Restraining overconfident CEOs through improved governance: Evidence from the Sarbanes-Oxley Act*

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Abstract

The literature posits that some CEO overconfidence benefits shareholders, though high levels may not. In principle, adequate controls and oversight should mitigate the costs of CEO overconfidence. We use the concurrent passage of the Sarbanes-Oxley Act and changes to the NYSE and NASDAQ listing rules (collectively, SOX) as natural experiments to examine whether increased oversight improves decision-making by overconfident-CEOs. The results are strongly supportive: Post-SOX, overconfident CEOs reduce investment and risk exposure, increase dividends, improve post-acquisition performance, and have better operating performance and market value. Importantly, these changes are absent for overconfident-CEO firms that were compliant prior to passage.

JEL Classification Code: G23, G32, G34
Keyword: CEO Over-Confidence, Over-investment, Risk-taking, Quality of Investment, SOX, Firm performance

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1 Introduction

Overconfidence can lead managers to overestimate returns and underestimate risk. The literature suggests that while some CEO overconfidence can benefit shareholders, a highly distorted view of risk-return profiles can destroy shareholder value. An intriguing question is whether there are ways to channel the drive and optimism of highly overconfident CEOs while curbing the extremes of risk-taking and over-investment associated with such overconfidence. We explore such a possibility in this paper. Specifically, we investigate whether appropriate restraints on CEO discretion and the introduction of diverse viewpoints on the board serve to moderate the actions of overconfident CEOs and, in the end, benefit shareholders.

While governance issues, such as board independence, have been viewed mainly through the lens of managerial agency, they have a bearing in the context of CEO overconfidence as well. For instance, while the scandals that precipitated Sarbanes-Oxley Act of 2002 (SOX) and the changes to NYSE/NASDAQ listing rules[1] are usually attributed to poor governance and unethical behavior, they were likely exacerbated in many cases by managerial hubris. In the case of Enron, for instance, it is claimed that overconfidence may have rendered managers slow to recognize their mistakes and quick to engage in risky behavior in their attempt to cover up these mistakes (O'Connor, 2003). These troubles were likely compounded by a permissive board that exhibited group-think and inadequate oversight. SOX and the changes to the NYSE/NASDAQ listing rules were intended to mitigate such problems by, inter alia, increasing independent oversight in both the board and the audit committee. This package of reforms, combining increased board and audit-committee independence, represent an argued significant strengthening in oversight (Clark, 2005). The logic being that the increased oversight, and the diverse set of view-points, promoted by an independent board, could help to attenuate

[1]For brevity, unless otherwise stated, because these changes were concurrent, we refer to the set of changes in SOX and to the listing rules as "SOX" or the "Sarbanes-Oxley Act" unless otherwise stated (per Guo et al., 2014; Linck et al., 2009). Indeed, the changes implemented in SOX precipitated the NYSE/NASDAQ changes, and it is the combination of increased independence in both the board (through a majority independent board) and in the audit committee that improved oversight (Clark, 2005).

the impact of managerial moral-hazard and biased beliefs.

While the consequences of SOX and the listing rules have been studied in the context of poorly governed firms, the question for us is whether the increased oversight and other governance changes also helped to reign-in the more harmful aspects of CEO overconfidence. Evidence that SOX improved the decision-making of overconfident-CEOs would demonstrate that appropriate governance structures and advice can help to better channel the optimism of overconfident managers toward creating shareholder value.

The double-edged nature of confidence is evident from the literature. Confidence is essential for success in myriad domains, including business (Johnson and Fowler, 2011; Puri and Robinson, 2007).[2] Not surprisingly, CEOs tend to be more optimistic, and less risk-averse, than the lay population (Graham et al., 2013). Overconfidence can be a desirable trait in managers when, for instance, there are valuable, but risky, investments to be made in developing new technologies or products (see e.g., Galasso and Simcoe, 2011; Hirshleifer et al., 2012; Simsek et al., 2010). The downside is that overconfidence can lead to faulty assessments of investment value and risk, resulting in suboptimal decision making (Dittrich et al., 2005). Indeed, Ben-David et al. (Forthcoming) indicate that managers often miscalibrate the risk-return relationship of investments.

We use the concurrent passage of the Sarbanes-Oxley (SOX) Act of 2002 and the changes to the NYSE/NASDAQ listing rules as a natural experiment to investigate whether governance changes can moderate the impact of CEO overconfidence. In some ways these changes provide an ideal setting for such a test: they were exogenous to the circumstances of specific firms, but were associated with improvements in governance, disclosure, and monitoring (see e.g., Coates, 2007).[3] By requiring a fully independent audit committee and a majority of directors to be independent, SOX, coupled with the NYSE/NASDAQ rule changes (collectively, just

[2]Johnson and Fowler (2011) argue that overconfidence, and the investment and risk-taking associated with it, can create the (potentially false) signal of corporate profitability, which itself can deter competitors and improve the company's competitive position.

[3]We briefly discuss the literature concerning SOX in Section 2.

'SOX'), is believed to have helped bring new perspectives and greater scrutiny into the board room. Consequently, we would expect SOX to mitigate the extent to which overconfident CEOs could hold sway over insider-dominated boards.

A concern with using SOX (and the listing rule changes) as an instrument is that it was enacted during a single year and it is, therefore, possible that firm policies and values were influenced by other events at the time. We address this concern in various ways. An important falsification test is to scrutinize the changes in firms with overconfident CEOs that were not impacted by the passage of SOX and the rule changes, since they were already compliant with the requirements (i.e., by having a majority of independent directors and a fully independent audit committee prior to 2002). Further confidence is gained by a variety of specific tests such as, say, the performance of subsequent M&A activity that are not easily explained other than by changes in the nature of decision-making of firms with overconfident CEOs. Our regressions include a large number of firm and CEO control variables, in addition to firm and year fixed-effects.

We use both options-based and press-based measures of overconfidence. The premise behind the option-based measures is that a CEO's human capital and personal wealth is tied to his/her company. Since CEOs are relatively undiversified, they should rationally exercise deep-in-the-money options and cash-out the shares as and when they vest. Hence, holding deep in-the-money vested options represents a degree of overconfidence.[4] We construct overconfidence measures similar to those in Malmendier and Tate (2005, 2008) and Malmendier et al. (2011). We use both a continuous measure of CEO overconfidence and an indicator that equals one if the CEO's options-measure is in the top quartile of the sample. In robustness tests, we examine alternative measures of overconfidence, including press-based measures of overconfidence.

We have several important findings. We first examine the investment choices by over-

[4]As confirmed in Malmendier and Tate (2008, pg. 36), the return from holding these options is poor, inconsistent with an inside information explanation for not cashing-out.

confident CEOs. Our results indicate that, prior to SOX, overconfident CEOs invest more aggressively than their peers. However, after the passage of SOX, overconfident CEOs appear to moderate their capital expenditures, bringing them more in line with the CEOs of other firms in their industries. SOX is also associated with a reduction in asset growth and PP&E growth. The pattern is similar for Sales, General and Administrative expenses (SG&A). In this, we follow the argument in Chen et al. (2013) that overconfident CEOs are less likely to downward-adjust SG&A, reflecting their beliefs about future growth prospects and SG&A needs. Our results indicate that the passage of SOX is associated with a substantial drop in SG&A for overconfident CEOs.

SOX also affects the sensitivity of investment to cash flows of overconfident managers. As Malmendier and Tate (2005) show, overconfident CEOs spend more of their cash flows on capital expenditures, reflecting their greater propensity to invest available internal funds. We find that, post-SOX, overconfident CEOs' investment-sensitivity-to-cash-flow decreases. In addition, post-SOX, firms with overconfident CEOs exhibit a significant drop in risk, both systematic and firm-specific.

An important question is whether the reduction in investment and risk-taking works to the benefit of shareholders. In other words, does SOX curb the value-destroying tendencies of overconfident CEOs or does it, instead, hinder value-creation by these CEOs and force them to abandon positive-NPV projects. For our tests, we use several measures of firm performance. We use both market-based and accounting-based measures of firm performance, namely Tobin's Q, Earnings Before Interest & Tax (EBIT), and Standard & Poor's Earning Quality (EQ) measure. We also examine the impact of overconfidence on the value of R&D and CAPEX. Our results are unambiguous – along with the reduction in investment-expenditure and risk, overconfident CEOs create more shareholder value post-SOX.

Next we examine the performance of overconfident CEOs in the context of acquisitions. Malmendier and Tate (2008) find that overconfident CEOs tend to undertake acquisitions that create significantly less shareholder wealth. After the passage of SOX, however, takeovers

by overconfident CEOs create relatively more long-term shareholder wealth (or equivalently, destroy less shareholder wealth). Another issue is that of dividend payout. With the drop in investment expenditure of overconfident CEOs, firms would have more free-cash-flow available to distribute in the form of dividend payout. We find that while payout tends to be low for overconfident firms (see e.g., Deshmukh et al., 2013), there is a significant increase in payout, post- SOX. Hence, in conjunction with the reduction in expenditures, SOX appears to encourage overconfident CEOs to distribute cash to shareholders.

We conduct a number of robustness tests to increase our confidence in the results and their interpretation. As noted above, we conduct falsification tests to show that these SOX-related changes are concentrated in the companies that were not previously compliant with SOX and the listing rule requirements (in relation to the need for an independent audit committee and a majority independent board). Also, the SOX-related effects observed for high-confidence managers are not present for CEOs with confidence in the bottom quartile. Together, these falsification tests suggest that our results reflect the impact of SOX in moderating the implications of CEO overconfidence.

We undertake several additional robustness tests in order to mitigate econometric issues. As noted, we control for various firm, CEO, and governance characteristics, and include firm/industry and year fixed effects. Given that our results relate to a strong exogenous event (SOX), and we support these results with the aforementioned falsification tests, endogeneity (reverse-causality) is unlikely to drive our results. Nonetheless, we conduct some additional robustness tests to mitigate reverse-causality concerns. We confirm that overconfidence tends to be 'sticky' over time (as Malmendier and Tate, 2005, have previously shown), suggesting that it is a stable behavioral characteristic rather than a function of contemporaneous firm performance. We also conduct robustness tests using alternative measures of CEO overconfidence: it is shown that results hold when using a press-based measure of overconfidence; a *Holder67* measure of overconfidence; and a measure based on the value of the CEO's vested-but-unexercised options scaled by his/her salary.

Our results contribute to the literatures on managerial overconfidence and market regulation. We confirm that CEO overconfidence can lead to excessive risk-taking and expenditure. The results provide (some) support for exogenously mandated improvements in certain governance practices. While it might be more of an unintended consequence, SOX and the NYSE/NASDAQ rule changes appear to have been beneficial in terms of mitigating significant value-destruction and in capitalizing on the positive aspects of CEO overconfidence. Hence, the paper provides novel evidence on the benefits of SOX and the listing rule changes: these benefits go beyond limiting expropriation and perquisite consumption by powerful CEOs and are important in terms moderating the excesses of highly overconfident CEOs. While there may be questions as to whether our findings extrapolate to other types of broad governance changes that may have been proposed or enacted, in the specific case of SOX and the listing rules, the changes appear to have acted as a beneficial restraint on CEO excesses and increased shareholder wealth (and social welfare).[5]

Our results connect with prior work in the context of overconfidence and governance. Our findings also support evidence in Campbell et al. (2011) that overconfident CEOs are more likely to be dismissed than are other CEOs in boards dominated by outsiders, highlighting the centrality of improved governance to mitigating the impact of CEO overconfidence. Our results also connect with the finding in Kolasinski and Li (2013) that a majority independent board can reduce the acquisitiveness of overconfident CEOs. Our findings differ from, and extend, those in Kolasinski and Li (2013) in that we analyze the value-implications of such improved governance, assess myriad aspects of corporate behavior (i.e., CAPEX, firm value, operating performance, the value of investments, and the value-implications of takeovers), and provide additional evidence on the efficacy of SOX in the specific context of CEO overconfidence.

The remainder of this paper is structured as follows: Section 2 reviews the literature and develops the hypotheses. Section 3 describes the sample selection process, and provides

[5]Such evidence is consistent with prior literature that suggests that SOX prevents insiders from expropriating from minority shareholders (as in Duarte et al., 2014), and is associated with improvements in disclosure and governance (see e.g. Arping and Sautner, 2013; Ashbaugh-Sakife et al., 2009).

variable definitions, and summary statistics. Our main findings are presented in Sections 4-6. Section 4 examines the effect of SOX on the investment, risk-taking, and asset-growth decisions of firms with overconfident CEOs. Section 5 examines the value-implications of SOX for firms run by overconfident CEOs. Section 6 explores payout policies. Section 7 presents the results of robustness tests and Section 8 concludes the paper.

2 Hypotheses

Overconfident CEOs, by definition, are overly optimistic about their investments and opportunities. They are more likely to undertake hubristic takeovers (see e.g., Hayward and Hambrick, 1997; Roll, 1986), and to spend more resources internally i.e., in CAPEX or asset growth (Malmendier and Tate, 2008). Overconfident CEOs also engage in increased personal and corporate risk-taking (see e.g., Cain and McKeon, 2013). The argument is that because overconfident CEOs over-estimate the expected value of their investments, and under-estimate the downside risk, they are more likely to increase corporate risk than are other CEOs.

The Sarbanes-Oxley Act of 2002 (SOX) is ostensibly intended to restrict managerial excesses, increase transparency, and improve corporate governance. Several of its provisions are aimed at enhancing corporate governance (for a complete summary see Coates, 2007): These include having an independent audit committee (Section 301), executive certification of financial reports (Section 302), disclosure of managerial assessment of internal controls (Section 404), and a code of ethics for senior financial officers (Section 406). SOX also prevents accounting firms from providing both auditing and non-auditing services to the same firm and increased penalties for corporate fraud. Put together, the increased environment of disclosure and monitoring by a more independent board, can help to moderate managerial excesses. Consistent with this, Duarte et al. (2014) argue that SOX significantly reduced the ability of insiders to extract value from minority shareholders. It is an empirical question as to whether such constraints can restrain CEO overconfidence and enhance shareholder wealth.

There is evidence suggesting that SOX might impose significant costs on some companies (see e.g., Iliev, 2010; Leuz et al., 2008). However, despite the potential costs, there is evidence that SOX enables better protection for minority shareholders against extraction of value by insiders (Duarte et al., 2014), improvements in disclosure and governance (see e.g., Arping and Sautner, 2013; Ashbaugh-Sakife et al., 2009), and increases in market value (Switzer, 2007). Overall, the literature suggests that SOX is generally associated with better governance and disclosure. Given that overconfident CEOs might be expected to overinvest and to assume more risk than optimal from a shareholder's perspective, and may be less likely to learn from past mistakes when doing so (Chen et al., Forthcoming), we hypothesize that stronger governance may curtail these excesses. This is all the more so in the light of prior evidence that overconfident CEOs are more likely to be dismissed than other CEOs in boards dominated by outsiders (Campbell et al., 2011). The hypothesis gives rise to the following predictions:

Hypothesis 1. *SOX reduces the impact of CEO overconfidence on the amount of corporate investment.*

Hypothesis 2. *SOX weakens the impact of CEO overconfidence on firms' exposure to systematic as well as unsystematic risk.*

Malmendier and Tate (2005) have argued that overconfident managers tend to be more cash-constrained, given their high investment levels and their reluctance to raise external equity capital. Hence, if there is a decrease in the capital expenditure in these firms, we would also expect a decrease in their investment-to-cashflow sensitivity. This is tested along with other tests on the effect of SOX on investment policies of firms with overconfident CEOs.

