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Powerful CEOs and Corporate Governance

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Excessive CEO power is often regarded as value-destroying. We use a quasi-exogenous regulatory shock to analyze whether improved governance helps to channel firms with powerful CEOs toward more value-enhancing corporate policies. We use the Sarbanes-Oxley Act and NYSE/NASDAQ listing rules and focus on firms that were required to improve governance. We find that postregulation firms led by powerful CEOs increase innovation inputs (Research and Development expenditures) and produce more innovation outputs (patents) that are scientifically more important (citations) and economically more valuable (market value of patents). Investment quality also improves, manifesting in better takeover performance and improvements in firm performance and corporate value. Our results suggest that improved governance can mitigate value destruction in powerful CEO-managed firms. We take steps to mitigate econometric concerns and ensure our results are robust to various combinations of fixed effects and control variables.

Keywords: Board Independence; CEO Power; Corporate Governance; Innovation; Powerful CEOs; SOX; Sarbanes-Oxley Act

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I. Introduction

Top executives need some level of power to lead their organizations (Bennis & Nanus, 1985; Pfeffer, 1993). However, as CEOs gain more power, agency problems may lead to empire-building and complacency, resulting in overinvestment in low-quality projects and a reduction in shareholder wealth (Pan et al., 2016). Indeed, powerful CEOs are associated with increased stock price crash risk (Al Mamun et al., 2020). Nevertheless, the literature has been relatively silent on whether specific governance mechanisms could channel powerful CEOs' efforts into value-maximizing corporate policies. By exploring regulatory changes that mandated the adoption of independent boards by some firms, our study provides new insights into how governance mechanisms can mitigate the distorted investment policies of powerful CEO-managed firms.

Without the presence of influential independent directors, powerful CEOs may have more control over the board; and thus, be given more authority to make decisions. By contrast, an empowered board could potentially reduce the incentives to make suboptimal investments (Fama & Jensen, 1983). Directors may also block CEOs' proposals when they are not in the best interest of shareholders (Fogel et al., 2014; Knyazeva et al., 2013; Tang et al., 2011). Independent directors, who are arguably less beholden to CEOs than are executive directors, may be more effective in disciplining powerful CEOs.

A complicating factor in identifying the effects of board governance is that corporate boards are endogenously determined (Hermalin & Weisbach, 1998), particularly in the context of powerful CEOs. Powerful CEOs can use their influence to select pliable directors (Fama, 1980) and increase firm-specific information asymmetry to reduce board scrutiny (Baldenius et al., 2014; Hermalin & Weisbach, 1998; Raheja, 2005). As powerful CEOs have higher bargaining power and influence, directors are often less diligent in monitoring (Cohen et al., 2012; Zajac & Westphal, 1996). This creates an identification issue where directors, especially executive directors, can be endogenously determined.

To overcome this identification challenge, we use the concurrent passage of regulations targeting independent corporate boards (Sarbanes-Oxley Act and NYSE/NASDAQ listing regulations, collectively referred to as "SOX") as a quasi-exogenous natural experiment. Guo and Masulis (2015) argue that SOX is an exogenous shock that alters board structure and improves the monitoring role of the board.[1] These regulations force some, but not all, U.S. companies to change their board composition to (inter alia) have a majority independent board and a fully independent audit committee. Some firms had already satisfied these requirements before any regulatory changes, whereas others had

[1]The extant literature also documents that the average board independence increases following the introduction of SOX (see Balsmeier et al., 2017; Graham et al., 2018; Linck et al., 2008, 2009).

not. The change in regulations is unlikely to be an "exogenous shock" for firms that had already satisfied these requirements, that is, preregulation *Compliant Firms*.[2] Thus, these firms, irrespective of whether they are managed by powerful CEOs, are unlikely to experience significant moderation in governance after these regulations. This identification strategy of using the "exogenous" change in board composition to estimate the effectiveness of board independence helps to mitigate the aforementioned endogeneity concerns (see Duchin et al., 2010).

To capture the intended effect of board governance after the regulatory changes, we study preregulation *noncompliant firms*, which were, presumably, more exposed to agency conflicts due to the absence of independent boards before these regulatory changes. Thus, the forced transition to an independent board in the postregulation period is more likely to bring an exogenous variation in *noncompliant firms*' governance. We argue that the impact of such regulatory changes on *noncompliant firms* differs depending on whether the firm is managed by a powerful CEO. We conjecture that improvements in governance brought about by more independent boards help to improve powerful CEOs' performance.

To test this conjecture, we investigate the moderating effect of improved governance on value-enhancing strategic investments, particularly investments in technological innovation. These investment decisions require board approval and contribute to long-term firm growth and success. Prior studies have explored a firm's Research and Development (R&D) investment and innovation in the context of mandated changes in board independence by comparing *compliant firms* against *noncompliant firms*. However, the impact of such regulatory mandated changes on R&D is inconclusive. For example, Balsmeier et al. (2017) argue that the exogenous transition to board independence mitigates agency problems leading to higher innovation, although firms' R&D investment level remains unchanged. However, Faleye et al. (2011) claim that exogenous transition to an independent board reduces firms' R&D and innovation due to intense monitoring. Although both studies highlight the context of agency conflicts, the impact of managerial traits remains underexplored in these studies. In contrast, we explore whether the mandated changes in board-level governance are useful and contingent on CEOs' characteristics, especially for firms that led to the enactment of SOX (i.e., *noncompliant firms* with powerful CEOs). Indeed, the regulations around 2002 were initiated in the wake of corporate scandals and widespread criticisms of corporate executives' excessive power, lack of accountability, and passive corporate boards.

We find that among the *noncompliant firms*, powerful CEO-managed firms invest more in R&D after the regulatory changes. While suggestive, increased investment in

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[2]For example, the directors of the Archer-Daniels-Midland Company approved a series of proposals to turn majority control of the board over to a group of outside directors in 1996 in response to widespread criticism of its insider dominated board (Kurt Eichenwald, New York Times, Business Week, January 16, 1996). Similarly, companies, like Amazon had a fully independent audit committee and majority board independence before enacting SOX. Armstrong et al. (2014) also confirm that *compliant firms* experienced virtually no change in their proportion of independent directors. However, *noncompliant firms* have a 45% increase in the mean proportion of independent directors after the board independence rule.

R&D may not increase shareholder wealth or translate into innovation outputs. Therefore, we examine the innovation outputs of powerful CEO-managed *noncompliant firms* relative to other *noncompliant firms*. We find that in the postregulation period, *noncompliant firms* run by powerful CEOs obtain more patents that are scientifically more valuable. The patents of powerful CEO-managed firms are cited more often, on average, and are more likely to be radical or breakthrough innovations. More importantly, while prior studies have considered the quantity and quality of innovation, the value implications of innovation following the mandatory adoption of independent boards are relatively underexplored (see Balsmeier et al., 2017; Faleye et al., 2011). We find that after the regulatory changes, the innovations of *noncompliant* firms with powerful CEOs are economically more valuable, as proxied by the market's reaction to patent grants. Furthermore, we find that new product announcements made by powerful CEO-managed firms have more positive abnormal market returns in the postregulation period. This evidence is consistent with the notion that enhanced governance focuses powerful CEOs' attention on innovations that translate into marketable and valuable products.

We additionally analyze the impact of improved governance on powerful CEOs' takeover decisions. Prior literature suggests that the market reacts negatively to powerful CEOs' takeover announcements (Grinstein & Hribar, 2004). Since takeover decisions are strategic corporate decisions that also require approval from board directors, we analyze the impact of the regulatory changes on takeovers undertaken by *noncompliant* firms. We find that the market reacts favorably to takeover announcements by powerful CEO-managed firms in the postregulation period. Furthermore, we find that firms with powerful CEOs are more likely to acquire innovative firms in the postregulation period and that these acquisitions of innovative firms create more value. The purchase of innovation through acquisitions could partially explain the observed increase in innovation in powerful CEO-managed firms in the postregulation period.

We further find that better governance in the post-SOX period improves the corporate performance of powerful CEO-managed firms. We find that after SOX, powerful CEOs have a significantly more positive impact on firm profitability (measured by return on assets [ROA]) and Tobin's Q. This effect is in addition to the finding that powerful CEOs' takeovers appear to create more corporate value after SOX. Overall, the results indicate that SOX can have a positive impact on some specific types of CEO that might otherwise exhibit governance problems.

We also find that this improved governance manifests in changes to powerful CEOs' compensation contracts. After SOX, options that increase CEOs' risk-taking incentives are a significantly higher proportion of compensation for powerful CEOs. This evidence suggests a direct mechanism through which boards can influence the innovation of powerful CEO-managed firms in the post-SOX period. This is in addition to the aforementioned changes to board composition, which themselves would increase corporate monitoring and scrutiny.

We also address potential econometric concerns. One concern is that CEO power—in addition to governance—may change upon the mandatory adoption of an independent board. Thus, our results might be attributable to a diminution in CEO power rather than a change in corporate governance. We address this concern by

constructing the measure of CEO power from sources that are unlikely to be affected *directly* by board composition. Specifically, we do not include any source of CEO power that emanates directly from board structure (e.g., board co-option or a CEO's soft power from connectedness [see Kim & Lu, 2018], dual-class stock structure, and anti-takeover provision [ATP], among others). Although we do not deviate from the extant literature to identify the sources of CEO power (Daily & Johnson, 1997; Han et al., 2016), our approach allows us to construct the CEO power measure so that it is not mechanically affected by the regulatory changes or with changes in board structure. Nonetheless, in our robustness tests, we control for other sources of CEO power, such as issuance of dual-class stock (Masulis et al., 2009), extraction of a higher pay slice by the CEO (Bebchuk et al., 2009), and whether the CEO is the only insider on the board (Adams et al., 2005) and find similar results. We also show that our power index does not fluctuate much throughout the sample period.

We also address concerns about CEO turnover. Indeed, independent boards may remove the CEO in the postregulation period (Weisbach, 1988). Thus, changes in corporate policies may be driven by new CEOs where the power structure, leadership style, and choice of corporate policies differ significantly from those of the replaced powerful CEOs from the preregulation period. We address this concern in a robustness test and show that our main results are similar after excluding firms that experienced turnover of CEOs around the regulation changes in 2002.

Another relevant concern is that some powerful CEOs could also be overconfident CEOs which may drive the suboptimal corporate policies of powerful CEOs in the absence of board oversight.[3] However, the standard measures of CEO power differ from the measures of CEO overconfidence used in the literature, such as holding in-the-money options and presence in media (Malmendier & Tate, 2008). As a robustness test, we control for "CEO overconfidence" in the specifications. We also exclude highly overconfident CEOs from the analysis. We find similar results suggesting that our baseline results are not significantly driven by CEO overconfidence. We also ensure the results are robust to controlling for myriad other corporate variables and the characteristics of CEO compensation.

We consider additional tests to validate our identification strategy. These include placebo and falsification tests. More precisely, using only pretreatment data and exploiting placebo shocks, we document that there are no discernible changes in the investment decisions of powerful CEO-managed *noncompliant firms*. In addition, we do not observe any discernible strategic shifts for powerful CEO-managed firms that had already complied with the requirements of the regulations before their passage. The analysis of the effect of regulatory changes on powerful CEOs in *noncompliant firms* vis-à-vis *compliant firms* in a triple-difference test further supports our argument. Thus, we document novel

[3]Banerjee et al. (2015) follow a similar identification strategy in the context of overconfident CEOs but do not explicitly consider pre-SOX heterogeneity in firm's governance structure in their main tests. More importantly, their main variables of interest differ markedly from those used in this study.

empirical evidence that CEO power coupled with weak governance drives the negative views about powerful CEOs.

