose pocket? Director compensation, board independence, and barriers to effective monitoring. *Journal of Financial Economics* 73 (3): 497–524.

Smith, J. A., and P. E. Todd. 2001. Reconciling conflicting evidence on the performance of propensity-score matching methods. *American Economic Review* 91 (2): 112–118.

Srivastava, A. 2019. Improving the measures of real earnings management. *Review of Accounting Studies* 24(4): 1277–1316.

Wahid, A. S. 2018. The effects and the mechanisms of board gender diversity: Evidence from financial manipulation. *Journal of Business Ethics* 159 (3): 705–725.

Whited, T. M., and G. Wu. 2006. Financial constraints risk. *Review of Financial Studies* 19 (2): 531–559.

Yan-Xin, C. 2018. Executive compensation and real earnings management: Perspective of managerial power. *International Journal of Advances in Agriculture Sciences*.

Zang, A. Y. 2012. Evidence on the trade-off between real activities manipulation and accrual-based earnings management. *Accounting Review* 87 (2): 675–703.

Zhang, X., K. M. Bartol, K. G. Smith, M. D. Pfarrer, and D. M. Khanin. 2008. CEOs on the edge: Earnings manipulation and stock-based incentive misalignment. *Academy of Management Journal* 51 (2): 241–258.