Hypothesis 3. *SOX weakens the investment-cash-flow-sensitivity of overconfident CEOs.*

To the extent that SOX reduces excessive risk-taking and wasteful expenditures by overconfident CEOs, we expect there to be a positive impact on their firms' operating performance and on other measures of firm valuation. We predict, therefore:

Hypothesis 4. *SOX enhances the impact of CEO overconfidence on firm-value.*

Hypothesis 5. *SOX enhances the impact of CEO overconfidence on firms' operating performance.*

Given that we expect SOX to curb the wasteful expenditure and excessive risk-taking tendencies of overconfident CEOs, it follows that SOX can help to increase the value of the investments that they do make. We, therefore, expect SOX to enhance the impact of CEO overconfidence on the value of major corporate investments such as R&D and capital expenditures:

Hypothesis 6. *SOX enhances the value of CAPEX and the value of R&D investment in firms managed by overconfident CEOs.*

The impact of SOX in moderating CEO overconfidence should encourage better takeover decisions. Managerial overconfidence can induce over-bidding and value-destruction in acquisitions (Kim, 2013b; Kolasinski and Li, 2013; Malmendier and Tate, 2008). Additionally, poor corporate governance appears to facilitate such acquisitions. For example, entrenched CEOs appear to make acquisitions that destroy more corporate value, implying overpayment in acquisitions (e.g., Harford et al., 2012; Masulis et al., 2007). We might, therefore, expect SOX to help reduce over-bidding in acquisitions and encourage CEOs to engage in greater long-term value-creation. Kolasinski and Li (2013) provide some consistent evidence, suggesting that a strong independent board reduces the likelihood that an overconfident manager undertakes an acquisition. From an empirical stand-point, we are most interested in long-term value-creation (as compared with short-run market returns) given the evidence that the market can take some time to impound the value-implications of takeovers (Masulis et al., 2013; Schijven and Hitt, 2012). This leads to the prediction:

Hypothesis 7. *SOX improves the impact of CEO overconfidence on long-term value-creation in acquisitions.*

In addition, Malmendier et al. (2011) argue that overconfident CEOs consider their firms under-valued and, hence, prefer not to raise external equity financing. They choose to retain earnings to finance investments and as a result pay lower dividends (Deshmukh et al., 2013). We anticipate that, to the extent SOX curbs overinvestment and other wasteful expenditures, it would free more cash for companies to pay as dividends. We therefore predict:

Hypothesis 8. *SOX will encourage overconfident CEOs to increase or initiate dividend payments.*

3 Data

This study utilizes several standard data-sets. Our data on CEO compensation is from the Execucomp Database. We start with approximately 30,000 plus observations on CEO compensation between January 1, 1992 through December 31, 2012. After excluding observations with missing data on essential components of CEO compensation, we obtain a sample size of approximately 22,000 firm-year observations for which we can compute the "CEO confidence" measure. When creating this sample, we exclude cases where there is insufficient data to construct our option-based measure of overconfidence. Next we merge this modified Execucomp data with the Compustat and CRSP databases to obtain the firm-level variables and market/return variables required for our analysis. We also obtain additional data on the percentage holdings of all institutional investors from the Thomson 13f filing database. The acquisition data-set is from SDC. In robustness tests, we use data from IRRC/Risk Metrics in order to examine the effect of anti-takeover provisions.

We construct a continuous "CEO confidence" variable. The CEO confidence measure is based on the CEO's option holdings. The logic is that CEO's human capital is undiversified, and the CEO ordinarily has a large part of their wealth tied to the company. Thus, a rational CEO would exercise options as and when they vest. Therefore, holding vested in-the-money

options represents a degree of overconfidence (Malmendier and Tate, 2005).[6]

We use Execucomp data to construct the overconfidence measure. We first obtain the total value-per option of the in-the-money options by dividing the value of all unexercised exercisable options (Execucomp item named: opt unex exer est val) by the number of options (Execucomp item named: opt unex exer num). Next we scale this value-per-option by the price at the end of the fiscal year as reported in (Compustat item named: prcc f). This gives an indication of the extent to which the CEO retains in-the-money options that are vested. This is analogous to the variables in Malmendier and Tate (2008). The variables differ slightly from those in Malmendier and Tate (2008) because the Execucomp database does not provide the same set of variables as their proprietary database. In our main tests we allow the managerial overconfidence measure to vary over time due to prior evidence that overconfidence can vary over time based upon past experience and performance (see e.g., Billett and Qian, 2008; Hilary and Menzly, 2006). We further create an indicator variable that equals one if the CEO's confidence measure is in the top quartile of all firms in that year.[7]

In robustness tests, we ensure that the results are robust to various different definitions of overconfidence, including newspaper or press-based measures of overconfidence. As per Hirshleifer et al. (2012), we hand-collect data on how the press portrays each of the CEOs from 2000-2006. We search for articles referring to the CEOs in The New York Times (NYT), Business Week (BW), Financial Times (FT), The Economist, Forbes Magazine, Fortune Magazine and The Wall Street Journal. For each CEO and sample year, we record the number of articles containing the words "over confident" or "over confidence;" the number of articles containing

[6]Malmendier and Tate (2005, 2008) highlight that holding such in-the-money options is indeed a behavioral bias, and they find no evidence that such option-holdings connote private information. Further, while it is arguable that CEOs who choose to hold such options are simply well-incentivized, so should perform better, such an interpretation is inconsistent with the finding both in this paper, and in prior work (see e.g., Malmendier and Tate, 2005, 2008), that option-based measures of overconfidence are negatively associated with corporate performance.

[7]We examine a continuous variable, in addition to the indicator variable, due to prior evidence (in Ben-David et al., 2013) that many executives mis-calibrate the risk/return distribution, suggesting that there is a continuum of mis-calibration and overconfidence.

the words "optimistic" or "optimism". We also record the number of articles containing the words "reliable", "cautious", "conservative", "practical", "frugal", or "steady." We carefully hand-check that these terms are generally used to describe the CEO in question and separate out newspaper articles describing the CEO of interest as "not confident" or "not optimistic." We then construct the variable "Net News", which is equal to the number of "confident" references less the number of non-confident references. This alternative proxy of CEO over confidence is significantly positively correlated with our option-based financial measures.

We also use the Execucomp database to obtain other governance variables that might influence corporate performance, including CEO tenure, CEO age, the ratio of bonus-compensation to fixed-salary, and the CEO's percentage ownership.

The acquisition data-set starts with all acquisition-announcements in SDC, which we then merge with accounting data from Compustat, managerial overconfidence data (from Execucomp) and institutional ownership data (from the Thomson 13f filings). To construct this dataset we identify the acquirer in an acquisition. We then obtain the relevant explanatory variables for the acquiring company, including a set of control variables that are standard in the acquisition literature.

We use the firm-year panel to estimate the impact of SOX and overconfidence on firm-value, expenditure (i.e., CAPEX and asset growth), corporate risk (beta, daily stock-return variance, and mean squared error), and, further, the impact on the value of cash holdings, CAPEX, and R&D. In all models we control for time fixed effects to mitigate issues of unobserved time-effects that could otherwise bias an examination of SOX. When examining the firm-year panel of observations we examine models that include industry and year effects, as well as those that include firm and year fixed effects. In the acquisition-sample, we use industry and year effects. In robustness tests we also examine the impact of SOX on companies that were already SOX-complaint to further ensure that the reported results are attributable to the governance-changes imposed by SOX.

We report the sample composition by year in Table 1 and provide summary statistics in

Table 2. The statistics in Table 1 indicate that overconfidence is relatively stable over time. This is consistent with the idea that CEO overconfidence is a behavioral trait (rather than a transient reflection of the corporation's position). The summary statistics in Table 2 provide some indication of the nature of our sample. Panel A presents the statistics for the panel data sample, and Panel B presents statistics for the M&A sample. The figures in Panel B are broadly consistent with those reported in prior literature. In particular, acquirer CARs are close to zero (for CAR(-10,10)) or slightly negative (for CAR(-42, 125)), which is consistent with prior literature (see e.g., Harford et al., 2012; Masulis et al., 2007; Moeller et al., 2004). The mean level of managerial confidence for the acquirers (0.38) is higher than that for the general sample (0.31), which is consistent with prior evidence that managers who are more confident tend to undertake more acquisitions (see e.g., Malmendier and Tate, 2008). The following sections use these data to conduct a multivariate analysis of effect of SOX on the impact of managerial overconfidence.

4 SOX & Overconfidence: Investment Policy, and Corporate Risk

4.1 Does SOX restrain over-investment by overconfident CEOs?

We begin by testing our first hypothesis using a difference-in-difference approach. In particular, we test whether changes in the firm's investment, asset growth and sensitivity of investment to cash flows following the passage of SOX are related to the CEO's overconfidence in the manner predicted by our hypotheses.

4.1.1 Capital Expenditure following SOX

Our hypothesis is that the passage of SOX results in overconfident CEOs becoming less aggressive in terms of capital expenditures. We test the relationship between the passage of

SOX, CEO-confidence, and CAPEX using a regression model of the following form:

$$\begin{aligned}\text{CAPEX/Assets}_{i,\,t+1} = \alpha + \text{SOX}_{i,t}\beta^{(1)} + \text{Confidence}_{i,t}\beta^{(2)} + \text{SOX}_{i,t} \times \text{Confidence}_{i,t}\beta^{(3)} \\ + \mathbf{X}_{i,t}\theta + \lambda_{j(i)} + \phi_t + \varepsilon_{i,t}\end{aligned} \tag{1}$$

where, $\mathbf{X}$ represents a set of CEO and firm control variables, and ϕ_t, and $\lambda_{j(i)}$ are year, and industry (firm) dummies respectively. SOX is an indicator that equals one if the observation occurs in 2002 or later and zero otherwise.[8] We estimate the models using OLS regressions with standard errors that allow for heteroskedasticity and clustering at the firm level. Our hypothesis predicts $\beta^{(3)} < 0$ i.e., a decrease in CAPEX following SOX. Based on the findings in the literature that overconfident managers tend to invest more heavily, we expect $\beta^{(2)} > 0$,

The regression results are provided in Table 3. First, we estimate the regression using industry dummies, λ_j, and year dummies, ϕ_t. The regression results support our hypothesis: the coefficient on 'Confidence' in Column M1 of Table 3 is positive (i.e., $\beta^{(2)} = +1.883$) whereas, the coefficient associated with the interaction term, 'Confidence × SOX' is negative (i.e., $\beta^{(3)} = -1.401$). Both are significant at less than 1%. These results indicate that prior to SOX, overconfident CEOs tended to invest more capital relative to other CEOs in their industry. After the passage of SOX, however, overconfident CEOs sharply cut capital expenditures, bringing them much closer to other firms in their industries ($= +0.483 = 1.883 - 1.401$). Hence, SOX appears to have had a significant moderating effect on capital expenditures by overconfident CEOs. As we have discussed, SOX could lead to such moderation by bringing in more independent directors, thereby facilitating divergent opinions and, possibly, candid discussions among board members. As a result, we might expect the board to question expenditures that appear to be driven more by the CEO's behavioral biases than by clear economic opportunities, thereby prodding the firm's investments closer to industry levels.[9]

[8] Clearly, it is not possible to estimate a regression with all year fixed effects and the SOX indicator. Thus, the requisite number of year fixed effects are omitted from the model, when estimating the regression.

[9] Lower capital expenditures are not necessarily good for a firm's shareholders, unless the eliminated expenditures are wasteful in nature. We investigate the value implications of the changes in CAPEX in subsequent sections and find that the changes appear to move the investment levels closer to an optimal level.

In model M2 we replace our continuous measure of CEO overconfidence, i.e., the variable 'Confidence', with the binary measure of the CEO's overconfidence, the variable 'Confidence-TopQ'. 'ConfidenceTopQ' equals one if the CEO's confidence-measure is in upper quartile of the sample for that year; otherwise, 'ConfidenceTopQ' is zero. As indicated, the results are qualitatively similar and consistent with the hypothesis that SOX restrains over-investment by overconfident CEOs.

The results are similarly supportive of our hypothesis when we estimate the above regressions with firm fixed-effects in place of industry fixed-effects (models M3, M4). For instance, in model M3 the estimated coefficient on 'Confidence' is positive (i.e., $\beta^{(2)} = 1.450$) and the coefficient on 'Confidence × SOX' is negative (i.e., $\beta^{(3)} = -0.912$), indicating that overconfident CEOs employ more capital prior to the passage of SOX but significantly reduce capital employed after the passage of SOX. These coefficients are highly significant.

4.1.2 Asset growth and SG&A expenses following SOX

We next examine the growth in the assets of firms managed by overconfident CEOs, and the changes therein following SOX. We expect overconfident CEOs, with their overly positive views on firm prospects, to seek greater asset growth, whether measured by total assets or property, plant and equipment.[10] Asset growth includes CAPEX, which was discussed above, but is also affected by the firm's policies such as its inventory management and payout. Excessive asset growth, for instance through a high level of inventory or cash retention, may not contribute to shareholder value. We test for whether SOX helps to moderate (undesirable) growth in total assets as well as in property, plant and equipment, in the following equation:

$$\begin{aligned}\text{Asset Growth}_{i,(t,t+\tau)} = \alpha + \text{SOX}_{i,t}\beta^{(1)} + \text{Confidence}_{i,t}\beta^{(2)} + \text{SOX}_{i,t} \times \text{Confidence}_{i,t}\beta^{(3)} \\ + \mathbf{X}_{i,t}\theta + \eta_i + \phi_t + \varepsilon_{i,t},\end{aligned} \tag{2}$$

[10]The reason to look at growth rates rather than scaled Asset or scaled PPE is because it is unclear as to what variable may be appropriate for scaling. Hence, we instead use growth rates of these two dependent variables.

where Asset Growth$_{i,(t,t+\tau)}$ represents the log increase in assets between from year t to year $t+\tau$, i.e., Asset Growth$_{i,(t,t+\tau)} = \ln\left[\frac{\text{Asset}_{t+\tau}}{\text{Asset}_t}\right]$, and similarly for PPE growth. We estimate a panel regression using firm and year fixed effects and standard errors that are heteroskedasticity-consistent and clustered by firm. The results with industry dummies instead of firm fixed-effects are similar and are not reported for brevity.

We report the regression results in Table 4 in models M1-M4. As conjectured, we find that the coefficient associated with the interaction terms 'Confidence × SOX' (-0.087 and -0.069) as well as the coefficients associated with the interaction term 'ConfidenceTopQ × SOX' (-0.042, -0.021) are negative in sign and statistically significant. Thus, in the pre-SOX era it appears that overconfident CEOs tended to grow the assets of their firms more rapidly than their industry peers. However, post-SOX their asset growth fell more in line with that of other firms in their respective industries.

In addition, we examine the impact of SOX on Sales, General, and Administrative expenses (SG&A) following Chen et al. (2013). Their argument is that overconfident CEOs tend to over-spend on the SG&A account, given their excessively positive views about the future demand for their products. We test whether SOX restrains SG&A spending by estimating regression models similar to those for asset growth.

The results are stated in the last two columns of Table 4. The results suggest that overconfident CEOs were not necessarily over-spending on SG&A prior to SOX, since the coefficients on 'Confidence' and 'ConfidenceTopQ' are not statistically significant in columns M5 and M6. However, consistent with our conjecture, it appears that SOX did tend to lower SG&A as indicated by the negative and significant coefficients on the interaction terms 'Confidence × SOX' and 'ConfidenceTopQ × SOX'.[11] These findings are consistent with the view that the passage of SOX restrained overconfident CEOs from (fully) acting on their excessively positive view of future demand by, for instance, heavy spending on marketing and advertising.

[11]The R-squared in the models is high. This arises because we control for lagged SG&A and we know from Chen et al. (2013) that SG&A is sticky. The R-squared are low in models that use firm dummies because firm dummies consume a lot more degrees of freedom compared to the regressions with industry dummies.

4.1.3 Sensitivity of investment to cash flows

We next examine how SOX impacts a firm's investment sensitivity to cash flows. Malmendier and Tate (2005) find that overconfident CEOs spend more of their cash flows on capital expenditures. Based on our hypotheses, we expect SOX to restrain excessive spending by overconfident CEOs and, hence, expect the investment by overconfident CEOs to become less sensitive to cash flows post-SOX. We examine the sensitivity of expenditure in year t to cash flow in year t within a framework similar to that in Malmendier and Tate (2005). This type of investment-cash-flow sensitivity model has been widely studied in the literature (see e.g., Agca and Mozumdar, 2008; Almeida et al., 2004; Brown and Petersen, 2009; Fazzari et al., 1988, 2000; Hovakimian, 2009).[12] Specifically, we run regressions of the following form:

$$\begin{aligned}\text{CAPEX/Assets}_{i,t} = \alpha &+ \text{SOX}_{i,t}\beta^{(1)} + \text{Confidence}_{i,t}\beta^{(2)} + \text{SOX}_{i,t} \times \text{Confidence}_{i,t}\beta^{(3)} \\ &+ \text{SOX}_{i,t} \times \text{Cash Flow}_{i,t}\beta^{(4)} + \text{Confidence}_{i,t} \times \text{Cash Flow}_{i,t}\beta^{(5)} \\ &+ \text{SOX}_{i,t} \times \text{Confidence}_{i,t} \times \text{Cash Flow}_{i,t}\beta^{(6)} + \mathbf{X}_{i,t}\theta + \lambda_{j(i)} + \phi_t + \varepsilon_{i,t}.\end{aligned} \tag{3}$$

Here, 'Cash Flow' represents one of the two measures of cash flows: EBIT/Assets and OCF/Assets, $\mathbf{X}$ is a vector of control variables, and ϕ_t, and $\lambda_{j(i)}$ represent year, and industry (firm) fixed effects, respectively. We anticipate a negative sign on $\beta^{(6)}$, which would suggest that SOX attenuates the tendency of overconfident CEOs to invest out of their cash flows.