Our study adds to the literature that explores whether exogenous improvements to board governance influence corporate outcomes. Prior literature has analyzed the impact of such regulations in several areas, for example, management disclosure (Armstrong et al., 2014), investment and firm performance (Banerjee et al., 2015; Duchin et al., 2010), innovation (Balsmeier et al., 2017; Faleye et al., 2011), and interactions of internal and external governance (Guo et al., 2015). These studies broadly focus on both pre-SOX *compliant* and *noncompliant firms* and are not conclusive on whether the effect of regulations targeting independent boards creates shareholder value (Coates, 2007; Holmstrom & Kaplan, 2003; Perino, 2002). The mixed findings could be potentially attributable to the ex ante heterogeneity in underlying firm governance mechanisms. We focus on preregulation *noncompliant firms* where both the treatment and control firms are exposed to the mandatory adoption of the independent board rule. However, the ex ante difference between these two sets of firms arises from the differences in CEO power. This allows us to analyze whether these regulations have had a significant impact in moderating the investment decisions of poorly governed firms led by powerful CEOs. Our study has important implications for policymakers since the literature is relatively silent on which governance mechanism can align the efforts of powerful CEOs to value-maximizing corporate policies. This study supports the notion that regulation-driven improvement in firm-level governance is beneficial for firms that were more in need of such an exogenous shock, that is, preregulation *noncompliant firms* with powerful CEOs.

We also contribute to the literature on how governance regulations influence innovation. Some prior literature has analyzed the relationship between board governance and innovation (see, e.g., Faleye et al., 2011, Balsmeier et al., 2017). However, the prior literature primarily measures innovation success through citation counts, as opposed to value creation by generating economically more impactful patents. In addition, prior studies have not focused on how the impact of governance-related regulations can be contingent on CEO attributes. By contrast, our study also analyzes the value implications of innovation. Our novel evidence on new product announcement returns corroborates the baseline analyses of economic value creation through patents. Our study also illustrates the importance of accounting for CEO power when analyzing the impact of independent boards on corporate strategies. An important distinguishing aspect of our study is our focus on the changes in M&A strategies and the associated market reactions to those M&A announcements by *powerful CEOs* after the regulation change as opposed to those of *average CEOs*, who are the focus in Faleye et al. (2011) and Balsmeier et al. (2017).

Finally, our study also contributes to the impact of CEO power. Prior studies highlight the negative impact of CEO power (Bebchuk et al., 2011; Morse et al., 2011). Our study is the first to show that powerful CEOs can generate value in the presence of independent boards. We contribute to the growing literature that highlights the context where powerful CEOs could have positive value implications. For example, Li et al. (2019) explore the context of product market competition where powerful CEOs could be beneficial. We focus on governance mechanisms that could divert the efforts of powerful CEOs to value-enhancing corporate policies. We further demonstrate that the impact

of governance reforms can depend in part on the nature of the CEO. Thus, our study is also related to the literature that studies how managerial preferences and interactions among CEOs and boards influence corporate investment decisions (Balsmeier et al., 2017; Bertrand & Schoar, 2003; Graham et al., 2013, 2018; Malmendier et al., 2011; Manso, 2011).

II. Motivation and Hypothesis Development

The classical agency conflicts literature builds on the idea that managers act in their self-interest in the presence of ineffective board oversight. Agency conflicts due to a lack of effective monitoring may take several forms. Managers might "shirk," exerting less effort than is desirable (Bertrand & Schoar, 2003). Managers could also engage in empire-building through undertaking over-investment or value-destroying investments as managers are disproportionately rewarded for investment successes but are not penalized for failures (Harford & Schonlau, 2013). These agency conflicts could be exacerbated when managers capture more power. Powerful CEOs may have more control over the board; and thus, be given more authority to make decisions. Previous studies suggest that powerful CEOs may influence board decisions (Bebchuk et al., 2011; Grinstein & Hribar, 2004; Morse et al., 2011) and adversely affect board decisions and firm performance (Adams et al., 2005; Han et al., 2016; Khanna et al., 2015). This can manifest in greater stock crash risk (Al Mamun et al., 2020). However, an improvement in corporate governance, such as mandated independent boards, may help to mitigate the distorted investment policies of powerful CEO-managed firms.

This study examines whether a more independent board can better direct powerful CEOs toward higher-quality investments, such as those in innovation and value-creating takeovers. This analysis is important for several reasons. Prior literature is broadly silent on which governance mechanism could discipline powerful CEOs. Thus, understanding to what extent, if any, the board can help restrain and redirect powerful CEOs is important from a corporate governance mechanism. Furthermore, although the corporate board is a powerful mechanism to reduce a manager's moral hazard problem (see Shleifer & Vishny, 1997), we still do not know whether the board could play its role in the presence of powerful CEOs. In so doing, the results help to highlight that the benefits of an independent board can depend on the firm's executive composition.

We use the enactment of regulatory changes around 2002, the Sarbanes-Oxley Act, and the changes to the NYSE/NASDAQ rules, hereafter, "SOX") as a quasi-exogenous experiment. SOX imposes board independence rules that provide the board with more monitoring power and a stronger voice to replace self-serving managers (e.g., powerful CEOs). Following these regulatory changes, firms that did not have a majority independent board and a fully independent audit committee before 2002 (hereafter, preregulation *noncompliant firms*) were forced to change their board structures. The prior literature suggests that preregulation *noncompliant firms* experience a significant change in board composition (Armstrong et al., 2014; Balsmeier et al., 2017; Harris &

Raviv, 2008). Evidence suggests that the introduction of board independence regulations has improved disclosure, and subsequently, governance and monitoring (Chhaochharia & Grinstein, 2007). The regulatory changes have also increased the personal responsibility of corporate leaders (Faleye et al., 2011) and have increased the diversity of opinion at the board level (Linck et al., 2009). Thus, the regulatory change is likely to have a stronger disciplining effect in powerful CEO-managed *noncompliant firms*. We examine whether the regulatory changes initiate a strategic shift in powerful CEO-managed *noncompliant firm* investment decisions, such as innovation and mergers and acquisitions.

A. Innovation Inputs and Outputs

Innovation can drive corporate growth (Geroski et al., 1993). However, R&D investments, the input of innovation, are often risky with distant and uncertain cash flows and have a high failure rate (Nelson & Winter, 1982). Successful innovation also requires a corporate culture that allows for the freedom to experiment, tolerance for failure, and diversity in the top management team to motivate innovation among employees (Sutton, 2002). Breakthrough innovation is a valuable intangible asset and has a strategic importance that may improve long-term corporate performance (Tushman & Anderson, 1986).

Prior literature suggests that CEO characteristics such as tenure, stock ownership, preferences, firm-specific knowledge, and incentives can shape a firm's commitment to R&D investments and innovation (Barker & Mueller, 2002). Powerful CEOs, particularly those who are founders or long-tenured, may possess better firm-specific knowledge and are more likely to invest in innovative projects. In contrast, powerful CEOs with larger ownership stakes might drive underinvestment in R&D and innovation due to the high probability of failure (Holmstrom, 1989; Kim & Lu, 2011a, 2011b). R&D investment and innovation may not be compatible with the inflexible strategies, which are more often prevalent in powerful (long-tenured) CEO-managed firms (Grimm & Smith, 1991). Given the opposing findings in the literature, the impact of powerful CEOs on R&D investments and innovation is an open empirical question.

We suggest that compared to their nonpowerful peers, powerful CEOs might derive more disutility from R&D investment and innovation as they value control over larger resources. Failed investments in R&D and innovation may dissipate those resources. Nevertheless, an independent board could discipline managerial discretions and mitigate agency problems in *noncompliant firms*. Thus, we expect enhanced board oversight from regulatory changes will increase R&D investment and innovation in *noncompliant firms* with powerful CEOs, bringing them more in line with other CEOs.

Improved governance should also enhance the quality of the innovation investment in addition to the quantity of investment. We expect that improved oversight would encourage CEOs to focus on value-creating and beneficial R&D investments rather than enabling a disorganized approach to innovation. This should manifest in higher patenting and improved patent quality. Moreover, these higher-quality innovations should translate into new commercially viable products. If the market perceives new products as

important breakthroughs, then there should be a more positive market reaction to product announcements. Thus, we make the following hypotheses:

Hypothesis 1: Improved governance increases expenditures on innovation (i.e., R&D) in powerful CEO-managed noncompliant firms.

Hypothesis 2: Improved governance increases patent output and patent quality in powerful CEO-managed noncompliant firms.

Hypothesis 3: Improved governance positively increases the market reaction to new product announcements in powerful CEO-managed noncompliant firms.

B. Investments in Takeovers

Powerful CEOs have stronger incentives to engage in empire building (Baldenius et al., 2014) as they arguably like to lead larger firms (Jensen, 1986). The empire-building motive may distort corporate capital allocations, manifesting (inter alia) in value-destroying M&A deals (Grinstein & Hribar, 2004). For example, CEO power increases with CEO tenure (Pan et al., 2016), and the board often permits long-tenured powerful CEOs to overinvest or engage in empire building (Jensen, 1993). A lack of oversight could enable managers to spend money on acquisitions (Harford & Schonlau, 2013). Weaker governance might encourage empire-building, especially for powerful CEOs who are less likely to be removed for doing so. This lack of monitoring could also cause powerful CEOs to overpay for targets or select targets that they erroneously believed were synergistic. Such decision failures may at least partially explain why takeovers of powerful CEO-managed firms underperform. By contrast, increased independent oversight could mitigate such agency problems by forcing powerful CEOs to consider outside opinions and exposing CEOs to discipline by independent directors who are incrementally less beholden to the CEOs than are executive directors.

Acquiring innovation through takeovers could be a plausible mechanism to enable firms to access innovative resources faster than developing innovation internally (see Bena & Li, 2014). This strategy could also enhance corporate growth. Given the prediction that improved governance encourages powerful CEOs to adopt value-enhancing corporate policies, we also expect that firms managed by powerful CEOs would undertake more acquisitions of innovative targets after these regulatory changes. In addition, such acquisitions will elicit a more favorable market response. We capture these predictions in the following hypotheses:

Hypothesis 4: Improved governance increases takeover announcement returns of powerful CEO-managed noncompliant firms.

Hypothesis 5: Improved governance increases the likelihood that powerful CEO-managed noncompliant firms acquire innovative targets.

Hypothesis 6: Improved governance improves the market reactions to the acquisitions of innovative targets by powerful CEO-managed noncompliant firms.

III. Variable Construction, Sample, and Methodology

A. Variable Construction: CEO Power

CEOs may derive power from a number of sources. CEOs may derive power from their status as founders of firms or from retaining significant holdings of a firm's equity (Daily & Johnson, 1997; Finkelstein, 1992). Prior studies show that CEOs, through their status as founders or with significant shareholdings, can influence a firm's operating, capital allocation, and strategic decision, prevent involuntary dismissal, and thus are likely to be more powerful (Daily & Johnson, 1997).

We hand-collect information on founders such as names and the number of founders of each firm and founding year. We use several sources, including 10-K filings of the firms with the Securities and Exchange Commission (SEC) available in Electronic Data-Gathering, Analysis, and Retrieval, the Funding Universe website, company websites, and other internet resources, including Wikipedia, Forbes pages, Bloomberg's Business Week website, among others. "Founder-CEO" in a given year is an indicator variable that equals one if any source explicitly mentions that the current CEO is one of the founders of the firm or was the main executive at the time the company was founded (Adams et al., 2005). In addition, using Execucomp ownership data, we construct the "CEO Ownership above Industry Median" variable that represents CEOs with ownership above the industry (two-digit) median (see Han et al., 2016).

CEOs may increase their power by holding the chairman title of the board and/or holding the titles of other top corporate executives such as President or Chief Operating Officer and, thus, dominate the decision-making forum. These sources capture a CEO's structural power and reflect their influential leadership ability within the firm (Finkelstein, 1992). Morck et al. (1988) argue that a powerful CEO is one who holds the title of president or chairman, and no other person co-signs the letter to the shareholders in the annual report. Since the regulatory changes of 2002 do not contain provisions directly targeting CEO-Chair duality or title concentration, these components of CEO power are not expected to be affected by these regulations. Although these sources of power could reduce the presence or influence of independent directors (see Morse et al., 2011), this is less of a concern in our study as we concentrate on *noncompliant firms* who had to comply with the mandatory adoption of independent directors after the regulatory changes.