The results are in Table 5. Consistent with Malmendier and Tate (2005), we find that overconfident CEOs do indeed spend more of their cash flows (i.e., we find a positive value for $\beta^{(5)}$). However, the coefficient on the triple interaction term, $\beta^{(6)}$, is negative and statistically highly significant in M1 - M4, and is negative and mostly significant in M5 - M8. This result suggests that SOX attenuates the tendency of overconfident CEOs to invest out of cash flows.

[12]The investment cash flow sensitivity models have received some criticism as measures of financial constraints. However, we do not use the model to measure financial constraints (see e.g., Chen and Chen (2012); Kaplan and Zingales (1997)). We use the model to analyze the tendency of overconfident CEOs to spend available cash flows as per Malmendier and Tate (2005).

4.2 Does SOX reduce overconfident CEOs' risk-taking tendencies?

Next we examine firms' exposure to risk – both systematic or market risk and unsystematic or firm-specific risk – under overconfident CEOs. We test for whether overconfident CEOs moderate their firm's level of risk exposure post-SOX. Our hypothesis is that overconfident CEOs tend to under-estimate the risk associated with their investment projects. Thus, firms under their control may assume an excessive level of risk. We argue that after the passage of SOX, a relatively more independent board and independent audit committee, and/or a mandate for more disclosure, leads to an environment in which it is less feasible for overconfident CEOs to have the firm take on higher levels of risk.

We examine two different types of risk: exposure to market risk (measured by beta) and the level of idiosyncratic/firm-specific risk (as per Low, 2009). We estimate beta by running a single-index model over the course of the year using daily data. The proxy for idiosyncratic risk is the mean squared error (MSE) from that single-index-model. When examining MSE, we take logs in order to mitigate concerns about skewness. The model is of the following form:

$$\begin{aligned} \text{Risk}_{t+1} = \alpha + \text{SOX}_{i,t}\beta^{(1)} + \text{Confidence}_{i,t}\beta^{(2)} + \text{SOX}_{i,t} \times \text{Confidence}_{i,t}\beta^{(3)} \\ + \mathbf{X}_{i,t}\theta + \lambda_{j(i)} + \phi_t + \varepsilon_{i,t} \end{aligned} \tag{4}$$

where, Risk can be either beta or ln(MSE), $\mathbf{X}$ represents a set of firm and CEO control variables, and ϕ_t and $\lambda_{j(i)}$ are year, and industry (firm) dummies, respectively. We cluster standard errors by firm.

The results are reported in Table 6. The results for market risk (beta) are in Columns M1 to M4, and the results for idiosyncratic risk (ln(MSE)) are in Columns M5 to M8. We find that coefficients associated with the variable 'Confidence' as well as the variable 'ConfidenceTopQ' are positive and highly significant in all the models. This suggests that overconfident CEOs expose their firms to relatively more market risk when compared with their industry peers. But after the passage of SOX these overconfident CEOs tend to reduce the level of risk

exposure considerably. For instance, in models M2 and M4 with firm and year fixed-effects, the coefficients associated with the interaction terms 'Confidence ×SOX' and 'ConfidenceTopQ × SOX' are both negative and statistically significant at less than one percent level (−0.176 and −0.106). In models M1 and M3 where we use industry and year dummies, the coefficients associated with the interaction terms are similarly negative and significant.

These results hold for firm-specific risk as well. For example, in models M6 and M8 where we use firm and year dummies, the coefficients associated with the interaction terms 'Confidence ×SOX' and 'ConfidenceTopQ × SOX' are both negative and statistically significant at less than one percent level (−0.059 and −0.038). In models M5 and M7 where we replace firm dummies with two-digit SIC industry dummies, the coefficients are negative and significant as well. Hence, SOX appears to have a significant moderating effect on the risk-taking tendencies of overconfident CEOs.

5 SOX, Overconfidence, and Corporate Performance

Our analysis so far has focused on the role of SOX in mitigating the levels (or rates of growth) of investments and risk exposure of firms with over-confident CEOs. The question that naturally arises is whether these changes contribute to firm value. We conjecture that the increased discipline associated with SOX will induce CEOs to focus on value-creating investments. For our measures of firm performance we use both market and accounting based measures. We also examine industry-adjusted measures of performance as well as the Standard & Poor's Index of Earning Quality.

5.1 Value impact of SOX on firms with overconfident CEOs

We use Tobin's Q and industry-adjusted Tobin's Q as proxies of firm-value (as per Bebchuk et al., 2009; Gompers et al., 2003). The proxies for operating performance are the firm's EBIT/Assets and industry-adjusted EBIT/Assets (following Powell and Stark, 2005). The

industry-adjusted Q (or EBIT/Assets) is the firm's Q (or EBIT/Assets) less the average Q (or EBIT/Assets) for all firms in its two-digit industry and year.

As in our earlier analysis, we examine the impact of SOX and overconfidence on firm-value by constructing a firm-year panel of all companies in Compustat that have the necessary data. We run models with two-digit SIC code based industry dummies and year dummies and also models with firm and year dummies. We cluster standard errors by firm. We also examine the salutary role of SOX on the impact of overconfidence on earnings quality. The models we estimate are of the following form:

$$\begin{aligned}\text{Performance}_{i,\,t+1} = \alpha + \text{SOX}_{i,t}\beta^{(1)} + \text{Confidence}_{i,t}\beta^{(2)} + \text{SOX}_{i,t} \times \text{Confidence}_{i,t}\beta^{(3)} \\ + \mathbf{x}_{i,t}\theta + \lambda_{j(i)} + \phi_t + \varepsilon_{i,t}\end{aligned} \tag{5}$$

where, 'Performance' refers to either (a) the firm's Tobin's Q or industry-adjusted Tobin's Q, (b) the firm's EBIT/Assets or industry-adjusted EBIT/Assets, or (c) 'Earnings Quality' that refers to the firm's S&P earnings quality rating. The EBIT and Tobin's Q regressions are OLS regressions. For earnings quality, we obtain each company's S&P earnings quality variable from Compustat (Compustat code: spcsrc). The earnings quality variable ranks the firm's quality from 'A+' through to 'D', with 'A+' being the highest. We re-code the original earnings quality variable to be a numerically ordered variable from 1 through to 8 (with a higher value representing better earnings quality) and run an ordered logit model.

The results for models that examine Tobin's Q are in Table 7. As such, the results indicate that CEO overconfidence has little effect on Tobin's Q prior to the passage of SOX. The coefficients associated with the variables 'Confidence' as well as 'ConfidenceTopQ' are not statistically different from zero.[13] But after the passage of SOX, CEO overconfidence appears to influence firm performance for the better. We find that the coefficients associated with the interaction terms 'Confidence ×SOX' and 'ConfidenceTopQ × SOX' are all positive and statistically significant. For instance, after the passage of SOX, in the model M2 with firm

[13]There is only one exception – in Column M2 where the coefficient $\beta^{(2)}$ is positive and marginally significant.

dummies and year dummies we obtain coefficient of 'Confidence' equal to $+0.239 = 0.094 + 0.145$ when we consider just Tobin's Q. When we consider industry-adjusted Tobin's Q (i.e., Column M4), the coefficient associated with 'Confidence' is equal to $+0.218 = 0.062 + 0.156$. We get similar effects when we replace our continuous measure of overconfidence with the discrete measure, 'ConfidenceTopQ'.

The results for the EBIT models are in Table 8 and are consistent with our hypotheses. As with Tobin's Q, CEO overconfidence does not significantly influence earnings prior to SOX, as indicated by the insignificant coefficients on 'Confidence' and 'ConfidenceTopQ'. However, post-SOX it appears that CEO overconfidence influences earnings in a positive way. We find that the coefficients associated with the interaction terms 'Confidence ×SOX' and 'ConfidenceTopQ × SOX' are all positive and highly significant. We get similar effects when we replace our continuous measure of overconfidence with the discrete measure, 'ConfidenceTopQ'. This suggests that SOX helps to redirect overconfident CEOs towards investments that create more shareholder wealth.

The earnings-quality models are presented in Columns M7 and M8. As noted, the dependent variable is a discrete ordered variable that represents the company's S&P earnings quality. A positive coefficient on a variable indicates that it is associated with higher earnings quality. The results suggest that CEO overconfidence weakly but negatively affects earnings quality. After the passage of SOX, firms with overconfident CEOs appear to improve the earnings quality of their firms. Thus, results from Table 8 support the view that SOX encourages overconfident CEOs to both increase earnings and improve the quality of those earnings.

5.2 Values of R&D and CAPEX

Next, we study the impact of CEO overconfidence (pre and post-SOX) on values of R&D and CAPEX. This is important to interpreting our result that post-SOX, overconfident CEOs reduce CAPEX significantly. Hence, the question we would like to address is whether SOX

helps to eliminate relatively wasteful expenditures. We do this analysis by using a triple interaction term of 'Confidence×SOX' times either CAPEX/Sales or R&D/Sales. We also, run separate regressions for the pre-SOX and the post-SOX periods and observe the sign and significance of the double interaction term between 'Confidence' and either CAPEX/Sales or R&D/Sales. The dependent variable in these models is the firm's industry adjusted Tobin's Q in year $t+1$ (the results are robust to using straight Tobin's Q instead of industry adjusted Tobin's Q). For brevity, we only report models that include firm fixed effects and year fixed effects and cluster standard errors by firm. The results are similar in models with industry (instead of firm) fixed effects.

The results in Table 9 support the hypothesis that SOX positively moderates the impact of confidence on the value of R&D (in Panel A) and CAPEX (in Panel B). The triple interaction terms 'Confidence × SOX × R&D/Sales' and 'ConfidenceTopQ × SOX × R&D/Sales' are 1.910 and 1.941 respectively – both positive and statistically significant at less than 1% level. Further, there are economically significant differences between the impact of CEO confidence on the value of R&D between the pre-SOX and post-SOX periods. For example, the coefficient on 'Confidence× R&D/Sales' is negative (-2.376) and highly significant in the pre-SOX period whereas the same coefficient is positive though insignificant in the post-SOX period. Overall, this suggests that SOX significantly improves the impact of overconfidence on the value of R&D.

The results in Table 9 (Panel B) indicate that SOX positively influences the impact of CEO confidence on the value of CAPEX. As with Panel A, the key variables of interest are the triple interaction terms in Columns M1 and M4. Both triple interaction terms are positive and significant at the 5% level. Further, whereas CEO confidence significantly negatively affects the value of CAPEX in the pre-SOX period (i.e., Columns M2 and M5) it has an insignificant effect on value in the post-SOX period (i.e., Columns M3 and M6). These results are consistent with the notion that SOX encourages overconfident CEO's to focus on value-creating capital expenditures.

5.3 Overconfidence and Acquisitions

We next look at acquisitions by overconfident CEOs. We analyze announcement returns over both short and long windows. Further, we look at post-takeover performance, as proxied by industry-adjusted Tobin's Q and EBIT/Assets. We expect SOX to encourage overconfident CEOs to create more value (or, at least, destroy less value) in acquisitions (Hypothesis 7). We examine this by collecting data on acquisitions made by firms for which we have the necessary data on executive compensation and governance. The acquisition must be announced between 1992 and 2011 to appear in the sample.

We start with an examination of the cumulative abnormal returns (CARs) over various event-windows. The CARs are based an OLS estimation of the market model from 125 days to 375 days before the acquisition announcement. Figure 1 plots the CARs. The figure reveals that there is a significant negative pre-announcement run-up and post-announcement decline for acquisitions by overconfident CEOs. The decline is less negative for overconfident CEOs after SOX than it is before SOX. The pre-announcement and post-announcement returns are largely consistent with prior studies, documenting a relatively low cumulative abnormal return for acquirers on average (as per Duchin and Schmidt, 2013; Humphery-Jenner and Powell, 2011). We obtain similar results if we look at the sub-set of acquisitions of public targets, with acquisitions of publicly listed targets generally performing worse (as per Chang, 1998; Fuller et al., 2002). This figure does not control for other firm-level and deal-level factors that might drive acquisition performance, which leads us to conduct multivariate tests.

We examine the long-run post-acquisition performance, as proxied by post-acquisition BHAR, and industry-adjusted Tobin's Q and industry-adjusted EBIT/Assets (as in Harford et al., 2012; Healy et al., 1992; Powell and Stark, 2005).[14] The industry-adjusted Q values are the firm's value less the mean value for all companies in the firm's two-digit SIC industry and year. We control for factors that are standard in the literature for examining long-run

[14]We focus on long-term performance due to evidence that it can take some time for the market to fully impound the value created by a takeover. See, for example, Masulis et al. (2013) for more details.

post-takeover performance. For an acquisition that is announced in year t, we run a model of the following form:

$$\begin{aligned}\text{Performance} = \alpha + \text{SOX}_{i,t}\beta^{(1)} + \text{Confidence}_{i,t-1}\beta^{(2)} + \text{SOX}_{i,t} \times \text{Confidence}_{i,t-1}\beta^{(3)} \\ + \mathbf{X}_{i,t}\theta + \lambda_j + \phi_t + \varepsilon_{i,t}\end{aligned} \tag{6}$$

where the vector of controls, $\mathbf{X}_{i,t}$, contains a set of standard control variables, that are lagged as appropriate to ensure that they pre-date the acquisition announcement. We include year dummies and industry dummies, to account for the documented industry and time-effects in mergers (e.g., Harford, 2005; Ovtchinnikov, 2013; Powell and Yawson, 2005, 2007) and cluster standard errors by firm.

The results for short-horizon windows are in models M1 and M2 in Table 10. The dependent variable is the acquirer's short-run abnormal return on announcing the takeover. As in Malmendier and Tate (2005), CEO overconfidence is negatively related to acquisition-performance. However, the relationship between CEO overconfidence and short run returns is not statistically significant (consistent with Kolasinski and Li, 2013).[15] The results do not suggest that SOX significantly changes the impact of overconfidence on acquisition returns. However, given that Figure 1 suggests that the negative returns manifest themselves over a longer time horizon in our sample, this is not surprising.

The results on long-horizon market-performance are in models M3-M6 of Table 10 and are consistent with the notion that SOX tends to enhance the value created in acquisitions by overconfident CEOs. CEO overconfidence is negatively related to long-term value creation, as proxied by BHARs. However, SOX positively affects the relationship between CEO overconfidence and long-term value-creation from acquisitions. The results in relation to long-run operating performance (models M7 and M8) and long-run value (models M9 and M10) support the BHARs-results. They indicate that while overconfident CEOs are associated with signifi-

[15]Specifically, the coefficient on *Confidence* is consistent with that on the analogous *Underdiversified* in Table 4 of Kolasinski and Li (2013).

cantly lower post-acquisition operating returns and market values, SOX helps to mitigate the impact of CEO overconfidence.

In unreported results, we further examine whether SOX influences the acquisitiveness of overconfident CEOs. This follows from prior evidence, in Kolasinski and Li (2013), that overconfident CEOs tend to be more acquisitive. We obtain the number and value of acquisitions that each firm does in each year, as reported in SDC Platinum. We find that while overconfident CEOs do significantly more acquisitions, and spend more on acquisitions, SOX does not significantly influence acquisitiveness. Thus, the results suggest that while SOX did not reduce the number of acquisitions that overconfident CEOs do, it did improve their value-implications.