A CEO's tenure allows us to capture both expert and prestige power (Finkelstein, 1992). CEOs with tenure that is longer than the median tenure of managers in the same industry would be more powerful than other CEOs (see Han et al., 2016). This is because CEOs gather firm-specific knowledge and influence corporate development to cater to their expertise, thereby making them more difficult to replace. Longer-tenured CEOs may hire supportive executives, form a co-opted board, and influence firm policy, further entrenching them. Graham et al. (2018) show that CEOs with high bargaining power

due to their longer tenure significantly reduce board independence. However, after the regulatory changes of 2002, they document an insignificant effect of long-tenured CEOs on board independence. Thus, the director's bargaining power in *noncompliant firms* is less likely to be affected by long-tenured CEOs.

We collect CEO tenure data from Execucomp. However, CEO-tenure constructed using Execucomp data (variable *became CEO*) could be problematic for a set of CEOs who leave their managerial position and return to the focal firms of analysis later during the sample period. For these CEOs, we use hand-collected tenure data from various sources, including those described above. CEO power ("CEO Power") is constructed as an index which consists of "Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median," and "CEO Ownership above Industry Median."

We do not include dual-class structures, staggered boards, or ATPs in constructing the "CEO Power" index. While dual-class structures can increase CEO power (Masulis et al., 2009), the mandatory adoption of board independence reduces firms' incentives to use a dual-class structure (Arugaslan et al., 2010). Similarly, the presence of staggered boards or ATPs could be altered through board monitoring, and an active board could be a potential substitute for the takeover market (Brickley et al., 1994).[4]

B. Sample and Data Description

We construct our primary data set combining the universe of firms contained in the Standard and Poor's Executive Compensation (Execucomp) database and Compustat. Following the standard literature, we exclude financial firms (Standard Industrial Classification [SIC] codes 6000–6999) and regulated industries (SIC codes 4900–4949). The Centre for Research in Security Prices (CRSP) data set provides stock price information. Most of the CEO characteristics are from Execucomp. We collect corporate board data from the Institutional Shareholder Services (ISS) Directors database. The primary data set includes 2622 unique firms and 27,585 firm-year observations during 1992–2011, for which we have data on "CEO Power" measures.[5] We merge the primary data set with the ISS data set to identify preregulation *noncompliant firms*.

To identify preregulation *noncompliant firms*, we first focus on firms with available data on both fully independent audit committees and majority board independence during 1998–2001. We then use the preregulation 4-year rolling average of these indicators to track firms that had complied with the requirements of these regulations before these

[4]Our CEO power measure also excludes any SOX reform requirements directed at CEOs, for example, certification requirements of financial reports, restrictions on loans, and trading, among others.

[5]The year 1992 is the first year for available data in ExecuComp. We end the sample in 2011 to have a balanced preregulation (10 years) and postregulation (10 years) period.

regulations became mandated.[6] The merged primary-ISS data set consists of 1070 firms, of which 524 are preregulation *noncompliant firms*.[7]

1. Dependent Variables

As the measure of innovation inputs, we use the firm's R&D expenditures$_{(t+1)}$ scaled by total assets$_{(t)}$. We use the natural logarithm of one plus the number of patents applied for (and subsequently granted) as a proxy for the quantity of innovation. To distinguish major technological breakthroughs from incremental technological improvements, we use the citations received by these patents to measure the quality of innovation. Since citations may only reflect technological value rather than the market value of innovation, we also explore the economic value of innovation through the market reaction to patent grants. Finally, we examine whether powerful CEO-managed firms file differential radical innovations in the postregulation period. To measure radical innovation, we first identify the patents of the firms cited in the 90th (95th) percentile of the technology–class–year citation distribution. Then, we construct a continuous variable "Radical_90" ("Radical_95") that distinguishes the firm's radical innovation by adding the patents cited in the 90th (95th) percentile of the technology–class–year citation distribution. We use these innovation measures to analyze whether powerful CEO-managed firms experience better innovation after the improvement in board governance.

The patent data are from the Kogan et al. (2017) patent data set (Kogan, Papanikolaou, Seru, and Stoffman [henceforth KPSS]). The KPSS patent data set provides data for all patents granted by the U.S. Patent and Trademark Office over 1926–2010. We restrict the sample to patent applications up to 2008 since patents applied for after 2008 may not appear in the data set due to the time lag in granting patents. We use the KPSS (2017) patent data instead of the NBER patent data (see Hall et al., 1986). This data set allows us to identify comprehensive patent portfolios up to 2008, compared to 2004 for the NBER patent data. After merging our final data set with KPSS (2017), the sample consists of 1049 unique firms. Out of the 1049 matched firms, 510 firms are *noncompliant*. Since innovation outputs (i.e., patents and citations generated from R&D investment) require considerable time to occur, we examine the effect of powerful CEOs on innovation outcomes at time $t + 2$[8].

We also analyze the product market conditions of the firms, which could be influenced by corporate innovation. We use "75th Percentile Return" and "Product

[6]Although Chhaochharia and Grinstein (2007) and Duchin et al. (2010) discuss the timelines of these regulations, prior studies use different periods to identify *noncompliant firms* (see Armstrong et al., 2014; Balsmeier et al., 2017; Guo & Masulis, 2015). The rolling average of indicators that we apply limits our exposure to any preshock period while identifying *noncompliant firms*.

[7]Although our noncompliant firm sample does not include firms that comply with SOX requirements before 2002, our baseline results do not change much if the sample includes firms that comply with SOX requirements just before 2002 (i.e., 2001 or 2000) (unreported).

[8]The results for innovation outputs are robust to measuring outputs at time $(t + 1)$ (see Table A1).

Announcement Return" to measure the market reaction to the announcement of new products. The variable "Product Announcement Return" is the natural logarithm of the sum of all positive cumulative abnormal returns (CARs) over the year. "75th Percentile Return" is the natural logarithm of one plus the number of announcements with the CARs above the 75th percentiles.

We obtain new product data from Mukherjee et al. (2017) during 1992–2006. Mukherjee et al. (2017) create this data set by searching the LexisNexis News database for company press releases that are tagged under the subject "New Products" and where their headlines include keywords (with the roots of words) such as "Launch," "Product," "Introduce," "Begin," "Unveil." They use a standard event study methodology to calculate CARs over the 3-day (−1, 1) period around the product announcement press release. Due to data constraints, our merged data set includes 328 unique *noncompliant firms* for which we have the market reaction to a product announcement.

For the tests involving M&A, we calculate the market reaction to takeover announcements using CARs over the 3-day event window. We measure "buy and hold returns," where the estimation window starts 210 days prior to the announcement date and ends 11 days prior to the announcement date (−210, −11) since the market may react before the merger announcement. We calculate abnormal returns based on the difference between the predicted return and actual stock return. Following Masulis et al. (2007), we require that the deal size is larger than 1 million dollars and that acquirers control less than 50% of the target company before the acquisition and control 100% of the target company after the acquisition. We exclude government, joint-venture, foreign, and mutual targets and deal with missing transaction values and CRSP price data. Finally, we require that the deal value be at least 1% of the acquirer's market equity value measured on the 11th trading day before the announcement date. The merged data set includes 3638 unique deals for which we had a market reaction to M&A deals. Out of 3638 firms, we find 1706 deals initiated by noncompliant firms.

We also identify innovative public and private targets among the target firms using the Harvard Patent Inventor Data project (Li et al., 2014).[9] We define a target firm as an innovative target if the firm receives at least one patent prior to the takeover. The resulting subsample includes 1024 unique target firms, where 374 are identified as innovative targets.

2. Independent Variables

In our tests, we control for variables that are standard in the literature. The firm-level controls include "firm size," as proxied by the natural logarithm of the book value of assets. We also control for "firm age" in all our specifications since older firms' may experience less growth through takeovers and explore different technological innovations. A firm's profitability, market performance, and debt ratio affect the firm's access to funds

[9]We exclude subsidiary targets when identifying an innovative target as Harvard patent dataset does not consistently report the patents of subsidiaries.

Table 1: Summary Statistics

Panel A: Summary statistics

	Noncompliant firm sample			*Compliant firm sample*			
Variables	*Mean*	*Median*	*SD*	*Mean*	*Median*	*SD*	t-*test*
Firm characteristics							
Firm Size	7.119	6.967	1.557	7.368	7.282	1.578	2.74**
Firm Age	24.108	20.000	17.885	28.929	24.000	21.707	−3.93***
Profitability	0.040	0.055	0.117	0.039	0.054	0.113	0.33
Leverage	0.181	0.150	0.196	0.192	0.173	0.173	−1.31
Tobin's Q	0.592	0.497	0.515	0.589	0.491	0.502	0.11
$R\&D_{(t)}$	0.040	0.000	0.099	0.045	0.014	0.087	−1.14
CAR	0.003	0.002	0.064	0.001	0.00	0.058	−1.24
Measures of innovation							
Patents	0.945	0.000	1.538	1.366	0.000	1.770	−4.14***
Citations	1.385	0.000	2.259	1.937	0.000	2.555	−4.08***
Value of Innovation	1.498	0.000	2.500	2.205	0.000	2.862	−4.72***
Radical_90	0.151	0.000	0.625	0.175	0.000	0.639	−0.69
Radical_95	0.111	0.000	0.510	0.130	0.000	0.516	−0.67
75th Percentile Return	0.599	0.693	0.712	0.529	0.000	0.674	1.32
Product Announcement Return	0.097	0.037	0.153	0.083	0.030	0.139	1.12
Measures of CEO power							
Founder CEO	0.224	0.000	0.417	0.129	0.000	0.336	4.73***
CEO-Chair	0.607	1.000	0.488	0.649	1.000	0.477	−2.07**
Title Concentration	0.233	0.000	0.423	0.275	0.000	0.446	−2.38**
CEO Tenure	9.494	7.000	8.794	7.866	6.000	6.977	4.39***
CEO Ownership	0.037	0.005	0.075	0.017	0.003	0.045	6.58***
CEO Power	2.076	2.000	1.438	1.940	2.000	1.326	2.38**

Panel B: Summary statistics of dependent variables in the preregulation period

	Noncompliant firm sample			*Compliant firm sample*			
Variables	*Mean*	*Median*	*SD*	*Mean*	*Median*	*SD*	t-*test*
$RD_{(t+1)}/Asset_{(t)}$	0.039	0.000	0.071	0.045	0.013	0.073	−1.53
Patents	1.117	0.000	1.622	1.619	1.099	1.855	−4.15***
Citations	1.935	0.000	2.587	2.721	2.197	2.852	−4.25***
Value of Innovation	1.834	0.000	2.693	2.716	1.709	3.042	−4.78***
Radical_90	0.175	0.000	0.684	0.201	0.000	0.683	−0.59
Radical_95	0.131	0.000	0.560	0.151	0.000	0.559	−0.58
75th Percentile Return	0.671	0.693	0.736	0.593	0.693	0.706	1.34
Product Announcement Return	0.110	0.045	0.166	0.094	0.036	0.154	1.13
CAR	0.005	0.002	0.074	−0.000	0.000	0.066	1.41

Panel C: Correlation matrix of the components of powerful CEO index in noncompliant firms

Variables	*1*	*2*	*3*	*4*	*5*
1. Founder CEO	1				
2. CEO-Chair duality	0.160*	1			
	(0.000)				
3. Title Concentration	0.011	0.444*	1		
	(0.316)	(0.000)			

Table 1: *Continued*

Panel C: Correlation matrix of the components of powerful CEO index in noncompliant firms