The foregoing analysis points to the fact that, after the passage of SOX, firms run by overconfident CEOs cut their investments (CAPEX, PPE, etc.) and at the same time improve the quality of their investments. Hence, these firms are likely to accumulate relatively high free cash flows. This begs the question of whether these overconfident CEOs hold on to these liquid assets or whether they disburse them to shareholders in the form of dividends.

6 Overconfidence and dividend payout

The foregoing results indicate that SOX helped to attenuate investment by overconfident CEOs – but how did overconfident CEOs employ the capital that they did not spend? Deshmukh et al. (2013) indicate that overconfident CEOs are reluctant to pay dividends. However, if the company has no additional positive NPV projects and a lower or unchanged precautionary motive for cash holdings, our prediction is that it may be optimal to distribute at least part of the excess cash flow to shareholders. We examine whether SOX mitigated the reluctance of overconfident CEOs' to pay dividends. We test this using a regression approach similar to that employed above, in which we examine the impact of SOX on dividend payments by overconfident CEOs.

The results are in Table 11 and are consistent with our prediction. We find that the coefficients on the overconfidence measures, "Confidence" and "ConfidenceTopQ" are −0.232 and −0.124 in Columns M2 and M4 which presents models with firm and year dummies. This is consistent with the findings documented in Deshmukh et al. (2013) that overconfident CEOs prefer to limit dividend payments. But we also find that the coefficients associated with the interaction terms 'Confidence × SOX' and 'ConfidenceTopQ × SOX' are 0.284 and 0.147 in models where we control for firm fixed effects. The results are similar when we replace the firm dummies with two-digit SIC code based industry dummies. These results indicate that after the passage of SOX, overconfident CEOs started to pay significantly higher dividends.

It is important to note one caveat with these results: In 2001, the U.S. government reduced the personal tax payable on dividends, potentially making dividends a more favorable way for companies to return cash to shareholders. We address this caveat below.

7 Extensions and robustness tests

We conduct a series of tests to address alternative explanations and to mitigate potential concerns about the robustness of our results.

7.1 Pre-SOX Voluntary Compliance and Overconfidence

We take further steps to both refine the paper's identification strategy and to identify the mechanism-of-action through which SOX moderated the impact of overconfidence. We do this by examining the impact of SOX on companies that satisfied SOX's board and audit-committee independence requirements even before the passage of SOX, as compared with those companies who did not comply. A finding that SOX impacts only the non-compliant firms would indicate that the improvements in board/audit-committee independence drive the moderation of CEO overconfidence.

We cross-validate our results by analyzing the impact of SOX on firms that already satisfied

the requirements of SOX. We have argued that SOX enhanced the operations and value of firms with overconfident-CEOs by improving governance and oversight. However, if our argument is valid, it should also imply that companies that were already compliant should see no improvement on the passage of SOX. That is, SOX should not moderate the impact of overconfidence in firms that already met SOX's requirements before its passage. We test this by separately examining the impact of SOX in the 'compliant' firms and in the 'non-compliant' firms. We define the compliant firms as those that had both a majority independent board and a fully independent audit committee before SOX (in 1998-2001).[16] All firms that are not compliant are regarded as non-compliant. We focus on firms being compliant with both the board independence requirement (from the NYSE and NASDAQ rules) and the audit committee independence requirement (from SOX) as they were concurrent, SOX inspired the rule-changes, and the two changes worked in tandem to improve oversight (Clark, 2005). We then undertake several additional robustness tests.

Compliant/non-compliant comparison:

We analyze the impact of SOX on overconfident managers for compliant and non-compliant firms, using both the continuous measure of overconfidence (*Confidence*) and the indicator variable (*ConfidenceTopQ*). The sample is restricted to companies that were listed during the SOX period. It is worth noting that because the sample contains only S&P 1500 firms (covered by Execucomp), there would be few, if any, firms that could seek an exemption to SOX's requirements (as such exemptions would only apply to small firms). Further, while it is possible that some firms would delay compliance with SOX, this would actually weaken the ability to identify clear differences between the compliant and non-compliant firms.

We report results for the *Confidence* measure for non-compliant firms in Table 12 and in Table 13 for compliant firms. It is clear from the tables that the interaction terms are significant only in the non-compliant sample. They are not significant in the compliant sample.

[16]We require compliance in all four years because firms that become compliant in 2001 might have been influenced by the legislative deliberations/public discussion prior to actual passage of SOX.

Similar results are obtained when we use the *ConfidenceTopQ* instead (unreported for brevity). We also obtain qualitatively similar results (unreported) if we restrict the sample-period to 1998-2004 (i.e., a tighter time-window around SOX).

We report M&A results split by whether the firm was compliant in Table 14. The general nature of the results is that SOX has a more significant impact on the firms that were non-compliant with SOX prior to its passage. However, compliant firms still experience a benefit, suggesting that other provisions in SOX (such as the imposition of personal liability on CEOs) could also have influenced managerial behavior.

Overall, these results imply that the key mechanism of action is the change in board-composition. The theory behind this is that the increased board-independence forces CEOs to consider other non-overconfident views, and also prevents overconfident CEOs from acting on their overconfident beliefs.

Compliant/non-compliant firms in regressions by year: We present regressions by year for the years around SOX for both the compliant and non-compliant firms. Here, we focus on the coefficient on the *Confidence* variable in a yearly regression of *Confidence* onto CAPEX/Assets, EBIT/Assets, and Tobin's Q. We split the results by whether the firm was compliant or non-compliant. We report the coefficient on *Confidence* for the non-compliant firms in Columns 1-7 of Table 15 and those for the compliant firms in Columns 8-14. There are several interesting results. Before SOX, *Confidence* significantly increases CAPEX for non-compliant firms, but does not do so post-SOX. There is, however, no change in the impact of *Confidence* for the compliant firms. Similarly, *Confidence* significantly reduces Tobin's Q for non-compliant firms prior to SOX, but not after its passage. SOX; for compliant firms, however, no such SOX-related change is evident. Finally, for non-compliant firms, *Confidence* is significantly and positively associated with EBIT/Assets post-SOX, but not pre-SOX; there is no such change for compliant firms.

Alternative SOX indicator equalling one only if firm was non-compliant prior to SOX: We also check that the results are robust to using an alternative SOX indicator, SOX^*, that equals

one if the observation is post-SOX and the firm was not previously compliant with SOX and equals zero otherwise (i.e., if the observation pre-dates SOX or if the firm was previously SOX-compliant). This indicator helps to distinguish the treated group (i.e., those that were not compliant with SOX) from the control (i.e., compliant) group. This follows a similar approach to that in Duchin et al. (2010). As above, SOX-compliant firms are defined as those with both a majority independent board and a fully independent audit committee. The 'main' models in the paper are estimated using this alternative indicator and the results are reported in Table 16. The results with the alternative indicator are qualitatively similar to those obtained earlier with the SOX indicator.

7.2 Placebo test - the impact of SOX on less confident managers

We conduct placebo tests to examine the impact of SOX on less confident managers. We do this by creating an indictor for whether the "Confidence(t)" measure is in the bottom quartile of all firms in that year, which we denote "ConfidenceBottomQ(t)". We then re-run the models by replacing the confidence measures with the "ConfidenceBottomQ(t)". We also run tests in which we further exclude firms with confidence in the top quartile from the control sample (in order to ensure that we are not just looking at the mirror image of highly overconfident managers). The results (unreported for brevity) indicate that SOX is not associated with a reduction in investment or risk taking, and is not associated with improvements in value, acquisition performance, earnings, or dividends for firms in the bottom quartile of confidence. In other words, the SOX-effect observed for high-confidence managers is not observed for low-confidence managers.

7.3 Additional overconfidence measures and endogeneity issues

We take additional steps to mitigate endogeneity concerns and examine alternative measures of overconfidence. One issue is that the variable, as constructed, reflects how in-the-money

the CEO's options are. This could be related to strong future prospects, raising the possibility of reverse causality affecting our results.

However, we claim that endogeneity is not likely to be a major concern for several reasons. First, this potential source of endogeneity would actually bias *against* finding the results that we obtain. This is because the impact of overconfidence on corporate value is insignificant or negative, both in our results and in prior literature (see e.g., Malmendier and Tate, 2005). Whereas, if endogeneity were an issue, one would expect a positive relationship between the CEO overconfidence measure and firm-value. Second, the fact that we find strong changes in the impact of overconfidence on firm policy and value following an exogenous shock (SOX) indicates that the results are not being driven by endogeneity. Third, the additional finding that SOX did not influence the impact of overconfidence in compliant firms (see above) lends further support to the direction of causality being from CEO overconfidence to value and other firm policies. Fourth, prior literature suggests that risk-taking traits (including overconfidence) are personality attributes that tend to derive from genetic-characteristics (Cesarini et al., 2009; Cronqvist et al., 2014; Cronqvist and Siegel, 2013), and/or early life experiences (Bernile et al., 2014).

Media Based Measure of Overconfidence

The reverse-causality story largely pertains to the relationship between options and corporate outcomes. Such endogeneity is less likely to be a concern for the alternative press-based measure of overconfidence. Prior studies have used press-based measures of overconfidence, usually based on a comparison of the number of articles that report a CEO as being confident with those that report the CEO as being non-overconfident (see e.g., Hirshleifer et al., 2012; Shu et al., 2013). We follow a similar method and construct a 'Net News' measure, which is equal to the number of articles that report the CEO as confident less the number that report the CEO as non-overconfident. We obtain news articles by conducting a Factiva keyword search (as in Hirshleifer et al., 2012) of articles in the New York Times, US Today, Business Week, and Wall Street Journal. We have this data for the years 2000, 2004, 2006. We run

the analysis between the years 2000-2006 and fill data for the years in which we are missing news-articles. Specifically, if the firm lacks news-data for year t then we use the data available from year $t-1$.[17] We report results for the main set of models in Table 17. The important finding is that the results are qualitatively similar to those obtained with option-based measures, indicating robustness of the results to alternative proxies for overconfidence.

Options relative to CEO compensation

A concern about some option-based overconfidence measures is that they do not capture whether the vested options are economically important to the CEO. One way to get at this is to divide the value of the options by the CEO's salary. We construct this measure by taking the natural log of one plus the ratio of the total value of vested but unexercised options scaled by the CEO's total compensation (Execucomp: tdc1). For brevity, we only report a sub-set of the results. The results are in Table 18 and are qualitatively similar to those in the main models.

Other measures of overconfidence

Another concern is that the reported overconfidence measures are based on option prices; and thus, are sensitive to the performance of the market. We argue that this is not likely to drive the results because the reported models also use the "ConfidenceTopQ(t)" indicator, which indicates whether the confidence measure is in the top quartile in year t. Given that this measure ranks firms within each year and that all firms are exposed to market forces, this variable helps to partially mitigate the concern that the results merely reflect changes in the value of options due to changes in market conditions. Nonetheless, in addition to the above press-based measure of overconfidence, we ensure that the results are robust to several alternative definitions of overconfidence:

1. The results hold if we use cut-offs other than the top quartile to identify the highly overconfident CEOs. That is, if we examine CEOs with confidence measures in the top

[17]The results are largely robust to using a backfilled measure (i.e., if the data is missing for year t, then using the data from year $t+1$), presumably on account of persistence in the confidence measures.

50% through to top 10%.

2. We construct the aforementioned Holder67-type variable, which equals one if the CEO's confidence exceeds 67%. This reflects the technique that Malmendier et al. (2011) use to construct Holder67 using publicly available data. Such levels of confidence are associated with deep in the money options, for which an increase in risk will lead to only a minimal increase in option value. Thus, this set of CEOs is unlikely to engage in risk-taking purely for the reason of increasing their option value. The results hold if we replace our confidence-measures with this Holder67-type measure.

3. The results hold if we construct dummy variables that equal one if the CEO's over-confident measure, "ConfidenceTopQ", equaled one in any prior year, which we call "PriorTopQ". The interpretation of "PriorTopQ" is that it reflects overconfidence as a behavioral trait of the CEO. We also construct a variable "AnytimeTopQ", which equals one if the CEO's "ConfidenceTopQ" variable equals one in any year (either before or after the present year). This variable works on the assumption that overconfidence is a behavioral attribute that can manifest itself after the present year, even if the CEO does not currently appear to be overconfident. When using these results, we focus on models that include year fixed effects and industry fixed effects (rather than firm fixed effects) due to the firm-time-invariant nature of "AnytimeTopQ". The results hold if we replace the confidence variables with "AnytimeTopQ" or 'PriorTopQ".

4. We address the possibility that the *Confidence* measure merely reflects private information about future performance.[18] We obtain a 'residual' confidence measure (*Confidence Resid FR*), which is the residual from a regression of the *Confidence* variable onto stock returns from year $t+1$. This *Confidence Resid FR* represents the portion of *Confidence*

[18]The approach in Kolasinski and Li (2013) is not ideal in our framework – their measure is premised on the CEO purchasing stock in their own company and losing money on that purchase. But such a loss presupposes that the company performs poorly, potentially creating a mechanical relationship between their measure and many of our dependent variables.

that does not merely reflect future performance. The results (unreported) are robust to using this alternative measure, suggesting that private information about future stock performance is unlikely to drive our results.

Further, the argument that CEOs rationally hold well-in-the-money options due to private information, would suggest a fair degree of transience in the CEO's tendency to hold these options (i.e., he/she would hold them if and only if they have positive private information). Around 18% of the sample transitions to/from the top quartile in confidence in any given year. The results (unreported) are robust to dropping from the sample any observation where the CEO transitions from being highly overconfident (not overconfident) in year $t-1$ to being non-overconfident (highly overconfident) in year t.

5. To address the issue that the *Confidence* measure might merely be an artifact of prior performance, we estimate a *Confidence Resid LR* measure, which is the residual of a regression of *Confidence* onto the firm's lagged stock return (or stock market return). This measure represents the portion of *Confidence* that does not merely reflect prior stock performance. The results (unreported) are robust to using this *Confidence Resid LR* measure. Results are similarly robust when using a residual measure based on the news-based measure of overconfidence instead.

6. The results are robust to using further lags of the overconfidence measure (in the reported results, the overconfidence measures date from year t while the outcome measures date from year $t+1$).

7. The results are also robust to using the natural log of the number of unexercised exercisable options (rather than their value), which would arguably be less subject to endogeneity concerns.

8. The results are robust to replacing the "Confidence" measure with the natural log of the total value of the CEO's unexercised, but exercisable, options (as per Li et al., 2012;

Schrand and Zechman, 2012).

7.4 Other robustness tests

Dividends and the Bush tax cut

In 2001, during the Bush administration, there was a reduction in the tax rate that shareholders paid on dividends. This could arguably induce low-dividend companies to increase dividends, thereby raising the concern that our reported results merely reflect the impact of the tax-cut rather than of SOX. Indeed, as noted above, the effect of SOX on dividends appears to be significant for compliant firms as well as for non-compliant firms. More important, however, is that the economic magnitude of SOX on dividends is far smaller for complaint firms. Comparing the coefficients on 'SOX' and 'SOX×ConfidenceTopQ' in Tables 12 and 13, it is evident that SOX has an economically larger effect on dividends for the non-compliant firms than for the compliant firms. That is, while the we expect the dividend tax cut to influence dividends, it is unlikely to account for the entire SOX effect on dividend payments by overconfident managers.

Robustness to changes in sample composition

We take steps to mitigate possible concerns that the results could be affected by the sample composition and/or improvements in Execucomp's data. We do this by examining the subsample of observations for the 1998-2006 period for firms that are in the database for all of 1998-2006 (i.e., a sample that does not change over the tight window surrounding SOX). For these tests, the results (unreported) are qualitatively similar to the reported results.

CEO age and gender

One issue is that there may be a significant relationship between age and risk-taking (see e.g., Kim, 2013a; Waelchi and Zeller, 2013). The reported models control for CEO age. However, we also find that the results are qualitatively robust to splitting the sample based on median CEO age, suggesting that mere CEO age does not drive the results. The results

are also robust to controlling for CEO-gender, which Levi et al. (2010) indicate is correlated with overconfident-like behavior, such as the tendency to undertake acquisitions.

Governance factors

We take steps to ensure that the confidence-effect does not merely reflect corporate governance factors. Our main models control for CEO-level governance characteristics and institutional ownership, suggesting that governance-characteristics do not explain the SOX/overconfidence relationship. The main models do not control for anti-takeover provisions because requiring ATPs significantly reduces the sample size. Nonetheless, as indicated in Table 19, our results are robust to controlling for managerial entrenchment. We also examine models where we control for both the state-average Bebchuk et al. (2009) entrenchment-index and the firm's entrenchment index.[19] The results obtained are similar to those in Table 19 and are untabulated for brevity.

Time from IPO

The results are robust to excluding companies that became public only recently. The concern is that CEOs in newly public firms often obtain options at the IPO issue-price rather than the first-day-close price (see e.g., Lowry and Murphy, 2007), allowing them to benefit from underpricing. This could lead to CEOs in some newly-public firms having deep in the money options, giving the appearance of overconfidence. It could be argued that the retention of such options would still connote overconfidence, since these CEOs would be rationally expected to exercise the deep in the money options, just as CEOs of established firms. Nonetheless the results, which are untabulated for brevity, are similar to the reported results.

Time effects and industry effect

The results are robust to industry and time effects. In the reported models, we include two-digit SIC dummies and year dummies, or firm and year dummies. All models cluster standard errors by firm. The results are robust to including industry dummies at various SIC

[19] We examine the state average values on grounds that the degree of entrenchment that is allowed depends on the laws of the firm's state-of-incorporation, and the prior literature suggests that there might be a race-to-the-bottom in corporate governance (McCahery and Vermeulen (2005)).

digit levels (or none at all), to excluding year-dummies, or to clustering by industry or year instead of by firm. The results are also robust to using either NAICS 3-digit industries or Hoberg and Phillips (2010) industries for all industry-adjustments and fixed effects. We also obtain qualitatively similar results if we cluster by year, industry, or double-cluster by firm and year.

The results are not due to any one time period. The results hold when we look at smaller windows around SOX in 2002 and restrict the sample to 1998-2004 or 1999-2003. The results are also qualitatively similar if we omit the tech-crash years of 2000 and 2001, or if we remove all high-tech firms from the sample.[20] The results are also robust to omitting the financial crisis years (2007 onwards).

Another concern is that the purported impact of SOX could be affected by the response to back-dating scandals during this period. We address this by using Corporate Library to identify firms with any backdating occurrences. The results (unreported) are robust to excluding these firms from the sample.

CEO turnover

The results are robust to excluding firms that experience a CEO changeover around SOX in 2002 (i.e., for whom the CEO in 2001 is different from the CEO in 2003). Thus, the results do not merely reflect a mechanical change in overconfidence owing to a change in CEO.

M&A and large loss deals

The M&A results are robust to controlling for the presence of 'large loss' and 'large gain' deals. Outlying 'large loss' deals can account for a significant portion of value-destruction in acquisitions (see Moeller et al., 2005). Conversely, 'large gain' deals account for a significant portion of value-creation in acquisitions (see Fich et al., 2012). We address the presence of such outlying deals by ensuring that the results (unreported) hold in quantile regressions (i.e.,

[20]Specifically, we define high-tech firms, following Loughran and Ritter (2002), as those whose industries are in computer hardware (SIC: 3571, 3572, 3575, 3577, 3578), communication equipment (SIC: 3661, 3663, 3669), electronics (SIC: 3671, 3672, 3674, 3675, 3677, 3678, 3679), navigation (SIC: 3812), measuring (SIC: 3823, 3825, 3826, 3827, 3829), medical (SIC 3841, 3845), telecommunications equipment (SIC: 4812, 4813), communication services (SIC: 4899), software (SIC: 7371, 7372, 7373, 7374, 7375,7378, 7379).

median regressions) and robust regressions and to omitting from the sample acquisitions where the 'performance' variable (i.e., CAR, BHAR, Q, or EBIT/Assets, as applicable) is in the top 1% or bottom 1% of the sample.[21]

Overconfident CEOs tend to be more acquisitive, which could inflate goodwill and, hence, the value of assets for acquisitive versus non-acquisitive firms. This could potentially bias the results. We find that the results (unreported) are robust to subtracting goodwill from the firms' book assets for all variables that are based on assets, suggesting that the presence of goodwill does not qualitatively affect our results.

Modeling technique

The reported models are ordinarily OLS models with various combinations of fixed effects. Some of the dependent variables are bounded above zero and/or below one. Hence, we verify that the results are robust to using tobit models (also with various combinations of fixed effects). The results are unreported for brevity and are qualitatively similar to those reported in the paper.

8 Conclusion

The literature suggests that CEO overconfidence can convey benefits as well as costs. While CEO overconfidence is associated with innovation (see e.g., Hirshleifer et al., 2012), it is also associated with over-investment and risk-taking (see e.g., Malmendier and Tate, 2005, 2008), potentially leading to increased CEO turnover (Campbell et al., 2011). We hypothesize that improving internal governance and disclosure can help to restrain overconfident CEOs. Hence, appropriate changes to governance and advisory structures could help capiltalize on the optimism of overconfident-CEOs to create shareholders value. The concurrent passage of Sarbanes-Oxley and changes to the NYSE/NASDAQ listing rules (collectively 'SOX'), though not usually attributed to CEO overconfidence, serves as a natural experiment to test whether

[21]Note that all continuous variables are winsorized at 1%.

increased oversight and exposure to diverse view-points from majority independent boards improves decision-making by overconfident CEOs.

Our results are striking. We find that SOX reduces over-investment and risk-taking by overconfident CEOs. Further, SOX enhances the impact of CEO-overconfidence on firm-value, earnings, earnings-quality, the value of R&D, and the value of CAPEX. Post-SOX, overconfident CEOs' acquisitions create significantly more value (or at least destroy significantly less value). We also find evidence that SOX is associated with an increase in dividends by overconfident CEOs.

The paper provides novel evidence on the consequences of SOX and of changes to the NYSE/NASDAQ listing rules: the ramifications appear to go well beyond limiting expropriation and perquisite consumption by powerful CEOs. Hence, at least to a degree, the benefits may be an unintended consequence of the legislation – coming in the form of moderating the excesses of highly overconfident CEOs. In terms of policy, our findings may not easily extrapolate to other types of broad governance mandates that may have been proposed or enacted. Burdensome constraints on a firm's management could well be counterproductive by overly restricting overconfident CEOs. In the specific case of SOX and the listing rule changes, and CEO overconfidence, however, the law appears to have imposed a beneficial restraint on the excesses of overconfident-CEOs and to have enhanced shareholder wealth and social welfare.

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Appendix 1: Definition of Variables

Table A1: Variable Definitions

This table contains the variable definitions. All continuous variables are winsorized at 1% unless otherwise specified.

Variable	Definition
Overconfidence Measures	
Confidence	A measure of how in-the-money the CEO's vested stock options are. First, we obtain the total value-per option of the ITM options by dividing the value of all unexercised exercisable options (Execucomp: opt_unex_exer_est_val) by the number of options (Execucomp: opt_unex_exer_num). Next we scale this 'value-per-option' by the price at the end of the fiscal year as reported in (Compustat: prcc_f)
SOX Measure	
SOX	An indicator that equals one if the observation occurs in 2002 or later and equals zero otherwise
Performance Measures	
MTB	The firm's market-to-book ratio, being its market value at the end of the fiscal year (CRSP/Compustat: prcc_f × csho) divided by its book assets (Compustat: at)
Ind Adj MTB	The firm's industry adjusted Tobin's Q, defined as its Tobin's Q less the average Tobin's Q for all firms in its two-digit SIC industry and year.
EBIT/Assets	The firm's EBIT (Compustat: ebit) scaled by its book assets (Compustat: at)
Ind Adj EBIT/Assets	The firm's EBIT/Assets less the mean EBIT/Assets for all companies in the firm's two-digit SIC industry and year
Risk Measures	
Beta	The firm's beta as estimated using a single index model using daily stock returns over the course of the year with an CRSP equally weighted market index.
ln (Variance)	The firm's daily stock price variance over the course of the year.
ln (MSE)	The mean squared error from the estimation of the single index model (above) over the course of that year.
Governance Variables	
ln (CEO Tenure)	The natural log of one plus the number of years that the CEO has been the CEO of the company.
ln (CEO Age)	The natural log of the CEO's age
CEO Bonus/Salary	The ratio of the CEO's bonus payment as ratio of his/her fixed salary
CEO%Ownership	The percentage of the firm that the CEO owns
Inst%Ownership	The percentage of the firm that institutional investors owns
BCF	The Bebchuk et al. (2009) entrenchment index. We use this in robustness tests in Table 19. The data is from IRRC/Risk Metrics.
State Ave BCF	The average Bebchuk et al. (2009) entrenchment index for all companies in the subject-company's state and year. We use this in robustness tests in Table 19. The data is from IRRC/Risk Metrics.
Corporate Variables	
Cash/Assets	The firm's cash holdings (Compustat: ch) divided by its book assets (Compustat: at)
R&D/Sales	The firm's R&D expenditure (Compustat: xrd) divided by its sales (Compustat: sale)
CAPEX/Assets	The firm's capital expenditures (Compustat: capx) scaled by its assets (Compustat:at)
CAPEX/Sales	The firm's capital expenditure (Compustat: capx) divided by its sales (Compustat: sale)
Ln (Assets)	The natural log of the firm's book assets (Compustat: at)
Debt/Assets	The firm's long-term debt (Compustat: dltt) scaled by its assets (Compustat: at)
Intangibles/ Assets	The firm's intangible assets (Compustat: intan) scaled by its total book assets (Compustat: at)
Stock Return	The firm's cumulative daily stock return over year t. The data is from CRSP
Stock Std Dev	The firm's standard deviation of daily stock returns over year t. The data is from CRSP
Prop No Trade Days	The proportion of days in year t on which there was no trade in the company's stock
Acquisition Characteristics	
CAR(-5,5)	The acquirer's cumulative abnormal return from five days before the acquisition announcement to five days after the acquisition announcement. The cumulative abnormal return on day t is the firm's raw return less the return predicted by a market model. We obtain the market model parameters using an OLS estimation of the market model from 125 days before the acquisition announcement for a period of 250 days.

CAR(-42,126)	The acquirer's cumulative abnormal return over the period 42 days before the acquisition announcement to 126 days after the acquisition announcement. The cumulative abnormal return on day t is the firm's raw return less the return predicted by a market model. We obtain the market model parameters using an OLS estimation of the market model from 125 days before the acquisition announcement for a period of 250 days.
BHAR(-5,250)	The buy and hold abnormal return earned from holding the acquirer's stock from five days before the acquisition announcement to 250 days after the acquisition announcement. The abnormal returns are based on a market model with parameters estimated using OLS from 11 days to 210 days before the acquisition announcement.
Diversifying Deal	A dummy variable that equals one if the bidder and target are in different SIC two-digit industries and equals zero otherwise.
Run-up	The acquirer's cumulative abnormal return earned over the period 260 days to 11 days before the acquisition announcement.
Competed Deal	A dummy variable that equals one if there is more than one bidder and equals zero otherwise.
Tender offer	A dummy variable that equals one if the deal was a tender offer and equals zero otherwise.
Tender offer	A dummy variable that equals one if the target is publicly listed and equals zero otherwise.
Cash only	A dummy variable that equals one if the method of payment was 100% cash and equals zero otherwise.
Rel Deal Size	The ratio of the target's market capitalization scaled by the acquirers assets.
ln(Transaction Value)	The natural log of the deal value

Tables

Table 1: Sample Composition by Year

This table contains the sample composition by year. Variable definitions are in the appendix. Figures are sample averages. We define Δ Confidence = Confidence(t) - Confidence(t-1).

Year	Num Obs	Confidence(t)					Δ Confidence
		Mean	Median	25^{th} Pctile	75^{th} Pctile	Std Dev	
1992	198	0.329	0.301	0.153	0.459	0.241	
1993	633	0.348	0.325	0.137	0.525	0.258	-0.017
1994	910	0.311	0.274	0.086	0.478	0.259	-0.057
1995	944	0.337	0.319	0.126	0.499	0.252	0.025
1996	998	0.356	0.337	0.132	0.550	0.258	0.007
1997	1,049	0.411	0.418	0.200	0.601	0.278	0.035
1998	1,090	0.365	0.364	0.105	0.584	0.283	-0.076
1999	1,148	0.348	0.292	0.039	0.587	0.316	-0.052
2000	1,190	0.355	0.319	0.043	0.582	0.370	-0.012
2001	1,246	0.304	0.251	0.063	0.488	0.276	-0.053
2002	1,374	0.220	0.151	0.004	0.368	0.232	-0.095
2003	1,436	0.322	0.291	0.103	0.487	0.271	0.080
2004	1,513	0.357	0.343	0.156	0.526	0.249	0.016
2005	1,492	0.355	0.330	0.122	0.534	0.287	-0.010
2006	1,510	0.380	0.364	0.165	0.554	0.268	0.007
2007	1,597	0.337	0.300	0.082	0.537	0.298	-0.047
2008	1,546	0.165	0.047	0.000	0.280	0.223	-0.174
2009	1,525	0.201	0.121	0.000	0.338	0.226	0.033
2010	1,468	0.257	0.202	0.050	0.409	0.242	0.058
2011	1,253	0.244	0.179	0.032	0.407	0.242	-0.018

Table 2: Summary Statistics

This table shows the summary statistics of all the variables. We depict sample averages, median 25^{th} and 75^{th} percentile of all of our variables of interest as well as our control variables. These are averages over all years between 1992 and 2011.

Variable	Mean	Median	25^{th} Pctile	75^{th} Pctile	Std Dev
Panel A: Statistics for the panel data sample					
Confidence	0.309	0.268	0.062	0.496	0.277
Beta	1.244	1.157	0.799	1.576	0.654
MSE	0.024	0.021	0.015	0.030	0.013
Variance	0.100	0.058	0.031	0.116	0.142
Q	1.324	0.935	0.509	1.649	1.299
Ind Adj Q	-0.034	-0.195	-0.624	0.240	1.127
EBIT/Assets	0.085	0.085	0.042	0.133	0.095
Ind Adj EBIT/Assets	-0.001	-0.001	-0.036	0.040	0.088
Assets	8702	1593	528	5389	24983
PPE/Assets	0.535	0.444	0.220	0.782	0.400
LT Debt/ Assets	0.192	0.170	0.038	0.299	0.168
R&D / Assets	0.042	0.000	0.000	0.033	0.100
Intangibles/Assets	0.154	0.086	0.011	0.244	0.176
CAPEX/Sales	0.076	0.038	0.020	0.076	0.124
Cash/ Assets	0.093	0.050	0.016	0.131	0.109
Bonus/Salary	0.726	0.359	0.000	1.002	1.163
CEO Tenure	6.726	5.000	2.000	9.000	7.167
CEO Age	55.379	55.000	51.000	60.000	7.225
CEO%Own	0.020	0.003	0.001	0.012	0.048
Inst%Own	0.575	0.654	0.399	0.813	0.319
Dividends/ Assets	0.010	0.002	0.000	0.015	0.016
SG&A/ Sales	0.252	0.216	0.119	0.339	0.177
Panel B: Statistics for the M&A sample					
CAR(-10,10)	0.002	0.003	-0.055	0.064	0.111
BHAR(-42,125)	-0.106	-0.054	-0.314	0.166	0.471
BHAR(-5,125)	-0.080	-0.040	-0.255	0.144	0.385
Confidence	0.383	0.364	0.148	0.575	0.274
SOX	0.681	1.000	0.000	1.000	0.466
Diversifying deal	0.439	0.000	0.000	1.000	0.496
Run-up	0.003	0.015	-0.326	0.312	0.668
Compted deal	0.014	0.000	0.000	0.000	0.119
Tender Offer	0.058	0.000	0.000	0.000	0.233
Public Target	0.195	0.000	0.000	0.000	0.396
Cash Only	0.400	0.000	0.000	1.000	0.490
Rel Deal Size	0.136	0.039	0.011	0.130	0.262
ln(Transaction Value)	4.519	4.430	3.246	5.690	1.756
ln(Assets)	7.792	7.613	6.558	8.945	1.705
CEO Bonus/Salary	0.995	0.657	0.000	1.307	1.392
ln(Tenure)	1.742	1.792	1.099	2.303	0.816
ln(CEO Age)	3.993	4.007	3.912	4.094	0.132
CEO%Own	0.016	0.003	0.001	0.011	0.040
Inst%Own	0.668	0.706	0.559	0.828	0.239
LT Debt/ Assets	0.178	0.155	0.035	0.276	0.157
R&D/Sales	0.052	0.011	0.000	0.065	0.091
EBIT/Assets	0.102	0.098	0.060	0.144	0.080
Intangibles/Assets	0.208	0.162	0.041	0.334	0.188
Q	1.666	1.202	0.749	2.046	1.504
Cash/Assets	0.099	0.059	0.020	0.137	0.108
CAPEX/Sales	0.072	0.038	0.022	0.068	0.119

Table 3: CEO Overconfidence, SOX and Capital Investments

This table contains regression models that examine the relationship between SOX, overconfidence, and CAPEX. The dependent variable is the firm's CAPEX in year $t+1$ scaled by its assets in year t. The appendix contains the variable definitions. The significance levels at the 1%, 5%, and 10% are denoted by ***, ** and *, respectively.