Variables	*1*	*2*	*3*	*4*	*5*
4. CEO Tenure above the Industry Median	0.307*	0.279*	0.086*	1	
	(0.000)	(0.000)	(0.000)		
5. CEO Ownership above the Industry Median	0.345*	0.166*	0.051*	0.353*	1
	(0.000)	(0.000)	(0.000)	(0.000)	

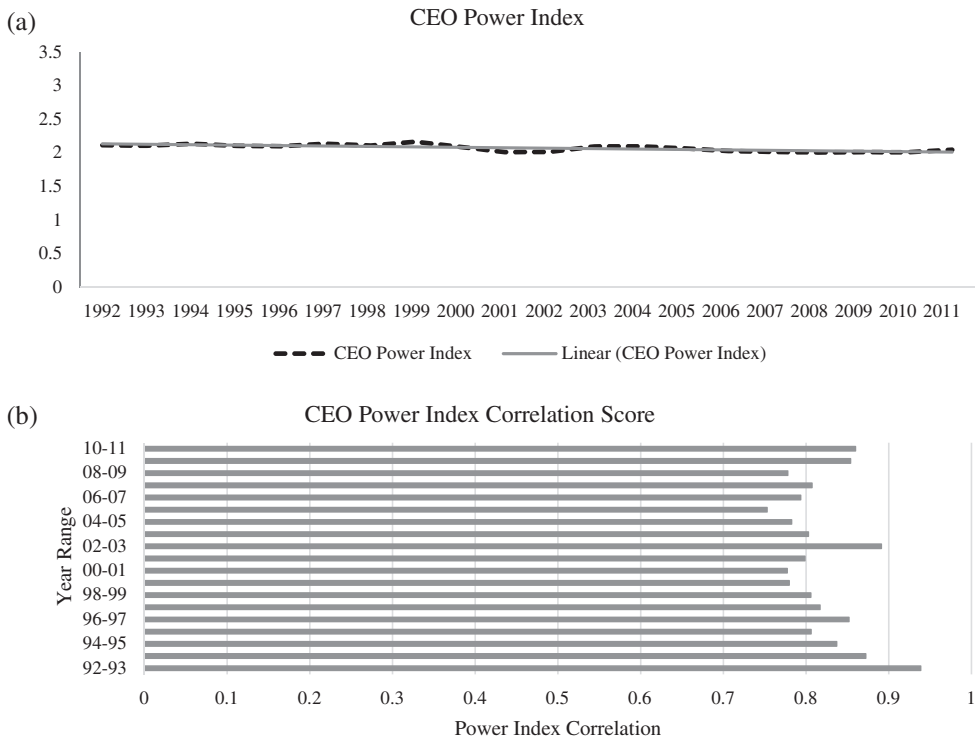
NOTES: This table reports summary statistics of the firms. The sample consists of publicly traded, nonregulated S&P1500 firms from 1992 to 2011. The noncompliant firm sample is a subsample of the full sample and consists of firms without fully independent audit committee or majority board independence before the year 2002. "Founder-CEO" in a given year is an indicator variable that equals one if any source explicitly mentions that the current CEO is one of the founders of the firm or was the main executive at the time the company was founded. "CEO-Chair" equals one if the CEO is also the chairman of the board. "CEO Title Concentration" equals one if the CEO holds more than two titles. "CEO Ownership above the Industry Median" is an indicator that equals one if the CEO's ownership is above the median ownership of CEOs in the industry–year distribution. "CEO Tenure" is the number of years the CEO has served as "CEO" of the firm. "CEO Tenure above the Industry Median" is one if the CEO's tenure is above the median tenure of CEOs in the industry–year distribution. "CEO Power" is an index which is an aggregate measure of the five components of CEO power—Founder-CEO, CEO-Chair, CEO Title Concentration, CEO Ownership above the Industry Median, and CEO Tenure above the Industry Median. Thus, the index value ranges from 0 to 5. "SOX" is an indicator that equals one if the observation occurs in 2002 or later and zero otherwise. "Firm size" is the natural logarithm of assets. "Firm age" is the difference between the current year and the year of the firm's incorporation. "Profitability" is the earnings before interest and tax (EBIT) scaled by the total assets. "Leverage" is the long-term debt scaled by the $\text{assets}_{(t-1)}$. "Tobin's Q" is the natural logarithm of the book value of debt plus the market value of equity scaled by the book value of assets. "$\text{RD}_{(t+1)}/\text{Asset}_{(t)}$" is the R&D $\text{expenditures}_{(t+1)}$ scaled by $\text{assets}_{(t)}$. "Patents" are the natural logarithm of one plus number of patents applied by a firm at $\text{time}_{(t+2)}$. "Citations" are the natural logarithm of one plus number of citations attributed to a firm's patents at $\text{time}_{(t+2)}$. "Value of Innovation" is the natural logarithm of one plus the average value of a firm's patents at $\text{time}_{(t+2)}$. "Radical_90" is the natural logarithm of one plus the number of a firm's patents at $\text{time}_{(t+2)}$ with citations in the 90th percentile of the technology–class–year citation distribution. "Radical_95" is the natural logarithm of one plus the number of a firm's patents at $\text{time}_{(t+2)}$ with citations in the 95th percentile of the technology–class–year citation distribution. "75th Percentile Return" is the natural logarithm of one plus the number of announcements with CARs above the 75th percentile. 'Product Announcement Return' is the natural logarithm of the sum of all positive CARs over the year. "CAR" is the 3-day (−1,1) CAR calculated using the market model. SEs are clustered at the firm-level for the *t*-test. Panel A reports the summary statistics of noncompliant and compliant firms. Panel B reports the summary statistics of the dependent variables in the preregulatory period. Panel C reports the Pearson correlation coefficients of the components of CEO power in noncompliant firms.

and subsequent investment. Thus, we also control for profitability, Tobin's Q, and leverage in our specifications. Variable definitions are in Table A7.

C. Summary Statistics

We report descriptive statistics of variables in Table 1. Panel A of Table 1 reports descriptive statistics for the full sample. The average firm size in our sample is large since the sample consists of S&P1500 firms. As in Armstrong et al. (2014) and Balsmeier et al. (2017), we find that *noncompliant firms* are smaller compared to *compliant firms*. The average age of *noncompliant firms* is 24 years, which is significantly lower than that of *compliant firms*. *Compliant* and *noncompliant firms* are similar in terms of profitability, Tobin's Q, R&D, and leverage (consistent with Duchin et al., 2010, Armstrong

Figure 1: Changes in CEO Power Index over 1992–2011.



(a) The mean value of the CEO power index from 1992 to 2011. The yearly figure shows that, on average, the powerful CEO index in the noncompliant firms does not change systematically around the event year 2002. The trend line also shows that the year-to-year change in the index is random, and on average, the power index was persistent during the sample period. (b) The year-to-year correlation of the power index.

et al., 2014, Balsmeier et al., 2017). *Compliant firms*, on average, have higher patents, citations, and patent value.

The percentage of founder CEOs in *noncompliant firms* is 22.4% compared to 12.9% in *compliant firms*. We find a higher prevalence of CEO-Chair duality and title concentration in *compliant firms*. *Noncompliant firm* CEOs have higher tenure, greater ownership, and are more powerful.

Panel B of Table 1 reports summary statistics of dependent variables used in the study. *Compliant firms* have similar R&D expenditures but more patents, citations, and valuable innovation than *noncompliant firms* in the preregulation period. The higher innovation of *compliant firms* without necessarily overspending in R&D suggests that the agency problem is less of a concern for *compliant firms* (Balsmeier et al., 2017). Hence, these firms are unlikely to benefit from the regulatory changes targeting better governance.

Panel C of Table 1 reports the correlation matrix of the individual sources of power and the CEO power index.

Since we use the regulatory changes as an identification strategy, the causal inference could be confounded if the treatment directly influences CEO power. To further address this concern, we plot the yearly average CEO power index in Figure 1a. The figure shows that, on average, the powerful CEO index in the noncompliant firms does not change systematically around the event year 2002. The trend line also shows that the year-to-year change in the index is random, and on average, the power index was persistent during the sample period. We also check the year-to-year correlation of the power index. The bar chart of Figure 1b shows that the consecutive years' CEO power indices are highly correlated. This chart provides evidence that the power index was not significantly volatile during the sample period. Thus, it is unlikely that these quasi-exogenous regulations significantly influence the CEO power measure in the postregulation period.

D. Methodology

We use a difference-in-difference (DID) continuous design. We examine whether the exogenous shock to governance due to the mandatory adoption of the board independence requirement has a differing effect on corporate policies of the preregulation *noncompliant firms* with powerful CEOs compared to *noncompliant firms* without powerful CEOs.[10] We estimate the following panel DID for our analysis:

$$Y_{i,t+1} = \alpha + \beta SOX_{i,t} \times CEOPower_{i,t} + \vartheta CEOPower_{i,t} + \tau SOX_{i,t} + \delta \gamma_{i,t} + \lambda_i + \lambda_t + \varepsilon_{i,t}. \quad (1)$$

Here, $Y_{i,t+1}$ represents the relevant dependant variable of firm *i*. *SOX* is an indicator variable (treatment) that is equal to one for years after the passage of the Sarbanes-Oxley Act and NYSE/NASDAQ listing regulation changes and zero otherwise. τ captures the average changes in corporate policies of *noncompliant firms* from pre to postregulations periods. CEO power, a time-variant measure of managerial power, is proxied by the CEO-power Index. ϑ measures the average difference in corporate policies between powerful (treatment group) and nonpowerful (control group) CEO-managed firms. β captures the average differential change in corporate policies from the pre to postregulation periods for powerful CEO-managed firms compared to firms without powerful CEOs. $\gamma_{i,t}$ is the vector of firm-level controls. λ_i is firm (or industry) fixed effect that addresses the concern for the firm (industry) specific omitted variable bias by controlling for any unobserved time-invariant cross-sectional heterogeneity across firms (industries). λ_t is time fixed effect that controls for any unobserved year-specific features.[11] $\varepsilon_{i,t}$ represents error terms. We cluster SEs at the firm level.

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[10]In robustness tests, we also explore a triple-interaction test that uses all firms.

[11]Since our methodology is based on a single shock, when we use the treatment variable "SOX" with year fixed effect, τ will be subsumed by year fixed effect.

Table 2: Covariate Balance Test

	Treatment firms			*Control firms*			
Variables	*Mean*	*Median*	*SD*	*Mean*	*Median*	*SD*	t-*test*
Firm Size	6.985	6.779	1.462	6.838	6.741	1.456	1.08
Firm Age	20.811	15.000	17.801	19.126	15.000	13.944	1.48
Profitability	0.036	0.052	0.125	0.037	0.050	0.127	−0.05
Leverage	0.197	0.169	0.189	0.195	0.164	0.195	0.08
Tobin's Q	0.647	0.528	0.603	0.674	0.535	0.628	−0.41

NOTES: This table reports the balance of covariates between treatment and control firms during the preregulatory period. The noncompliant firms are firms without a fully independent audit committee or majority board independence before the year 2002. "Treatment Firms" are the noncompliant firms with a positive value for the powerful CEO index. "Control Firms" are the noncompliant firms that have a powerful CEO index equal to zero. The CEO power index includes five indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median," and "CEO Ownership above Industry Median." "Firm size" is the natural logarithm of the asset. "Firm age" is the difference between the current year and the year of the firm's incorporation. "Profitability" is the earnings before interest and tax (EBIT) scaled by the assets. "Leverage" is the long-term debt scaled by the $\text{assets}_{(t-1)}$. "Tobin's Q" is the natural logarithm of the book value of debt plus the market value of equity scaled by the book value of assets. SEs are clustered at the firm level for *t*-test.

The fundamental requirements of a DID design are the homogeneity of the shock and the comparability of treatment and control groups in the preregulation period. Previous studies use SOX as a novel source of exogenous variation to corporate governance. We deal with the second requirement by focusing our study on the *noncompliant firms* where our treatment and control firms are comparable, at least, in terms of board features or regulatory compliance in the pretreatment period.[12] We also check the covariate balance between the treatment and control groups in the preregulation period to deal with any concern for selection bias in the methodology. Using the baseline control variables used in the study (Table 2), we confirm that our treatment (powerful CEO-managed *noncompliant firms*) and control groups (*noncompliant firms* without powerful CEOs) are similar in the preregulation period.

IV. Empirical Analysis

A. Innovation

We examine whether improvements in board governance can initiate a strategic shift in the investment decisions of powerful CEO-managed noncompliant firms compared to noncompliant firms without powerful CEOs. In this section, we specifically focus on the innovativeness of firms measured by innovation inputs (i.e., R&D), innovation outputs (i.e., patents and patent quality), and new product announcements.

[12]We also introduce placebo shocks in the pretreatment period, and the analysis supports the parallel trend assumption.

Table 3: Powerful CEOs and R&D Investment

Dependent variable	$[RD_{(t+1)}/Asset_{(t)}] \times 100$		
Models	*(1)*	*(2)*	*(3)*
SOX × CEO Power	0.228***	0.172***	0.131**
	[0.005]	[0.004]	[0.014]
CEO Power	−0.203***	−0.143***	−0.141***
	[0.004]	[0.006]	[0.004]
Firm Size	−1.304***	−1.052***	−0.322***
	[0.000]	[0.000]	[0.000]
Firm Age	0.015*	0.014**	0.009**
	[0.061]	[0.019]	[0.048]
Profitability	−1.839*	−1.469*	−4.027***
	[0.092]	[0.077]	[0.000]
Leverage	−0.328	−0.634*	−0.375
	[0.612]	[0.096]	[0.349]
Tobin's Q	0.970***	0.580***	1.162***
	[0.000]	[0.003]	[0.000]
$R\&D_{(t)}$		32.917***	57.729***
		[0.000]	[0.000]
SOX Indicator	Y	Y	Y
Firm FE	Y	Y	N
Year FE	Y	Y	Y
Industry FE	N	N	Y
Observations	7128	7128	7128
R^2	0.850	0.873	0.823

NOTES: This table represents the impact of improved governance on the R&D investments of noncompliant firms with powerful CEOs. The sample consists of publicly traded, nonregulated, noncompliant S&P1500 firms from 1992 to 2011. "$RD_{(t+1)}/Asset_{(t)}] \times 100$" is R&D $expenditures_{(t+1)}$ scaled by $assets_{(t)}$. "CEO Power" is an index: the sum of five indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median," and "CEO Ownership above Industry Median." "Firm size" is the natural logarithm of the asset. "Firm age" is the difference between the current year and the year of the firm's incorporation. "Profitability" is the earnings before interest and tax (EBIT) scaled by the assets. "Leverage" is the long-term debt scaled by the $assets_{(t-1)}$. "Tobin's Q" is the natural logarithm of the book value of debt plus the market value of equity scaled by the book value of assets. "$R\&D_{(t)}$" is the value of R&D $expenditures_{(t)}$ scaled by the $assets_{(t-1)}$. All models additionally include an indicator variable—"SOX," which equals one if the observation occurs in 2002 or later and zero otherwise. SEs are clustered at the firm level. *p*-values are in brakets. Significance levels: * = 10%; ** = 5%; *** = 1%.

1. Innovation Inputs

We first analyze whether expenditures on innovation inputs of powerful CEO-managed *noncompliant firms* increase in the postregulation period. In this section, the dependent variable is the firm's R&D expenditures. Our main regressor of interest is the "SOX × CEO Power" interaction. We control for firm characteristics and include several combinations of fixed effects.

The results in Table 3 are consistent with our hypotheses. We find that before regulatory changes, powerful CEO-managed firms are associated with less R&D. However, after changes in regulations, powerful CEO-managed firms invest significantly more in R&D. The coefficient is both statistically and economically significant. For example, in Column 1 of Table 3, a 1 SD increase in CEO power reduces R&D by 7.49% before the regulatory changes. However, after the regulatory changes, a 1 SD increase in CEO Power

increases R&D by 8.4%. Thus, changes in governance lead to an increase in R&D investments by 0.92% in noncompliant firms with powerful CEOs. This evidence focusing on innovation-related expenditures highlights the significance of improved governance in powerful CEO-managed firms.[13]

2. Innovation Outputs

R&D can generate competitive advantages (Barker & Mueller, 2002). Nevertheless, this is mostly premised on R&D translating into innovation outputs. Patents—especially highly cited patents—are key innovation outputs. We anticipate that improvements in governance will encourage powerful CEO-managed firms to engage in higher quality R&D, leading to more patents and high-quality patents.

The results for innovation outputs reported in Table 4 are consistent with our expectations.[14] Powerful CEO-managed firms, on average, are negatively associated with innovation performance, although the coefficient is not always statistically significant. However, improved governance postregulation significantly enhances the innovation outputs of powerful CEO-managed firms. This effect is both economically and statistically significant. We focus on Model 1, which includes firm and year effects (whereas Model 2 includes industry and year effects). Before the regulatory change, a 1 SD increase in CEO power reduces patenting by 3.49%, whereas patents of powerful CEO-managed firms increase by 5.92% after the regulatory changes.[15]

We next consider the quality of innovation, as measured by "Citations." We find that *noncompliant firms* with powerful CEOs have fewer citations in the preregulation period, although this estimate is not statistically significant if we include firm fixed effects (Column 3). By contrast, the regulatory change significantly increases the patent quality of powerful CEO-managed firms (i.e., citations).

We further test whether the innovations of powerful CEO-managed firms create more value after the regulatory changes. We analyze the value of innovation in Columns 5 and 6 of Table 4. We find that before the regulatory changes, the innovation of powerful CEO-managed *noncompliant firms* is not significantly different in value from the innovation of other CEOs. However, after the regulatory changes, the innovation of *noncompliant firms* with powerful CEOs increases in value, where the estimate is both

[13]Our evidence is robust to excluding pre-SOX zero-R&D firms.

[14]We control contemporaneous R&D expenditures (He & Tian, 2013) in some models following innovation literature. However, since we argue that powerful CEO run firms increase R&D investment in the postshock period, R&D intensity could be a *bad control* in the analysis focusing on innovation (Angrist & Pischke, 2009). However, excluding R&D intensity in the experiment of innovation output may lead to an omitted variable bias problem. So, we report analysis on innovation after controlling for R&D. In unreported results, we show that our results are robust to excluding R&D intensity.

[15]For Model 1 of Table 4, the CEO power coefficient is −0.027, and the standard deviation of the CEO power variable is 1.438. The average firm-year has 1.117 patents (see Table 1). Thus, powerful CEO managed firms are associated with 0.039 (or $0.039/1.117 = 3.49\%$) fewer patents. The SOX × CEO power coefficient is 0.046. Thus, after SOX, powerful CEO managed firms are associated with 0.066 (or $0.066/1.117 = 5.92\%$) more patents.

Table 4: Powerful CEOs and Innovation

Dependent variables	*Patents*		*Citations*		*Value of Innovation*		*Radical_90*	*Radical_95*
Models	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
SOX × CEO Power	0.046**	0.053**	0.093**	0.117***	0.079**	0.078*	0.020**	0.018**
	[0.048]	[0.037]	[0.032]	[0.004]	[0.026]	[0.086]	[0.042]	[0.037]
CEO Power	−0.027	−0.044*	−0.035	−0.082**	−0.005	−0.029	−0.006	−0.006
	[0.117]	[0.062]	[0.261]	[0.032]	[0.854]	[0.491]	[0.407]	[0.375]
Firm Size	0.222***	0.375***	0.243***	0.367***	0.108	0.600***	0.033*	0.022*
	[0.000]	[0.000]	[0.005]	[0.000]	[0.109]	[0.000]	[0.065]	[0.090]
Firm Age	0.000	0.001	0.013**	0.004	−0.014**	0.003	−0.007***	−0.005**
	[0.959]	[0.716]	[0.026]	[0.319]	[0.011]	[0.531]	[0.009]	[0.019]
Profitability	−0.151	−0.737*	−0.205	−0.887*	−0.298	−0.536	−0.324***	−0.246**
	[0.608]	[0.052]	[0.651]	[0.081]	[0.478]	[0.310]	[0.006]	[0.011]
Leverage	−0.119	−0.487**	−0.193	−0.711***	−0.305	−0.539**	0.005	0.020
	[0.486]	[0.015]	[0.489]	[0.008]	[0.221]	[0.031]	[0.933]	[0.705]
Tobin's Q	0.012	0.354***	0.096	0.460***	0.219***	0.912***	0.087***	0.061**
	[0.848]	[0.000]	[0.350]	[0.000]	[0.007]	[0.000]	[0.003]	[0.011]
$R\&D_{(t)}$	0.804***	2.496***	2.052***	3.552***	1.801***	3.723***	0.181	0.123
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.147]	[0.280]
SOX Indicator	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	N	Y	N	Y	N	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	N	N
Industry FE	N	Y	N	Y	N	Y	N	N
Observations	5472	5472	5472	5472	5472	5472	5472	5472
R^2	0.827	0.648	0.757	0.618	0.803	0.655	0.745	0.729

NOTES: This table represents the results of examining the effect of improved governance on the innovation of noncompliant firms with powerful CEOs. The sample consists of publicly traded, nonregulated, noncompliant S&P1500 firms from 1992 to 2008. "Patents" are the natural logarithm of one plus number of patents applied by a firm at $time_{(t+2)}$. "Citations" are the natural logarithm of one plus number of citations attributed to a firm's patents at $time_{(t+2)}$. "Value of Innovation" is the natural logarithm of one plus the average value of a firm's patents at $time_{(t+2)}$. "Radical_90" is the natural logarithm of one plus number of a firm's patents at $time_{(t+2)}$ with citations in the 90th percentile of the technology–class–year citation distribution. "Radical_95" is the natural logarithm of one plus the number of a firm's patents at $time_{(t+2)}$ with citations in the 95th percentile of the technology–class–year citation distribution. "CEO Power" is an index: the sum of five indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median," and "CEO Ownership above Industry Median." "SOX" is an indicator that equals one if the observation occurs in 2002 or later and zero otherwise. "Firm size" is the natural logarithm of the asset. "Firm age" is the difference between the current year and the year of the firm's incorporation. "Profitability" is the earnings before interest and tax (EBIT) scaled by the assets. "Leverage" is the long-term debt scaled by the $assets_{(t-1)}$. "Tobin's Q" is the natural logarithm of the book value of debt plus the market value of equity scaled by the book value of assets. "$R\&D_{(t)}$" is the value of R&D $expenditures_{(t)}$ scaled by the $assets_{(t-1)}$. SEs are clustered at the firm level. *p*-values are in brackets. Significance levels: * = 10%; ** = 5%; *** = 1%.

economically and statistically significant. Model 5 shows that after incorporating firm and year fixed effects, before the regulatory changes, a 1 SD increase in CEO power reduces innovation value by 0.4%. However, after the regulatory changes, the value of innovation in powerful CEO-managed firms increases by 6.22%.[16] This evidence suggests that the regulatory changes had a positive and meaningful impact on innovation value for powerful CEO-managed firms.

We also examine whether the regulatory change increases the likelihood of making breakthrough innovation (measured by radical innovation) in powerful CEO-managed firms. We find that before the regulatory changes, powerful CEO-managed firms generated similar levels of breakthrough innovation to nonpowerful CEO-managed firms. In contrast, powerful CEO-managed firms generate significantly more breakthrough innovation following the regulatory changes. This evidence suggests that after the improvement in governance, firms led by powerful CEOs experience an increase in breakthrough innovation, which could be a crucial driver of corporate growth.