	CAPEX (t+1)/Assets (t) × 100			
	M1	M2	M3	M4
a: Confidence (t)	1.883***		1.450***	
	[0.000]		[0.000]	
b: ConfidenceTopQ (t)		0.902***		0.614***
		[0.000]		[0.000]
c: SOX	0.153	-0.238	0.061	-0.265
	[0.431]	[0.173]	[0.946]	[0.768]
a × **c**	-1.401***		-0.912***	
	[0.000]		[0.003]	
b × **c**		-0.674***		-0.350**
		[0.000]		[0.043]
CEO-related controls				
CEO Bonus/Salary	0.033	0.042*	0.059*	0.067**
	[0.192]	[0.093]	[0.052]	[0.027]
ln(Tenure(t))	-0.009	0.005	0.015	0.028
	[0.769]	[0.876]	[0.762]	[0.581]
ln(CEO Age (t))	-0.846***	-0.863***	-0.548	-0.575
	[0.000]	[0.000]	[0.200]	[0.179]
CEO%Own(t)	1.331*	1.169*	3.172**	3.063**
	[0.057]	[0.096]	[0.039]	[0.046]
Firm-related controls				
ln(Assets(t))	-0.135***	-0.127***	-1.377***	-1.389***
	[0.000]	[0.000]	[0.000]	[0.000]
LT Debt/ Assets(t)	-0.158	-0.178	-2.587***	-2.615***
	[0.450]	[0.401]	[0.000]	[0.000]
R&D/Sales (t)	-1.033***	-1.037***	3.455***	3.498***
	[0.009]	[0.009]	[0.001]	[0.001]
EBIT/Assets (t)	2.263***	2.394***	6.752***	6.960***
	[0.000]	[0.000]	[0.000]	[0.000]
Intangibles/Assets (t)	-1.082***	-1.048***	1.829***	1.889***
	[0.000]	[0.000]	[0.000]	[0.000]
CAPEX/Assets (t-1)	80.186***	80.387***	45.944***	46.135***
	[0.000]	[0.000]	[0.000]	[0.000]
Market-related controls				
Tobin's Q(t)	0.254***	0.277***	0.487***	0.522***
	[0.000]	[0.000]	[0.000]	[0.000]
Stock Return (t)	1.489***	1.585***	0.788***	0.849***
	[0.000]	[0.000]	[0.000]	[0.000]
Stock Std Dev (t)	-11.804***	-12.010***	-12.767***	-12.907***
	[0.000]	[0.000]	[0.000]	[0.000]
Inst%Own (t)	0.212**	0.237***	0.282	0.327*
	[0.018]	[0.008]	[0.152]	[0.097]
Prop No Trade Days (t)	-1.214	-1.227	5.825	5.983
	[0.537]	[0.563]	[0.556]	[0.550]
Constant	5.092***	5.455***	14.724***	15.179***
	[0.000]	[0.000]	[0.000]	[0.000]
Year Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	No	No	Yes	Yes
Industry Fixed Effects	Yes	Yes	No	No
Observations	19,349	19,349	19,349	19,349
Adjusted R^2	72.10%	72.00%	35.30%	35.10%

Table 4: CEO Overconfidence, SOX and Its Effects on Total Asset, PP&E and SG&A

This table contains regressions that examine the relationship between CEO overconfidence, SOX and asset growth. The column header states the dependent variable. The models contain firm and year fixed effects, and use standard errors clustered by firm. Brackets contain p-values and superscripts ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Dependent variable	$Ln\left(\frac{PPE(t+1)}{PPE(t)}\right)$		$Ln\left(\frac{Assets(t+1)}{Assets(t)}\right)$		$\frac{SG\&A(t+1)}{Sale(t)}$	
	M1	M2	M3	M4	M5	M6
a: Confidence (t)	0.099***		0.042**		0.004	
	[0.000]		[0.013]		[0.318]	
b: ConfidenceTopQ (t)		0.044***		0.001		0.001
		[0.000]		[0.916]		[0.638]
c: SOX	0.007	-0.017	0.141***	0.123***	-0.001	-0.006**
	[0.820]	[0.589]	[0.001]	[0.002]	[0.921]	[0.050]
a × **c**	-0.087***		-0.069***		-0.013***	
	[0.000]		[0.000]		[0.008]	
b × **c**		-0.042***		-0.021*		-0.004*
		[0.000]		[0.053]		[0.054]
ln(Assets(t))					-0.002***	-0.001**
					[0.008]	[0.016]
SG&A/Sales (t)					0.572***	0.945***
					[0.000]	[0.000]
CEO-related controls	Yes	Yes	Yes	Yes	Yes	Yes
Other firm-related controls	Yes	Yes	Yes	Yes	Yes	Yes
Market-related controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18,145	18,145	19,380	19,380	15,778	15,778
Adjusted R^2	9.40%	9.20%	17.00%	16.90%	32.30%	92.30%

Table 5: Sensitivity of Investment to Cash Flows

This table contains regressions that examine how SOX attenuates the senitivity of investment by overconfident managers to cash flows. The dependent variable is the firm's CAPEX/Assets in year t (as per Malmendier and Tate (2005)). Variable definitions are in appendix 1. The models are OLS models that include firm fixed effects, industry fixed effects, year fixed effects (as indicated in the Column footer) and cluster standard errors by firm. Brackets contain p-values and superscripts ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Depenent Variable	CAPEX (t+1) /Assets (t)							
Model	M1	M2	M3	M4	M5	M6	M7	M8
a: Confidence (t)	0.013***		0.005		0.009**		0.000	
	[0.000]		[0.138]		[0.020]		[0.988]	
b: ConfidenceTopQ (t)		0.007***		0.003		0.006**		0.000
		[0.007]		[0.252]		[0.024]		[0.848]
c: SOX	-0.017***	-0.018***	-0.018**	-0.018**	-0.014*	-0.015*	-0.018**	-0.016**
	[0.000]	[0.000]	[0.022]	[0.020]	[0.089]	[0.069]	[0.030]	[0.039]
d: EBIT/Assets (t)	0.012	0.029***	0.034***	0.056***				
	[0.319]	[0.006]	[0.010]	[0.000]				
e: OCF/Assets (t)					0.096***	0.116***	0.055***	0.080***
					[0.000]	[0.000]	[0.000]	[0.000]
a × **c**	0.004		0.006		0.001		0.011**	
	[0.347]		[0.115]		[0.758]		[0.012]	
a × **d**	0.057***		0.067***					
	[0.006]		[0.005]					
a × **c** × **d**	-0.095***		-0.094***					
	[0.002]		[0.001]					
b × **c**		0.003		0.002		-0.001		0.005*
		[0.366]		[0.317]		[0.840]		[0.068]
b × **d**		0.026		0.022				
		[0.104]		[0.148]				
b × **c** × **d**		-0.053***		-0.038**				
		[0.010]		[0.028]				
a × **e**					0.064***		0.080***	
					[0.003]		[0.001]	
a × **c** × **e**					-0.055*		-0.093***	
					[0.094]		[0.001]	
b × **e**						0.022		0.028*
						[0.152]		[0.067]
b × **c** × **e**						-0.021		-0.041**
						[0.311]		[0.015]
c × **d**	0.029**	0.011	0.024	0.001				
	[0.025]	[0.287]	[0.106]	[0.904]				
c × **e**					0.007	-0.010	0.003	-0.020*
					[0.617]	[0.385]	[0.826]	[0.091]
CEO-related controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-related controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Market-related controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Industry Fixed Effects	Yes	Yes	No	No	Yes	Yes	No	No
Observations	21,714	21,714	21,714	21,714	21,267	21,267	21,267	21,267
Adjusted R^2	48.70%	48.60%	15.90%	15.60%	50.00%	49.90%	16.60%	16.30%

Table 6: CEO Overconfidence, SOX and Firm's Risk-taking Strategies

This table contains regressions that examine the relationship between CEO overconfidence, SOX, and risk taking. The column header states the dependent variable. The models contain fixed effects as stated in the column, and use standard errors clustered by firm. Brackets contain p-values and superscripts ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Dependent variable	Beta (t+1)				Ln(MSE(t+1))			
	M1	M2	M3	M4	M5	M6	M7	M8
a: Confidence (t)	0.357***	0.260***			0.083***	0.076***		
	[0.000]	[0.000]			[0.000]	[0.000]		
b: ConfidenceTopQ (t)			0.181***	0.129***			0.068***	0.058***
			[0.000]	[0.000]			[0.000]	[0.000]
c: SOX	0.254**	-0.042	0.174	-0.097	-0.136***	-0.249***	-0.146***	-0.262***
	[0.027]	[0.732]	[0.128]	[0.424]	[0.001]	[0.000]	[0.000]	[0.000]
a × **c**	-0.331***	-0.176***			-0.042**	-0.059***		
	[0.000]	[0.003]			[0.022]	[0.007]		
b × **c**			-0.180***	-0.106***			-0.031***	-0.038***
			[0.000]	[0.000]			[0.002]	[0.000]
CEO-related controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-related controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Market-related controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	No	Yes	No	Yes	No	Yes	No
Firm Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	17,110	17,110	17,110	17,110	17,110	17,110	17,110	17,110
R-squared	49.40%	27.20%	49.10%	27.00%	74.30%	62.90%	74.40%	63.00%

Table 7: CEO Overconfidence, SOX and Effects on Tobin's Q

This table contains regressions that examine the relationship between CEO overconfidence, SOX, firm value, as proxied by the firm's Tobin's Q or industry-adjusted Tobin's Q ratio, where we define the firm's Tobin's Q as its market capitalization divided by its book assets. The column header states the dependent variable. The models contain fixed effects as stated in the column, and use standard errors clustered by firm. Brackets contain p-values and superscripts ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Dependent Variable	Tobin's Q		Ind Adj Tobin's Q		Tobin's Q		Ind Adj Tobin's Q	
Time	(t+1)		(t+1)		(t+1)		(t+1)	
Model	M1	M2	M3	M4	M5	M6	M7	M8
a: Confidence (t)	-0.073	0.094*	-0.074	0.062				
	[0.140]	[0.062]	[0.106]	[0.188]				
b: ConfidenceTopQ (t)					-0.043	0.060*	-0.041	0.047
					[0.144]	[0.068]	[0.135]	[0.131]
c: SOX	0.029	0.077	0.078***	0.305**	0.041*	0.081	0.092***	0.316**
	[0.318]	[0.498]	[0.007]	[0.019]	[0.098]	[0.474]	[0.000]	[0.016]
a × **c**	0.085	0.145**	0.096*	0.156***				
	[0.110]	[0.016]	[0.054]	[0.007]				
b × **c**					0.069**	0.065*	0.074**	0.070**
					[0.032]	[0.067]	[0.016]	[0.039]
CEO-related controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-related controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Market-related controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	No	Yes	No	Yes	No	Yes	No
Firm Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	19,378	19,378	19,378	19,378	19,378	19,378	19,378	19,378
R-squared	72.20%	37.90%	65.90%	29.90%	72.20%	37.90%	65.90%	29.90%

Table 8: CEO Overconfidence, SOX and Effects on Earnings & Earnings Quality

This table contains regressions that examine the relationship between CEO overconfidence, SOX, and operating performance, as proxied by the firm's EBIT/Assets, industry-adjusted EBIT/Assets and S&P's Earnings Quality measure. The column header states the dependent variable. The models contain fixed effects as stated in the column, and use standard errors clustered by firm. Brackets contain p-values and superscripts ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

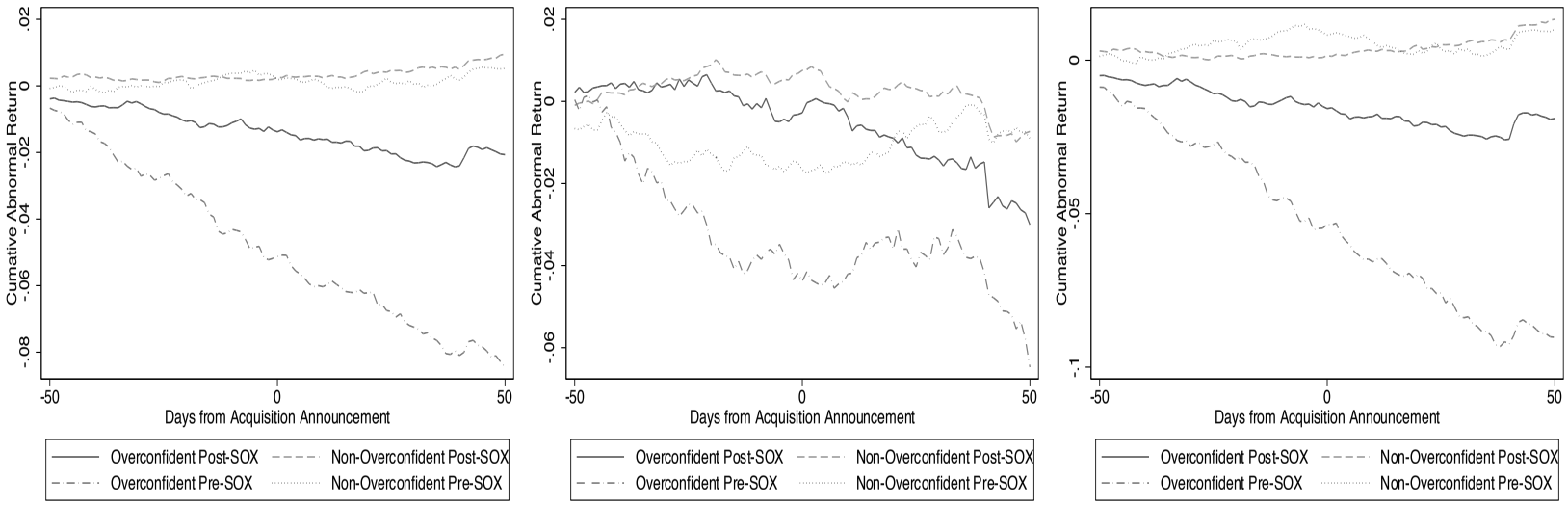
Dependent Variable	Ind Adj EBIT/Asset		EBIT/Asset		EBIT/Assets		Earnings Quality	
Time	(t+1)		(t+1)		(t+1)		(t+1)	
Model	M1	M2	M3	M4	M5	M6	M7	M8
a: Confidence (t)	0.001		-0.001		-0.004		-0.136	
	[0.830]		[0.748]		[0.124]		[0.479]	
b:ConfidenceTopQ (t)		0.000		-0.001		-0.001		-0.190*
		[0.934]		[0.611]		[0.491]		[0.082]
c: SOX	-0.009	-0.007	-0.014	-0.012	-0.015*	-0.013	-0.371***	-0.255***
	[0.348]	[0.459]	[0.125]	[0.201]	[0.092]	[0.144]	[0.000]	[0.000]
a × **c**	0.021***		0.022***		0.011***		0.831***	
	[0.000]		[0.000]		[0.001]		[0.000]	
b × **c**		0.008***		0.010***		0.005***		0.368***
		[0.000]		[0.000]		[0.008]		[0.002]
CEO-related controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-related controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Market-related controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	No	No	No	No
Observations	19,366	19,366	19,366	19,366	19,366	19,366	17,021	17,021
R-squared	29.20%	29.00%	33.30%	33.20%	68.60%	68.60%	9.96%	9.85%