One explanation for the success of innovation in the postregulation period could be the improvement of a sense of teamwork in the organization through better governance and monitoring. An independent board may moderate agency conflicts within the organization and encourage powerful CEOs to implement policies that achieve corporate goals of value maximization. It could also be argued that the postregulation increase in innovation productivity of firms with powerful CEOs could come from other firm-level changes due to regulatory changes. We use alternative fixed effects (firm fixed effects, industry fixed effects, and year fixed effects) to address this concern. We show that R&D expenditures of powerful CEO-managed firms become more productive and are more apt to translate into better innovation in the postregulation period.

3. New Product Value

The foregoing results suggest that, after the regulatory changes, powerful CEO managed *noncompliant firms* significantly increase innovation expenditures, and this investment results in more and higher quality innovation outputs. To corroborate the findings that the market perceives the innovation of powerful CEO-managed firms to be incrementally more valuable, we also examine new product development by powerful CEO-managed firms. If the governance changes in powerful CEO-managed firms are indeed valuable from the shareholders' perspective, then one would expect that the breakthrough innovation would translate into commercially viable products. One way to test whether the market perceives such products as valuable is to examine the announcement returns to the launch of new products by powerful CEO-managed firms relative to their less powerful counterparts in the postregulation period.

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[16]For Model 5 of Table 4, CEO power coefficient is −0.005. The standard deviation of the CEO power variable is 1.438. The SOX × CEO Power coefficient is 0.079. This estimate indicates that powerful CEO managed firms are associated with $0.005 \times 1.438 = 0.007$ (or $0.007/1.834 = 0.4\%$) lower innovation value. After SOX, powerful CEO managed firms are associated with $0.079 \times 1.438 = 0.114$ (or, $0.114/1.834 = 6.22\%$) more valuable innovation.

Table 5: Powerful CEO and New Product Announcement Returns

Dependent variables	*75th percentile return*	*Product announcement return*
Model	*(1)*	*(2)*
SOX × CEO Power	0.046**	0.009**
	[0.040]	[0.049]
CEO Power	−0.021	−0.005
	[0.161]	[0.151]
Firm Size	0.016	0.006
	[0.725]	[0.593]
Firm Age	0.006***	0.001**
	[0.000]	[0.020]
Profitability	−0.810***	−0.212***
	[0.002]	[0.001]
Leverage	0.010	−0.003
	[0.951]	[0.891]
Tobin's Q	0.077	0.010
	[0.151]	[0.372]
$R\&D_{(t)}$	0.984**	0.195*
	[0.024]	[0.083]
SOX Indicator	Y	Y
Firm FE	Y	Y
Year FE	Y	Y
Observations	1762	1762
R^2	0.651	0.718

NOTES: This table represents the results of examining the effect of better governance on the powerful CEO managed noncompliant firm's value creation through product announcements. The sample consists of publicly traded, nonregulated, noncompliant S&P1500 firms from 1992 to 2006. "75th Percentile Return" is the natural logarithm of one plus the number of announcements with CARs above the 75th percentile. "Product Announcement Return" is the natural logarithm of the sum of all positive CARs over the year. "CEO Power" is an index: the sum of five indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median," and "CEO Ownership above Industry Median" and thus the index value ranges from 0 to 5. "SOX" is an indicator that equals one if the observation occurs in 2002 or later and zero otherwise. "Firm size" is the natural logarithm of asset. "Firm age" is the difference between the current year and the year of the firm's incorporation. "Profitability" is the earnings before interest and tax (EBIT) scaled by the assets. "Leverage" is the long-term debt scaled by the $assets_{(t-1)}$. "Tobin's Q" is the natural logarithm of the book value of debt plus the market value of equity scaled by the book value of assets. "$R\&D_{(t)}$" is the value of R&D $expenditures_{(t)}$ scaled by the $assets_{(t-1)}$. SEs are clustered at the firm-level. *p*-values are in brackets. Significance levels: * = 10%; ** = 5%; *** = 1%.

We analyze new product announcements by looking at the CARs on the announcement. We use CARs from the 3-day (−1, 1) periods around the product announcement press release. The abnormal returns are based on a market model. We use short-run CARs, as opposed to long-term returns, in order to avoid the risk of multiple different announcements contaminating the event period and mitigate the possibility of supervening events interfering. We report the results from this test in Table 5.

The results in Column 1 suggest that the number of products with positive abnormal returns in the top quartile of the abnormal returns distribution is significantly larger for firms managed by powerful CEOs in the postregulation period. In addition, the results in Column 2 suggest that powerful CEO-managed firms experience a significantly higher market reaction (more positive CARs) to new product announcements after the regulatory change. Thus, the results indicate that the increase in the number and quality

of innovation outputs translated into more valuable products post the regulatory changes.

B. Investment in Takeovers

We expect powerful CEOs to prefer making tangible investments through frequent M&A deals, which might not be value-enhancing for shareholders. However, the board governance improvements help mitigate this agency problem and shift the firm's focus toward value-enhancing M&A deals that the market should greet with higher abnormal returns. Consistent with this conjecture, we first find that, on average, powerful CEO firms undertake more M&A deals. However, the improvement in board governance leads to fewer M&A deals by the powerful CEO firms than the control groups (unreported). This is consistent with the idea that SOX might induce powerful CEOs to reduce the number of low-quality deals and focus on higher-quality deals.

We further explore whether the improved governance imposed by the regulatory changes encourages powerful CEO-managed firms to undertake better takeovers. We use a standard event study methodology and report the results from tests that use 3-day announcement returns as the dependent variable in Table 6, Panel A. We find some evidence that the market reacts negatively (insignificantly) to M&A announcements by powerful CEO-managed firms in the preregulation period. However, takeovers by powerful CEO-managed firms create significantly more value in the postregulation period, as evidenced by the positive and statistically significant interaction term ("SOX $\times$ CEO Power"). More precisely, postregulation takeovers of powerful CEO-managed firms generate around 0.4% to 0.6% higher announcement CARs.

The results in relation to the control variables are consistent with the literature. Large bidders experience lower acquirer announcement returns (Moeller et al., 2004, 2005). Acquisitions of public targets perform worse relative to acquisitions of private targets, consistent with the idea that acquiring a private target could enable the bidder to capture an illiquidity discount, and thus, achieve more value (Chang, 1998). Cash-financed acquisitions perform better than stock-for-stock deals since stock payments might signal that the bidder is overpriced (Dong et al., 2005) or potentially that the bidder might use its equity as a "cheap" source of capital with which it ultimately overpays (Jensen, 2005).

We further explore the type of takeovers that powerful CEO-managed firms undertake after the regulatory changes by identifying innovative public and private targets. We run a logit model to predict the likelihood that a target is "innovative" (see Table 6, Panel B, Columns 1 and 2). The results are consistent with expectations that there is a significant increase in the likelihood of powerful CEO-managed firms acquiring an innovative target after the regulatory changes. The purchase of innovation through acquisitions could potentially explain the observed increase in innovation in powerful CEO-managed firms in the postregulation period.

We next analyze whether these acquisitions of innovative firms create value. In Table 6, Panel B, Columns 3–6, we analyze acquirer announcement CARs for the subsample of acquisitions of innovative targets (Columns 3 and 4) and noninnovative targets (Columns 5 and 6). In the postregulation period, we find that powerful CEO-managed

Table 6: Powerful CEO and M&A

Panel A: All M&A deals (public, private, and subsidiaries)

Dependent variables	*CAR*			
Model	*(1)*	*(2)*	*(3)*	*(4)*
SOX × CEO Power	0.006**	0.004*	0.005**	0.004*
	[0.031]	[0.069]	[0.039]	[0.058]
CEO Power	−0.003	−0.002	−0.004	−0.002
	[0.139]	[0.371]	[0.127]	[0.301]
Firm Size	−0.010*	−0.002	−0.010*	−0.000
	[0.059]	[0.284]	[0.061]	[0.906]
Firm Age	−0.000	0.000	−0.000	0.000
	[0.327]	[0.520]	[0.152]	[0.437]
Profitability	−0.009	−0.013	−0.034	−0.022
	[0.813]	[0.517]	[0.352]	[0.257]
Leverage	0.059***	0.016	0.059**	0.016
	[0.010]	[0.347]	[0.010]	[0.341]
Free Cash Flow	−0.000**	−0.000	−0.000*	−0.000
	[0.033]	[0.185]	[0.090]	[0.462]
Tobin's Q	0.007	0.007	0.010	0.006
	[0.376]	[0.245]	[0.241]	[0.279]
$R\&D_{(t)}$	−0.114**	−0.096***	−0.085*	−0.096***
	[0.022]	[0.003]	[0.063]	[0.002]
Relative Deal Size			−0.018	−0.007
			[0.133]	[0.523]
Friendly Target			−0.011	−0.019
			[0.558]	[0.201]
Subsidiary Target			−0.009**	−0.005
			[0.025]	[0.209]
Public Target			−0.024***	−0.028***
			[0.000]	[0.000]
All Cash Deal			0.013***	0.013***
			[0.001]	[0.000]
Stock Deal			−0.005	0.001
			[0.394]	[0.789]
SOX Indicator	Y	Y	Y	Y
Firm FE	Y	N	Y	N
Year FE	Y	Y	Y	Y
Industry FE	N	Y	N	Y
Observations	1625	1625	1625	1625
R^2	0.266	0.061	0.299	0.097

Panel B: Sample of public and private targets

Dependent variables	*Likelihood of acquiring innovative target firms Logit*		*CAR OLS*			
			(3)	*(4)*	*(5)*	*(6)*
Model	*(1)*	*(2)*	*Innovative target sample*		*Noninnovative target sample*	
SOX × CEO Power	0.225*	0.334**	0.018***	0.010*	−0.001	−0.000
	[0.069]	[0.039]	[0.005]	[0.059]	[0.852]	[0.915]

Table 6: *Continued*

Panel B: Sample of public and private targets

Dependent variables	*Likelihood of acquiring innovative target firms Logit*		*CAR OLS*			
			(3)	*(4)*	*(5)*	*(6)*
Model	*(1)*	*(2)*	*Innovative target sample*		*Noninnovative target sample*	
CEO Power	−0.197**	−0.206*	−0.012*	−0.004	0.000	−0.000
	[0.027]	[0.100]	[0.075]	[0.397]	[0.905]	[0.977]
SOX Indicator	Y	Y	Y	Y	Y	Y
Firm-Level Controls	Y	Y	Y	Y	Y	Y
Deal-Level Controls	Y	Y	Y	Y	Y	Y
Firm FE	N	N	Y	N	Y	N
Year FE	Y	N	Y	Y	Y	Y
Industry FE	Y	N	N	Y	N	Y
Industry × Year FE	N	Y	N	N	N	N
Observations	1024	1024	374	374	650	650
R^2	N/A	N/A	0.601	0.328	0.321	0.113

NOTES: This table represents the estimates of the effect of better governance on the market reaction to the announcement of M&A deals by noncompliant firms with powerful CEOs. The sample consists of publicly traded, nonregulated, noncompliant S&P1500 firms from 1992 to 2011. Panel A includes public, private, and subsidiary targets. Panel B includes public and private targets. "CAR" is the 3-day CAR calculated using the market model. "Likelihood of Acquiring Innovative Target Firms" is an indicator that equals one if the target firm is an innovative target firm. "CEO Power" is an index: the sum of five indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median," and "CEO Ownership above Industry Median." "SOX" is an indicator that equals one if the observation occurs in 2002 or later and zero otherwise. All models include baseline controls. Models (4)–(6) additionally control for deal features. "Innovative Target" is an indicator that equals one if the target has been awarded at least one patent prior to acquisition. "Relative Deal Size" is the transaction value over the acquirer's market capitalization 11 days before the announcement date. "Friendly Deal" is an indicator that equals one if the deal is friendly, zero otherwise. "Subsidiary Target" is an indicator that equals one if the target company is a subsidiary company, zero otherwise. "Public Target" is an indicator that equals one if the target company is a public company, zero otherwise. "All Cash Deal" is an indicator that equals one if the deal is fully cash financed. "Stock Deal" is an indicator that equals one if the acquirer pays a positive fraction of the transaction value using stocks. SEs are clustered at the firm level. *p*-values are in brackets. Significance levels: * = 10%; ** = 5%; *** = 1%.

firms generate more value when they acquire innovative targets (compare Columns 3 and 4 with Columns 5 and 6). This evidence is consistent with the idea that the benefits of having a powerful CEO could arise when executing the type of deals where greater power might be useful in order for the CEO to focus on long-term value creation.

In an unreported test, we find some evidence that the market more positively greets post-SOX acquisition announcements of private firms by powerful CEO firms. More precisely, we find that powerful CEOs' CAR of private firm acquisition announcements is higher than that of the control group in the post-SOX period. This result suggests that acquiring private targets in the post-SOX period can be another channel through which improved governance in powerful CEO firms generates shareholders' value.

Table 7: Powerful CEOs and Firm Performance

Dependent variables	$ROA_{(t+1)}$	$Log(Tobin's\ Q)_{(t+1)}$
Model	*(1)*	*(2)*
SOX × CEO Power	0.004**	0.020**
	[0.033]	[0.039]
CEO Power	−0.001	0.005
	[0.520]	[0.595]
Firm Size	−0.013***	−0.189***
	[0.002]	[0.000]
Firm Age	0.000	0.002
	[0.367]	[0.450]
Free Cash Flow	0.000***	0.000
	[0.000]	[0.214]
R&D	0.001	0.042
	[0.919]	[0.618]
Sales Growth	0.001	0.696**
	[0.994]	[0.022]
SOX Indicator	Y	Y
Firm FE	Y	Y
Year FE	Y	Y
Observations	6584	6566
R^2	0.574	0.692

NOTES: This table represents the results of examining the effect of better governance on noncompliant firms with powerful CEOs on firm performance measured by ROA and Tobin's Q. The sample consists of publicly traded, nonregulated, noncompliant S&P1500 firms. "CEO Power" is an index: the sum of five indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median," and "CEO Ownership above Industry Median." "SOX" is an indicator that equals one if the observation occurs in 2002 or later and zero otherwise. Other variables are defined in Table A7. All models include baseline controls and firm fixed effects. SEs are clustered at the firm level. *p*-values are in brackets. Significance levels: * = 10%; ** = 5%; *** = 1%.

C. Corporate Performance

This section investigates whether the performance of powerful CEO-managed firms improves when board governance improves in the postregulation period. Specifically, we explore whether postregulation powerful CEO-managed firms exhibit better performance measured by ROA and Tobin's Q. We analyze these by using a similar regression framework to the foregoing analysis.

The results reported in Table 7 provide a consistent picture of the positive impact of improved governance in the powerful CEO-managed firms. We find that CEO power has a statistically insignificant impact on performance, albeit after controlling for myriad other factors and both firm and year fixed effects. However, after SOX, powerful CEO-managed firms experience a significantly more improved corporate performance. This evidence suggests that the post-SOX changes to corporate activity in powerful CEO-managed firms (i.e., better innovation and acquisitions) significantly improve corporate performance and increase shareholder wealth.

D. Compensation and Mechanism of Action

In this study, we argue that improved board governance can mitigate agency conflicts in powerful CEO-managed firms. Consistent with this conjecture, we find that value-

Table 8: Powerful CEOs and Compensation

Dependent variables	*Option Intensity*$_{(t+1)}$		*Stock Intensity*$_{(t+1)}$		*Log(1 + Vega)*$_{(t+1)}$	
Model	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
SOX × CEO Power	0.018**	0.013*	−0.020***	−0.013***	0.054	0.026
	[0.012]	[0.079]	[0.000]	[0.001]	[0.204]	[0.527]
CEO Power	−0.012**	−0.010*	0.001	−0.001	−0.120***	−0.095***
	[0.026]	[0.087]	[0.571]	[0.719]	[0.001]	[0.005]
Firm Size	0.046***	0.036**	0.013	−0.009	0.495***	0.364***
	[0.002]	[0.029]	[0.150]	[0.324]	[0.000]	[0.000]
Firm Age	0.001	0.001	0.002	−0.001	−0.002	−0.014**
	[0.427]	[0.629]	[0.238]	[0.124]	[0.788]	[0.035]
Profitability	−0.011	0.015	0.013	−0.009	−0.112	−0.010
	[0.617]	[0.483]	[0.339]	[0.504]	[0.365]	[0.934]
Free Cash Flow	0.000	0.000	0.000	0.000	0.000**	0.000***
	[0.861]	[0.588]	[0.154]	[0.276]	[0.021]	[0.009]
Sales Growth	0.004	0.004	−0.001	−0.001	0.039	0.041
	[0.231]	[0.304]	[0.663]	[0.420]	[0.118]	[0.195]
CAPX	−0.002	0.002	0.002	0.003	0.055*	0.119***
	[0.836]	[0.804]	[0.645]	[0.520]	[0.090]	[0.000]
Tobin's Q	0.003	0.002	−0.000	−0.002	−0.035	−0.047*
	[0.687]	[0.771]	[0.822]	[0.301]	[0.149]	[0.056]
SOX Indicator	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	N	Y	Y
Year FE	N	Y	N	Y	N	Y
Observations	4,220	4,220	4,220	4,220	5,474	5,474
R^2	0.434	0.452	0.413	0.446	0.659	0.681

NOTES: This table represents the results of examining the effect of better governance on noncompliant firms with powerful CEOs on CEO portfolio vega, option intensity, and stock intensity. The sample consists of publicly traded, nonregulated, noncompliant S&P1500 firms. "CEO Power" is an index: the sum of five indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median," and "CEO Ownership above Industry Median." "SOX" is an indicator that equals one if the observation occurs in 2002 or later and zero otherwise. "Option Intensity" is the proportion of the CEO's total annual compensation that comes from option grants. This is the value of annual option awards (ExecuComp: "option_awards_blk_value" before FAS 123R and "option_awards_fv" after FAS 123R) scaled by the amount of total annual compensation (ExecuComp: "tdc1"). "Stock Intensity" is the proportion of the CEO's total annual compensation that comes from stock grants. This is the value of restricted stock granted to the executives (ExecuComp: "rstkgrnt" before FAS 123R and "stock_awards_fv" after FAS 123R) scaled by the amount of total annual compensation (ExecuComp: "tdc1"). "Vega" is the change in the dollar value of the CEO's wealth for a 0.01 change in the annualized SD of stock returns (following Coles et al., 2006; Core & Guay, 2002; Guay, 1999). Other variables are defined in Table A7. All models include baseline controls and firm fixed effects. SEs are clustered at the firm-level. *p*-values are in brackets. Significance levels: * = 10%; ** = 5%; *** = 1%.

enhancing strategic investments and innovation increase significantly in powerful CEO-managed firms in the post-SOX period. Although board governance through monitoring and advising can influence firm-level investment and innovation, the board can also adjust CEOs' compensation packages to align CEOs' interests to shareholders' wealth. Particularly, since innovation is a risky corporate strategy and CEOs' risk-taking can be incentivized through compensation contracts (Coles et al., 2006; Guay, 1999), we investigate whether post-SOX compensation serves as the mechanism to drive corporate innovation in powerful CEO-managed firms.

Specifically, we analyze option intensity, stock intensity, and compensation vega of CEOs' compensation package. Our analysis includes firm and year fixed effects, and we also control for other factors that might influence compensation. We hypothesize that

after SOX, there could be a shift toward risk-linked compensation, especially option-based compensation. The results in Table 8 are consistent with expectations. We find that powerful CEOs receive relatively more option compensation and relatively less stock compensation after SOX. Our results are consistent with the conjecture that the board aims to increase the CEO's risk-taking incentives in firms where CEOs' interests were not aligned to shareholders' wealth in the preregulation period.[17] However, the powerful CEOs in our sample often already have significant stock holdings. Higher stock intensity makes their portfolio less diversifiable and thus can demotivate risk-taking. Consistent with this conjecture, we find that stock intensity decreases in the post-SOX period.[18]

V. Robustness Tests

A. CEO Overconfidence and Powerful CEOs

We check that results are robust to controlling for the impact of CEO overconfidence. Banerjee et al. (2015) show that SOX helps to restrain overconfident CEOs by reducing overinvestment and improving their takeover performance. Some of the powerful CEOs in our study could also be overconfident CEOs. However, the correlation coefficient between powerful CEOs and overconfident CEOs is negative (−0.0295). This correlation suggests that a spurious correlation between CEO power and CEO overconfidence is unlikely to drive our results.

Nevertheless, we control CEO overconfidence by including a variable analogous to Holder67 (constructed following the approach in Malmendier et al., 2011) in our models in Table 9. We also rerun the models after excluding highly overconfident CEOs in Table A2. Furthermore, we examine models that include an overconfident CEO variable and an interaction-term of overconfident CEO and SOX, that is, "SOX × Holder67" (unreported). In all cases, we find results consistent with our baseline findings.

B. Alternative Measures of CEO Power and Compliant Firms

In this section, we focus on highly powerful CEOs and reestimate the models. We expect that the moderating effect of regulatory changes would be more pronounced for firms led by highly powerful CEOs. The corporate policies of highly powerful CEOs in the preregulation period are presumably more misaligned in a poorly governed firm. We construct a binary variable "CEO Power Top Q" that equals one if the powerful CEO index is in the top quartile of the industry–year distribution. The results in Table 10 support our baseline findings.

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[17]We find consistent evidence if we use Executive × Firm fixed effects with year fixed effects.

[18]We find that the post-SOX vega of powerful CEOs is not significantly different from other CEOs, although the pre-SOX vega was lower for powerful CEOs.

Table 9: Powerful CEOs and Overconfident CEOs

Dependent variables *Model*	*$[RD_{(t+1)}/Asset_{(t)}] \times 100$* *(1)*	*Patents* *(2)*	*Citations* *(3)*	*Value of Innovation* *(4)*	*Radical_90* *(5)*	*Radical_95* *(6)*	*75th Percentile Return* *(7)*	*Product Announcement Return* *(8)*	*CAR* *(9)*
SOX × CEO Power	0.206**	0.040*	0.099**	0.052*	0.016*	0.018**	0.048**	0.010*	0.005**
	[0.012]	[0.090]	[0.021]	[0.074]	[0.061]	[0.041]	[0.041]	[0.070]	[0.044]
CEO Power	−0.196***	−0.022	−0.041	−0.000	−0.005	−0.006	−0.023	−0.005	−0.002
	[0.005]	[0.190]	[0.196]	[0.988]	[0.587]	[0.381]	[0.134]	[0.258]	[0.429]
Holder67	0.215	−0.017	−0.066	0.077	−0.025	−0.022	0.039	−0.001	0.006
	[0.239]	[0.831]	[0.623]	[0.409]	[0.535]	[0.450]	[0.561]	[0.901]	[0.326]
SOX Indicator	Y	Y	Y	Y	Y	Y	Y	Y	Y
Baseline Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	N	N	Y	Y	Y
Observations	6658	5301	5301	5301	5301	5301	1718	1718	1569
R^2	0.854	0.828	0.759	0.762	0.745	0.728	0.654	0.751	0.286

NOTES: This table represents the results of examining the effect of better governance on noncompliant firms with powerful CEOs after controlling for CEO overconfidence. The sample consists of publicly traded, nonregulated, noncompliant S&P1500 firms. Models (1) and (9) include analyses during 1992–2011. Models (2)–(6) include analyses for the available information on innovation from Kogan et al. (2017) during 1992–2008. Models (7)–(8) include analyses during 1992–2006 with available data on the market reaction to a new product announcement from Mukherjee et al. (2017). "CEO Power" is an index: the sum of five indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median," and "CEO Ownership above Industry Median." "SOX" is an indicator that equals one if the observation occurs in 2002 or later and zero otherwise. "Holder67" is an indicator that equals one if the average vested option of the CEO is at least 67% in the money on at least two occasions, otherwise zero. Other variables are defined in Table A7. All models include baseline controls and firm fixed effects. SEs are clustered at the firm-level. *p*-values are in brackets. Significance levels: * = 10%; ** = 5%; *** = 1%.