Table 9: CEO Overconfidence, SOX and Effects on Value of R&D and CAPEX

We analyze how SOX moderates the impact of overconfidence on value of R&D (in Panel A) and CAPEX (in Panel B). The dependent variable is the firm's industry-adjusted market-to-book ratio in year $t+1$. Columns 1 and 4 examine the whole sample whereas columns 2, 3, 5, and 6 examine pre-SOX and post-SOX sub-samples. Variable definitions are in Appendix 1. CEO-related, firm-related and market-related controls are and interaction terms R&D/Sales(t) × SOX and CAPEX × SOX are included. OLS regression with firm and year fixed effects and cluster standard errors by firm. Brackets contain p-values and superscripts ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Dependent Variable				Ind Adj Q (t+1)		
Sample	All	Pre-SOX	Post-SOX	All	Pre-SOX	Post-SOX
Model	M1	M2	M3	M4	M5	M6
Panel A: Value of R&D						
a: Confidence (t)	0.161***	0.143**	0.144***			
	[0.004]	[0.045]	[0.003]			
b: ConfidenceTopQ (t)				0.129***	0.111***	0.070***
				[0.000]	[0.002]	[0.000]
c: SOX	0.320**			0.306**		
	[0.016]			[0.019]		
d: R&D/Sales (t)	1.124**	1.164	0.590*	0.866**	0.8300	0.533*
	[0.016]	[0.111]	[0.075]	[0.024]	[0.233]	[0.076]
a × **c**	0.056					
	[0.379]					
a × **c** × **d**	1.910***					
	[0.008]					
b × **c**				-0.032		
				[0.338]		
b × **c** × **d**				1.941***		
				[0.000]		
a × **d**	-2.126***	-2.376***	0.148			
	[0.003]	[0.004]	[0.836]			
b × **d**				-1.457***	-1.466***	0.643
				[0.000]	[0.004]	[0.146]
All controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm & Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,378	7,423	11,955	19,378	7,423	11,955
R-squared	30.20%	15.20%	21.40%	30.30%	15.20%	21.60%
Panel B: Value of CAPEX						
a: Confidence (t)	0.162***	0.166**	0.145***			
	[0.004]	[0.021]	[0.007]			
b: ConfidenceTopQ (t)				0.101***	0.097**	0.082***
				[0.007]	[0.023]	[0.000]
c: SOX	0.319**			0.297**		
	[0.013]			[0.020]		
e: CAPEX/Sales (t)	0.128	0.301	-0.150	-0.079	0.102	-0.182
	[0.452]	[0.296]	[0.252]	[0.584]	[0.678]	[0.149]
a × **c**	0.053					
	[0.447]					
a × **c** × **e**	1.067**					
	[0.015]					
b × **c**				0.0100		
				[0.797]		
b × **c** × **e**				0.614**		
				[0.023]		
a × **e**	-1.048***	-1.122**	0.039			
	[0.005]	[0.021]	[0.883]			
b × **e**				-0.563**	-0.599**	0.137
				[0.018]	[0.027]	[0.374]
All controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm & Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,378	7,423	11,955	19,378	7,423	11,955
R-squared	30.10%	14.70%	21.40%	30.00%	14.70%	21.50%

Figure 1: Cumulative abnormal returns to acquirers around takeover announcements



Panel A. Acquisitions Panel B. Public only Panel C. Nonpublic only

Figure 2: This figure plots the cumulative abnormal returns from 50 days before the takeover to 50 days after the acquisition announcement. The abnormal returns are based on an OLS estimation of the market model over the period 125 to 375 days before the acquisition announcement. In *Panel A* we depict CARs around acquisitions of all targets, public as well as non-pubic US firms between the year 1992 and the year 2011. In *Panel B* we depict CARs around acquisitions of only publicly-traded targets between the year1992 and the year 2011. In *Panel C* we depict CARs around acquisitions of all non-public targets between the year 1992 and the year 2011.

Table 10: CEO Overconfidence, SOX and Acquisition Strategy

We analyze how SOX moderates the performance of overconfidence CEOs' acquisition strategy. If acquisition is in the year $t+1$, then we use all explanatory variables from the year t. The models are OLS regression models that include year and industry fixed effects and cluster standard errors by firm. Brackets contain p-values and superscripts ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Dependent Variable	CAR		BHAR		Ind Adj EBIT/Assets		Ind Adj Q	
Time/Window	(-10, 10)		(-42, 125)		(t+1)		(t+1)	
	M1	M2	M3	M4	M5	M6	M7	M8
a: Confidence (t)	-0.022		-0.275***		-0.038***		-0.329**	
	[0.114]		[0.000]		[0.006]		[0.027]	
b: ConfidenceTopQ (t)		0.000		-0.086***		-0.018***		-0.188**
		[0.988]		[0.009]		[0.007]		[0.020]
c: SOX	-0.056***	-0.049***	-0.505***	-0.438***	0.006	0.021	-0.186	-0.068
	[0.000]	[0.001]	[0.000]	[0.000]	[0.748]	[0.285]	[0.254]	[0.607]
a × **c**	0.009		0.130*		0.047***		0.459***	
	[0.554]		[0.056]		[0.005]		[0.007]	
b × **c**		-0.001		0.048		0.022***		0.265***
		[0.892]		[0.183]		[0.004]		[0.004]
Diversifying deal	-0.007**	-0.007**	-0.030**	-0.030**	0.002	0.002	-0.005	-0.005
	[0.043]	[0.044]	[0.023]	[0.027]	[0.353]	[0.365]	[0.872]	[0.851]
Run-up	-0.014***	-0.014***	-0.081**	-0.083**	0.009***	0.009***	0.191***	0.190***
	[0.002]	[0.002]	[0.022]	[0.018]	[0.000]	[0.000]	[0.000]	[0.000]
Tender Offer	0.019***	0.019***	0.028	0.027	-0.005	-0.005	-0.110**	-0.115**
	[0.006]	[0.006]	[0.296]	[0.315]	[0.306]	[0.273]	[0.034]	[0.027]
Public Target	-0.028***	-0.028***	-0.056***	-0.055***	0.005	0.005	0.083**	0.085**
	[0.000]	[0.000]	[0.003]	[0.004]	[0.231]	[0.220]	[0.018]	[0.016]
Cash Only	0.009***	0.009***	0.02	0.019	0.005***	0.005***	0.021	0.020
	[0.007]	[0.007]	[0.137]	[0.149]	[0.004]	[0.005]	[0.391]	[0.420]
Rel Deal Size	0.005	0.005	-0.053	-0.054	-0.032***	-0.032***	-0.367***	-0.371***
	[0.626]	[0.629]	[0.254]	[0.251]	[0.006]	[0.006]	[0.000]	[0.000]
Ln(Transaction Value)	0.002	0.002	0.015***	0.015***	0.000	0.000	-0.010	-0.010
	[0.157]	[0.174]	[0.005]	[0.007]	[0.990]	[1.000]	[0.281]	[0.274]
All controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,262	5,262	5,262	5,262	4,704	4,704	4,707	4,707
Adjusted R^2	7.60%	7.50%	21.40%	20.70%	43.70%	43.50%	52.00%	52.00%

Table 11: CEO Overconfidence, SOX and Dividend Payment

This table contains OLS regression models that examine the relationship between CEO overconfidence, SOX and dividend payments. The dependent variable is the firm's total dividend payment scaled by its assets in year $t+1$. The models are OLS regression models that contain firm, industry, and year fixed effects as stated in the column, and use standard errors clustered by firm. Variable definitions are in Appendix 1. Brackets contain p-values and superscripts ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Dependent Variable	$100 \times \frac{\text{Total Dividends (t+1)}}{\text{Assets (t+1)}}$			
	M1	M2	M3	M4
a: Confidence (t)	-0.145***	-0.232***		
	[0.000]	[0.000]		
b: ConfidenceTopQ (t)			-0.098***	-0.124***
			[0.000]	[0.000]
c: SOX	0.084**	-0.449***	0.103***	-0.390***
	[0.018]	[0.001]	[0.002]	[0.003]
a × **c**	0.081**	0.284***		
	[0.038]	[0.000]		
b × **c**			0.063***	0.147***
			[0.006]	[0.000]
CEO-related controls	Yes	Yes	Yes	Yes
Firm-related controls	Yes	Yes	Yes	Yes
Market-related controls	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	No	Yes	No	Yes
Industry Fixed Effects	Yes	No	Yes	No
Observations	19,012	19,012	19,012	19,012
Adjusted R^2	79.10%	30.30%	79.10%	30.30%

Table 12: Non-Compliant firms, continuous (*Confidence*) definition of confidence

This table contains regressions that examine the set of non-compliant firms. We define firms as compliant if they have both a majority independent board and a fully independent audit committee between 1998 and 2001. The models also include controls as in the reported models in the text, year and firm fixed effects, and cluster standard errors by firm. Brackets contain p-values and superscripts ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Dependent Variable	CAPEX/ Assets [1]	Asset Growth [2]	PP&E Growth [3]	Ind Adj EBIT/ Assets [4]	Ind Adj Q [5]	Beta [6]	MSE [7]	Ind Adj Q [8]	Ind Adj Q [9]	Dividends/ Assets [10]
a: Confidence	1.330***	0.032	0.067***	-0.000	-0.032	0.237***	0.089***	0.075	0.012	-0.166***
	[0.000]	[0.105]	[0.002]	[0.895]	[0.538]	[0.000]	[0.000]	[0.226]	[0.826]	[0.002]
b: SOX	-0.074	0.063	-0.043	-0.014	0.356***	-0.250**	0.362***	0.374***	0.381***	-0.271**
	[0.950]	[0.117]	[0.211]	[0.313]	[0.002]	[0.014]	[0.000]	[0.001]	[0.000]	[0.029]
a × b	-0.590	-0.061***	-0.048*	0.026***	0.299***	-0.104**	-0.083***	0.189***	0.246***	0.206***
	[0.121]	[0.008]	[0.054]	[0.000]	[0.000]	[0.011]	[0.000]	[0.008]	[0.000]	[0.002]
a × CAPEX/Sales								-1.091**		
								[0.013]		
b × CAPEX/Sales								-0.041		
								[0.828]		
a × b × CAPEX/Sales								1.107**		
								[0.040]		
a × R&D/Sales									-2.091**	
									[0.013]	
b × R&D/Sales									0.088	
									[0.850]	
a × b × R&D/Sales									2.030**	
									[0.025]	
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,369	10,381	10,149	10,381	10,380	9,523	9,523	10,380	10,380	10,261
R-squared	0.388	0.178	0.099	0.314	0.341	0.291	0.559	0.344	0.314	0.365

Table 13: Compliant firms, continuous (*Confidence*) definition of confidence

This table contains regressions that examine the set of non-compliant firms. We define firms as compliant if they have both a majority independent board and a fully independent audit committee between 1998 and 2001. The models also include controls as in the reported models in the text, year and firm fixed effects, and cluster standard errors by firm. Brackets contain p-values and superscripts ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Dependent Variable	CAPEX/ Assets [1]	Asset Growth [2]	PP&E Growth [3]	Ind Adj EBIT/ Assets [4]	Ind Adj Q [5]	Beta [6]	MSE [7]	Ind Adj Q [8]	Ind Adj Q [9]	Dividends/ Assets [10]
a: Confidence	1.264**	0.047	0.124***	0.002	0.310***	0.301***	0.183***	0.436***	0.461***	-0.306**
	[0.017]	[0.208]	[0.000]	[0.849]	[0.010]	[0.000]	[0.000]	[0.008]	[0.005]	[0.017]
b: SOX	3.158**	0.645***	0.358**	-0.039	-0.875	0.706**	0.385**	-0.870	-0.758	-0.679***
	[0.015]	[0.000]	[0.026]	[0.189]	[0.429]	[0.013]	[0.034]	[0.435]	[0.517]	[0.000]
a × b	-0.838	-0.064	-0.124***	0.012	0.041	-0.152**	-0.230***	-0.087	-0.164	0.430***
	[0.110]	[0.132]	[0.001]	[0.231]	[0.783]	[0.037]	[0.000]	[0.657]	[0.328]	[0.004]
a × CAPEX/Sales								-1.789		
								[0.345]		
b × CAPEX/Sales								-0.321		
								[0.519]		
a × b × CAPEX/Sales								1.756		
								[0.375]		
a × R&D/Sales									-1.913	
									[0.450]	
b × R&D/Sales									-1.164	
									[0.529]	
a × b × R&D/Sales									5.105*	
									[0.067]	
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,583	2,584	2,528	2,584	2,584	2,419	2,419	2,584	2,584	2,561
R-squared	0.438	0.205	0.120	0.455	0.351	0.354	0.573	0.352	0.311	0.451

Table 14: M&A results by compliance with SOX

This table contains regressions that examine the M&A performance of overconfident CEOs split by whether the firm was SOX-compliant. We define firms as compliant if they have both a majority independent board and a fully independent audit committee between 1998 and 2001. The models also include controls as in the reported models in the text, year and SIC two-digit industry fixed effects, and cluster standard errors by firm. Brackets contain p-values and superscripts ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Dependent	CAR (-10,10)	CAR (-10,10)	BHAR (-42,125)	BHAR (-42,125)	Ind Adj EBIT/ Assets	Ind Adj EBIT/ Assets	Ind Adj Q	Ind Adj Q
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Panel A: Non-Compliant Firms								
Confidence	-0.018		-0.266***		-0.053***		-0.697***	
	[0.405]		[0.004]		[0.009]		[0.000]	
SOX x Confidence	0.019		0.218**		0.065***		0.942***	
	[0.430]		[0.042]		[0.009]		[0.000]	
ConfidenceTopQ		0.011		-0.028		-0.022**		-0.342***
		[0.370]		[0.581]		[0.046]		[0.002]
SOX x ConfidenceTopQ		-0.006		0.035		0.024**		0.413***
		[0.653]		[0.559]		[0.042]		[0.001]
SOX	-0.028	-0.019	-0.428***	-0.338***	-0.016	0.003	0.004	0.254*
	[0.121]	[0.211]	[0.000]	[0.000]	[0.308]	[0.782]	[0.981]	[0.056]
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,140	2,140	2,140	2,140	2,024	2,024	2,026	2,026
R-squared	0.089	0.089	0.229	0.223	0.446	0.439	0.572	0.568
Panel B: Compliant Firms								
Confidence	-0.044		-0.372*		-0.028		-0.008	
	[0.325]		[0.060]		[0.424]		[0.986]	
SOX x Confidence	0.059		0.353		0.080*		0.638	
	[0.228]		[0.128]		[0.055]		[0.295]	
ConfidenceTopQ		-0.016		-0.271**		-0.035*		-0.135
		[0.452]		[0.035]		[0.066]		[0.608]
SOX x ConfidenceTopQ		0.027		0.307**		0.048*		0.348
		[0.400]		[0.047]		[0.067]		[0.380]
SOX	-0.071**	-0.052**	-0.394***	-0.298***	-0.003	0.012	-0.181	-0.092
	[0.032]	[0.034]	[0.004]	[0.010]	[0.852]	[0.469]	[0.421]	[0.627]
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	398	398	398	398	396	396	396	396
R-squared	0.226	0.224	0.358	0.367	0.550	0.557	0.581	0.580

Table 15: Regression results by year

This table contains regressions by year for the set of compliant firms and non-compliant firms. We define firms as compliant if they have both a majority independent board and a fully independent audit committee between 1998 and 2001. The models also include controls as in the reported models in the text, year and firm fixed effects, and cluster standard errors by firm. Brackets contain p-values and superscripts ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Sample	Non-Compliant							Compliant						
Year	1999	2000	2001	2002	2003	2004	2005	1999	2000	2001	2002	2003	2004	2005
Column	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]
Panel A: CAPEX														
Confidence	1.455*	1.105	1.113**	-0.034	0.464	0.615	0.340	0.932	1.163	0.427	2.504	0.060	1.032	-0.139
	[0.080]	[0.132]	[0.022]	[0.945]	[0.311]	[0.124]	[0.428]	[0.529]	[0.484]	[0.707]	[0.132]	[0.837]	[0.469]	[0.909]
Observations	709	774	895	1,034	1,104	1,143	1,129	176	170	183	170	166	152	156
R-squared	0.658	0.699	0.749	0.724	0.752	0.812	0.857	0.850	0.818	0.837	0.837	0.799	0.860	0.793
Panel B: Tobin's Q														
Confidence	-0.537**	-0.095	-0.235**	0.008	0.049	-0.081	-0.058	-0.057	0.252	0.028	-0.178	0.290	0.073	-0.506**
	[0.038]	[0.295]	[0.035]	[0.959]	[0.597]	[0.400]	[0.424]	[0.904]	[0.606]	[0.942]	[0.516]	[0.334]	[0.809]	[0.026]
Observations	708	772	893	1,027	1,098	1,129	1,105	176	170	183	169	165	151	155
R-squared	0.507	0.624	0.667	0.756	0.730	0.751	0.799	0.784	0.830	0.847	0.930	0.879	0.872	0.930
Panel C: EBIT/Assets														
Confidence	0.014	0.011	0.021	0.051***	0.036**	0.042***	0.040***	0.029	0.060	0.045*	0.096***	0.093*	0.068	0.010
	[0.315]	[0.431]	[0.156]	[0.000]	[0.014]	[0.003]	[0.000]	[0.313]	[0.111]	[0.071]	[0.003]	[0.076]	[0.104]	[0.696]
Observations	579	652	809	922	994	997	1,042	175	170	183	169	165	151	155
R-squared	0.532	0.474	0.523	0.482	0.516	0.573	0.517	0.638	0.629	0.579	0.694	0.654	0.673	0.697

Table 16: Alternative *SOX* indicator

This table contains regressions that examine an alternative SOX indicator, SOX*. The SOX* indicator equals one if the observation post-dates SOX (is in 2002 or later) and the firm was not previously compliant with SOX, and equals zero otherwise (i.e. if the observation pre-dates SOX and/or if the firm was SOX-compliant prior to its passage). We define SOX-compliant firms as those with a majority independent board and a fully independent audit committee. The models also include controls as in the reported models in the text. Brackets contain p-values and superscripts ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Dependent Variable	CAPEX/ Assets [1]	Asset Growth [2]	PP&E Growth [3]	Ind Adj EBIT/ Assets [4]	Ind Adj Q [5]	Beta [6]	MSE [7]	Ind Adj Q [8]	Ind Adj Q [9]	Dividends/ Assets [10]
a: Confidence	1.289***	0.084***	0.030**	0.005*	0.127**	0.224***	0.056***	0.211***	0.144***	-0.158***
	[0.000]	[0.000]	[0.039]	[0.094]	[0.015]	[0.000]	[0.000]	[0.000]	[0.004]	[0.001]
b: SOX*	0.331*	0.008	0.014	-0.002	-0.019	0.028	0.017	-0.008	0.011	-0.057
	[0.060]	[0.489]	[0.243]	[0.507]	[0.676]	[0.189]	[0.140]	[0.847]	[0.801]	[0.260]
a × b	-0.761***	-0.062***	-0.052***	0.016***	0.109*	-0.129***	-0.028*	-0.023	0.053	0.197***
	[0.010]	[0.001]	[0.002]	[0.000]	[0.073]	[0.000]	[0.085]	[0.739]	[0.394]	[0.001]
a × CAPEX/Sales								-1.001***		
								[0.004]		
b × CAPEX/Sales								0.084		
								[0.600]		
a × b × CAPEX/Sales								1.031**		
								[0.016]		
a × R&D/Sales									-1.580**	
									[0.024]	
b × R&D/Sales									0.099	
									[0.816]	
a × b × R&D/Sales									1.579**	
									[0.050]	
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,349	18,145	19,380	19,366	19,012	17,110	17,110	19,378	19,378	19,012
R-squared	0.354	0.093	0.172	0.292	0.243	0.272	0.629	0.299	0.272	0.301

Table 17: Press-based Measure of CEO Overconfidence and Effects on Investments, Risk and Performance

This table contains regression models that use a press-based measure of overconfidence, "Net News." The variable "Net News" is equal to the number of "overconfident" articles in year t less the number of "non-overconfident" articles in year t. The models include the controls of the main models and include industry fixed effects (FE). Given the limited time period (2000-2006) we omit year dummies from these models in favor of retaining the "SOX" indicator. We include all other relevant interaction terms like SOX × R&D and SOX × CAPEX. Appendix 1 contains detailed variable definitions. Brackets contain p-values and superscripts ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Dep Var	CAPX	SG&A	PPE	Assets	EBIT	IndAdjEBIT	Q	IndAdjQ	Beta	MSE	Q	IndAdjQ	Q	IndAdjQ	Dividends
Window/Time	(t+1)	(t+1)	(t,t+1)	(t,t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)
Model	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15
a: NetNews(t)	0.083*	0.002**	0.015***	0.014***	-.001**	-.001**	-0.058***	-0.049***	0.045***	-0.003	-0.038***	-0.031***	-0.033***	-0.037***	-0.007
	[0.064]	[0.027]	[0.000]	[0.000]	[0.012]	[0.023]	[0.000]	[0.000]	[0.000]	[0.259]	[0.000]	[0.000]	[0.000]	[0.000]	[0.162]
b: SOX	0.412**	0.006**	0.027***	0.051***	-0.001	-0.013***	-0.006	-0.264***	0.394***	-0.208***	0.026	-0.235***	-0.002	-.197***	0.019
	[0.010]	[0.023]	[0.009]	[0.000]	[0.763]	[0.000]	[0.813]	[0.000]	[0.000]	[0.000]	[0.356]	[0.000]	[0.923]	[0.000]	[0.501]
c: CAPX/Sale	25.477***	0.002	0.208***	0.010			-0.103	-0.043	-0.018	0.026	0.694**	0.705**	-0.089	-0.050	-.210***
	[0.000]	[0.874]	[0.000]	[0.870]			[0.446]	[0.746]	[0.870]	[0.585]	[0.019]	[0.034]	[0.487]	[0.696]	[0.002]
d: R&D/Sale	-6.36***	0.084***	-0.105	-0.215***	-0.056***	-0.055***	0.885***	0.832***	0.356**	0.031	0.869***	0.819***	0.670*	0.574	0.142
	[0.000]	[0.000]	[0.136]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.027]	[0.502]	[0.000]	[0.000]	[0.098]	[0.157]	[0.144]
a × **b**	-0.058	-0.003***	-0.009***	-0.010***	0.003***	0.002***	0.079***	0.064***	-0.027***	0.000	0.065***	0.053***	0.056***	0.057***	0.015**
	[0.171]	[0.000]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.871]	[0.000]	[0.000]	[0.000]	[0.000]	[0.028]
a × **c**											-0.214***	-0.189***			
											[0.000]	[0.002]			
a × **b** × **c**											0.121*	0.089			
											[0.071]	[0.155]			
a × **d**													-0.317***	-0.295***	
													[0.000]	[0.001]	
a × **b** × **d**													0.267***	0.253***	
													[0.002]	[0.003]	
All Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,341	6,077	6,903	7,351	7,339	7,339	7,351	7,351	6,994	6,994	7,351	7,351	7,351	7,351	7,272
Adjusted R^2	63.90%	92.80%	12.80%	18.20%	71.80%	69.90%	75.10%	70.10%	46.20%	73.80%	75.20%	70.20%	75.80%	69.40%	77.40%

Table 18: Value-to-Compensation based measure of CEO Overconfidence, SOX and Effects on Investment, Risk and Performance

This table contains regression models that examine the relationship between the alternative measure of overconfidence, 'Val-to-Comp', SOX, and corporate outcomes. The variable 'Val-to-Comp' is the natural log of one plus the ratio of the total value of the CEO's vested but unexercised options scaled by the total compensation (Execucomp: tdc1). The models include the controls of the main models and include industry fixed effects. Given the limited time period (2000-2006) we omit year dummies from these models in favor of retaining the 'SOX' indicator. We include all other relevant interaction terms like SOX × R&D and SOX × CAPEX. Appendix 1 contains detailed variable definitions. Brackets contain p-values and superscripts ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Dependent Var	CAPEX	SG&A	PPE	Assets	EBIT	IndAdj EBIT	Q	IndAdj Q	Beta	MSE	Q	IndAdj Q	Q	IndAdj Q	Div
Window/Time	(t+1)	(t+1)	(t,t+1)	(t, t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)
a: Val-to-Comp	0.327***	0.002	0.017***	0.002	-0.000	0.001	0.005	0.001	0.062***	0.020***	0.026*	0.022	0.034***	0.016	-0.043***
	[0.000]	[0.132]	[0.000]	[0.654]	[0.659]	[0.361]	[0.678]	[0.905]	[0.000]	[0.000]	[0.069]	[0.101]	[0.006]	[0.205]	[0.000]
b: SOX	-0.295	-0.000	-0.011	0.138***	-0.015*	-0.011	0.060	0.288**	-0.042	-0.243***	0.057	0.290**	0.082	0.318**	-0.425***
	[0.774]	[0.952]	[0.726]	[0.001]	[0.096]	[0.290]	[0.598]	[0.029]	[0.604]	[0.000]	[0.609]	[0.026]	[0.466]	[0.012]	[0.001]
c: CAPX/Sales	13.848***	0.014	0.128***	0.094*			-0.091	-0.074	0.456***	0.042	0.012	0.075	-0.151	-0.142	-0.334***
	[0.000]	[0.416]	[0.004]	[0.067]			[0.541]	[0.605]	[0.000]	[0.175]	[0.948]	[0.680]	[0.345]	[0.377]	[0.000]
d: R&D/Sales	2.110*	0.007	0.020	-0.067	-0.085***	-0.073***	0.358	0.400	0.008	-0.210***	0.332	0.377	1.527***	0.977*	0.565**
	[0.084]	[0.874]	[0.829]	[0.483]	[0.001]	[0.003]	[0.200]	[0.134]	[0.939]	[0.000]	[0.234]	[0.157]	[0.003]	[0.059]	[0.017]
a × **b**	-0.195***	-0.003***	-0.017***	-0.014***	0.005***	0.005***	0.018	0.029**	-0.087***	-0.035***	-0.000	0.011	0.006	0.032**	0.069***
	[0.004]	[0.002]	[0.000]	[0.001]	[0.000]	[0.000]	[0.138]	[0.015]	[0.000]	[0.000]	[0.982]	[0.445]	[0.656]	[0.017]	[0.000]
a × **c**											-0.218***	-0.219***			
											[0.003]	[0.003]			
a × **b** × **c**											0.197**	0.192**			
											[0.039]	[0.035]			
a × **d**													-0.627***	-0.522***	
													[0.000]	[0.000]	
a × **b** × **d**													0.228	0.208	
													[0.170]	[0.204]	
Controls															
CEO-related	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-related	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Market-related	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,349	15,778	18,145	19,380	19,366	19,366	19,378	19,378	17,110	17,110	19,378	19,378	19,378	19,378	19,012
R-squared	0.286	0.324	0.092	0.170	0.333	0.293	0.377	0.297	0.276	0.631	0.379	0.299	0.383	0.274	0.304

Table 19: CEO Overconfidence, Entrenchment, SOX and Effects on Investment, Risk and Performance

This table contains regressions that include either the state average Bebchuk et al. (2009) entrenchment-index (Panel A) or the firm's entrenchment index (Panel B). The dependent variables are: CAPEX in $t+1$ scaled by assets in year t (Model M1), SG&A/Sales (M2), ln(PPE$t+1$/PPEt) (M3), ln(Assets$t+1$/Assets$t$) (M4), ln(PPE$t+2$/PPE$t+1$) (M5), ln(Assets$t+2$/Assets$t+1$) (M6), Ind Adj EBIT/Assets (t+1) (M7), Ind Adj Q (t+1) (M8, M12, M13), Beta (t+1) (M9), ln(Variance(t+1)) (M10), ln(MSE(t+1)) (M11), and Dividends/Assets (t+1) (M14). All models contain the control variables from the main regressions, which we omit for brevity. We include CEO-related, firm-related and market-related controls in all models. We also include a "constant" term in each model. All models include firm fixed effects as well as year fixed effects and use clustered standard errors as in the main regressions. Brackets contain p-values and superscripts ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Dependent Variable	CAPEX (t+1)	SG&A (t+1)	PPE (t+1)	Assets (t+1)	Ind Adj EBIT(t+1)	Ind Adj Q (t+1)	Beta (t+1)	MSE (t+1)	Ind Adj Q (t+1)	Ind Adj Q (t+1)	Dividends (t+1)
Model	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
Panel A: State Average BCF-Index											
a: Confidence(t)	1.589***	0.004	0.036***	0.016	0.001	0.063	0.260***	0.076***	0.162***	0.110**	-0.231***
	[0.000]	[0.326]	[0.008]	[0.238]	[0.791]	[0.188]	[0.000]	[0.000]	[0.004]	[0.045]	[0.000]
b: SOX	-0.225	-0.001	-0.031	-0.059*	-0.006	0.263**	-0.058	-0.255***	0.271**	0.329**	-0.244*
	[0.835]	[0.886]	[0.258]	[0.096]	[0.562]	[0.050]	[0.489]	[0.000]	[0.040]	[0.015]	[0.082]
a × **b**	-0.925***	-0.013***	-0.042**	-0.034**	0.021***	0.156***	-0.176***	-0.059***	0.053	0.098	0.285***
	[0.008]	[0.009]	[0.014]	[0.036]	[0.000]	[0.007]	[0.000]	[0.000]	[0.446]	[0.120]	[0.000]
State Ave BCF	-0.136	-0.004***	-0.001	0.006	-0.003*	0.005	0.011	0.004	0.009	0.023	-0.039*
	[0.375]	[0.005]	[0.851]	[0.455]	[0.070]	[0.795]	[0.465]	[0.600]	[0.653]	[0.296]	[0.098]
a × CAPEX/Sales(t)									-1.054***		
									[0.005]		
a × **b** × CAPEX/Sales(t)									1.077**		
									[0.016]		
a × R&D/Sales(t)										-1.900***	
										[0.010]	
a × **b** × R&D/Sales(t)										2.087***	
										[0.005]	
Observations	19,309	15,744	16,055	17,070	19,324	19,336	17,074	17,074	19,336	19,336	18,974
R-squared	28.80%	32.40%	5.10%	7.50%	29.20%	29.90%	27.30%	62.90%	30.00%	27.30%	30.40%
Panel B: Firm's BCF-Index											
a: Confidence(t)	1.486***	0.002	0.012	0.023*	0.004	0.06	0.233***	0.070***	0.218***	0.112*	-0.265***
	[0.001]	[0.605]	[0.295]	[0.089]	[0.249]	[0.194]	[0.000]	[0.000]	[0.001]	[0.051]	[0.001]
b: SOX	-1.259	-0.007**	-0.045	-0.061	0.012	0.248	0.023	-0.249***	0.291*	0.300**	-0.332**
	[0.278]	[0.036]	[0.232]	[0.117]	[0.224]	[0.112]	[0.842]	[0.000]	[0.058]	[0.049]	[0.046]
a × **b**	-0.744*	-0.011**	-0.008	-0.039**	0.023***	0.176***	-0.118***	-0.051***	0.017	0.168**	0.307***
	[0.083]	[0.017]	[0.570]	[0.028]	[0.000]	[0.002]	[0.001]	[0.008]	[0.819]	[0.012]	[0.000]
BCF	0.048	0	-0.002	-0.001	0.000	0.000	-0.008	-0.008**	0.001	0.001	-0.015
	[0.420]	[0.879]	[0.415]	[0.857]	[0.769]	[0.994]	[0.219]	[0.031]	[0.951]	[0.917]	[0.249]
a × CAPEX/Sales(t)									-1.843***		
									[0.005]		
a × **b** × CAPEX/Sales(t)									1.829***		
									[0.009]		
a × R&D/Sales(t)										-3.232***	
										[0.006]	
a × **b** × R&D/Sales(t)										1.671	
										[0.131]	
Observations	13,750	11,238	11,623	12,290	13,757	13,768	12,402	12,402	13,768	13,768	13,554
R-squared	29.10%	32.00%	4.00%	8.20%	29.40%	33.00%	30.10%	64.20%	33.30%	29.70%	35.30%