Table 10: Highly Powerful CEOs

Dependent variables *Model*	*[RD(t + 1)/ Asset(t)] × 100* *(1)*	*Patents* *(2)*	*Citations* *(3)*	*Value of Innovation* *(4)*	*Radical_90* *(5)*	*Radical_95* *(6)*	*75th Percentile Return* *(7)*	*Product Announcement Return* *(8)*	*CAR* *(9)*
SOX × CEO Power Top Q	0.490**	0.111**	0.228*	0.159*	0.055*	0.052**	0.129*	0.027*	0.017*
	[0.014]	[0.048]	[0.081]	[0.096]	[0.056]	[0.038]	[0.067]	[0.063]	[0.085]
CEO Power Top Q	−0.153	−0.054	−0.041	−0.040	−0.007	−0.010	−0.007	−0.006	−0.008
	[0.301]	[0.154]	[0.670]	[0.542]	[0.712]	[0.546]	[0.880]	[0.577]	[0.327]
SOX Indicator	Y	Y	Y	Y	Y	Y	Y	Y	Y
Baseline Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	N	N	Y	Y	Y
Observations	7128	5472	5472	5472	5472	5472	1762	1762	1625
R^2	0.874	0.844	0.753	0.826	0.753	0.739	0.634	0.718	0.302

NOTES: This table represents the results of examining the effect of better governance on noncompliant firms with highly powerful CEOs. The sample consists of publicly traded, nonregulated, noncompliant S&P1500 firms. Models (1) and (9) include analyses during 1992–2011. Models (2)–(6) include analyses for the available information on innovation from Kogan et al. (2017) during 1992–2008. Models (7)–(8) include analyses during 1992–2006 with available data on the market reaction to a new product announcement from Mukherjee et al. (2017). "CEO Power" is an index: the sum of five indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median," and "CEO Ownership above Industry Median." "SOX" is an indicator that equals one if the observation occurs in 2002 or later and zero otherwise. Panel A includes "CEO Power Top Q," which is an indicator that equals one if CEOs belong to the top 25% of the CEO power index distribution. Other variables are defined in Table A7. All models include baseline controls and firm fixed effects. SEs are clustered at the firm level. *p*-values are in brackets. Significance levels: * = 10%; ** = 5%; *** = 1%.

Next, in an unreported falsification test, we reestimate the models for the sample of *compliant firms* with powerful CEOs in the postregulation period. The analysis evaluates whether powerful CEO-managed *compliant firms* also initiate strategic shifts in the postregulation period. We find that *compliant firms* with powerful CEOs have similar corporate policies to compliant firms without powerful CEOs in the postregulation period. This evidence suggests that agency conflict is less of a concern in preregulation *compliant firms*. Thus, the marginal effect of the regulatory change on better corporate outcomes is statistically indistinguishable from zero.

C. Placebo Shocks

We also introduce placebo shocks to examine the robustness of our analysis. We only use pretreatment data and apply a placebo shock at a different time (the year 1996) (see Atanasov & Black, 2016).[19] These placebo tests help to ensure that the results are not spurious. They also help to cross-validate that the parallel trend assumption holds. If it did not hold, then we would expect a time trend. A time trend would imply a statistically significant result if we used any pre-SOX year indicator instead of analyzing SOX itself. Thus, to mitigate those concerns, we look at placebo shocks in 1996, 1997, and 1998. We expect that these shocks would *not* have a statistically significant relationship with the dependent variables. The results in Table 11 show the insignificant effects of the placebo shock on the corporate policies of firms managed by powerful CEOs compared to firms without powerful CEOs. More importantly, these results further demonstrate that any apparent pretreatment trends do not drive our results.

D. SOX Induced CEO Turnover

A concern with using regulatory changes as an identification strategy is that powerful CEOs may be replaced during the SOX period. Thus, the changes in corporate policies may be driven by a new CEO. We address this concern by excluding the 98 firms that experience turnover of CEOs around SOX in 2002 (i.e., for whom the CEO in 2001 is different from the CEO in 2003). The results in Table 12 show that our main findings remain unaltered, suggesting that the results are not affected by SOX-induced CEO turnover.

E. Shorter Event Window

Our analysis considers the longer-term effect of the regulatory change using a 20-year window (10 years before and 10 years after) since a strategic shift in corporate policies, such as R&D investment, innovation, and takeovers, may take longer to respond to the regulatory changes. However, DID estimates could be more consistent when we compare outcomes just before and after the policy change. Thus, we re-estimate the analysis using

[19]We also use the years 1997 and 1998 as placebo shock years and find robust outcomes.

Table 11: Powerful CEOs and Corporate Policies: Placebo Shock

Dependent variables	*$[RD_{(t+1)}/Asset_{(t)}] \times 100$*	*Patents*	*Citations*	*Value of Innovation*	*Radical_90*	*Radical_95*	*75th Percentile Return*	*Product Announcement Return*	*CAR*
Model	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
Placebo Shock × CEO Power	0.181	0.021	0.041	0.027	−0.001	0.002	−0.020	0.007	−0.005
	[0.111]	[0.381]	[0.332]	[0.410]	[0.952]	[0.826]	[0.683]	[0.699]	[0.367]
CEO Power	−0.214*	−0.019	−0.017	−0.008	−0.002	−0.003	−0.011	−0.006	−0.004
	[0.066]	[0.477]	[0.713]	[0.831]	[0.859]	[0.712]	[0.796]	[0.622]	[0.455]
Placebo Shock Indicator	Y	Y	Y	Y	Y	Y	Y	Y	Y
Baseline Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	N	N	Y	Y	Y
Observations	2679	2515	2515	2979	2979	2979	767	767	696
R^2	0.898	0.929	0.883	0.865	0.905	0.901	0.689	0.789	0.369

NOTES: This table represents the results of the effect of a placebo shock on firms with powerful CEOs. The sample consists of publicly traded, nonregulated, noncompliant S&P1500 firms for 1992–2001. "CEO Power" is an index: the sum of five indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median," and "CEO Ownership above Industry Median." "Placebo shock" is an indicator that equals one if the observation occurs in 1996 or later but before 2002 and zero if the observation occurs before 1996. Other variables are defined in Table A7. All models include baseline control variables and firm fixed effects. SEs are clustered at the firm level. *p*-values are in brackets. Significance levels: * = 10%; ** = 5%; *** = 1%.

Table 12: Powerful CEOs and Corporate Policies: After Excluding Firms Experiencing CEO Turnover around SOX

Dependent variables	*$[RD_{(t+1)}/Asset_{(t)}] \times 100$*	*Patents*	*Citations*	*Value of Innovation*	*Radical_90*	*Radical_95*	*75th Percentile Return*	*Product Announcement Return*	*CAR*
Model	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
SOX × CEO Power	0.237***	0.043**	0.103**	0.074**	0.023**	0.020**	0.041*	0.011*	0.006**
	[0.001]	[0.037]	[0.044]	[0.026]	[0.044]	[0.049]	[0.086]	[0.061]	[0.049]
CEO Power	−0.183***	−0.013	−0.023	−0.009	−0.011	−0.011	−0.024	−0.007	−0.004
	[0.001]	[0.410]	[0.564]	[0.741]	[0.199]	[0.152]	[0.143]	[0.154]	[0.175]
SOX Indicator	Y	Y	Y	Y	Y	Y	Y	Y	Y
Baseline controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	N	N	Y	Y	Y
Observations	5,532	4,320	4,320	4,320	4,320	4,320	1,406	1,406	1,244
R^2	0.873	0.848	0.770	0.831	0.763	0.743	0.667	0.738	0.301

NOTES: This table represents the results of examining the effect of better governance on noncompliant firms with powerful CEOs after excluding firms that experienced CEO turnovers during 2002–2003. The sample consists of publicly traded, nonregulated, noncompliant S&P1500 firms. Models (1) and (9) include analyses during 1992–2011. Models (2)–(6) include analyses for the available information on innovation from Kogan et al. (2017) during 1992–2008. Models (7)–(8) include analyses during 1992–2006 with available data on the market reaction to a new product announcement from Mukherjee et al. (2017). "CEO Power" is an index: the sum of five indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median," and "CEO Ownership above Industry Median." "SOX" is an indicator that equals one if the observation occurs in 2002 or later and zero otherwise. Other variables are defined in Table A7. All models include baseline controls and firm fixed effects. SEs are clustered at the firm level. *p*-values are in brackets. Significance levels: * = 10%; ** = 5%; *** = 1%

a 10-year window (5 years before and 5 years after). We continue to find results consistent with our baseline evidence (Table A3).

F. Other Sources of Power and Additional Controls

We undertake additional robustness tests to ensure the results are not driven by other governance characteristics or additional control variables. Although our specification uses firm-fixed effects, which lessens the likelihood that other omitted corporate governance characteristics may drive our results, we control for additional corporate governance features. Specifically, we include CEO Pay Slice (CPS) that measures the relative importance of the CEO and the extent to which the CEO may extract rents (see Bebchuk et al., 2011). We also include whether the CEO is the only insider on the board as this feature could capture CEO power (Adams et al., 2005). Furthermore, since dual-class share structures enable managers to hold greater control rights (Masulis et al., 2009), we include a dual-class structure in our analysis. Finally, as prior studies highlight the role of institutional investors in improving a firm's innovation and governance (Aghion et al., 2013; Kim & Lu, 2011a, 2011b), we control for institutional holdings. We find results consistent with our baseline estimations (see Table 13 Panel A).

We additionally ensure that the results are robust to controlling for other variables. Requiring additional controls reduces the sample size. Nevertheless, we ensure the results are robust to controlling the CEO's compensation delta, vega, and total compensation. We also ensure the results are robust to controlling for other corporate variables, including whether the firm pays dividends, capital expenditure, and advertising expenditure. The results are in Panel C of Table 13 and are consistent with our core results, implying that our results are robust to controlling for additional factors that could influence innovation.

G. Alternative Econometric Modeling

We also test whether the results are robust to the use of alternative fixed effects. Specifically, industry-specific shocks in a year may affect firm-level policies. Thus, unobserved heterogeneity across industries might also be correlated with corporate policies besides unobserved heterogeneity across firms. To mitigate this concern, we run the baseline specifications using (industry times year) interacted joint fixed effects with firm fixed effects instead of the baseline year fixed effects and industry fixed effects or year fixed effects and firm fixed effects. High-dimensional fixed-effect models also allow us to address any potential firm or industry level omitted variable bias problems (Gormley & Matsa, 2014). The results in Table 13 Panel B are consistent with the baseline results suggesting that time-varying industry shocks are unlikely to drive our results.

H. CEO Power Index Composition

We construct the proxy for CEO power as an index of five power measures. However, one concern with this approach is that a single component of CEO power may unduly

Table 13: Alternative Sources of CEO Power, High-Dimensional Fixed Effects, and Concern for Omitted Variable Bias

Panel A: Alternative Sources of CEO Power and Governance Measures

Dependent variables	*[RD(t + 1)/ Asset(t)] × 100*	*Patents*	*Citations*	*Value of Innovation*	*Radical_90*	*Radical_95*	*75th Percentile Return*	*Product Announcement Return*	*CAR*
Model	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
SOX × CEO Power	0.225***	0.044*	0.101**	0.084**	0.021*	0.016*	0.052*	0.011**	0.009*
	[0.007]	[0.065]	[0.022]	[0.024]	[0.066]	[0.090]	[0.070]	[0.044]	[0.063]
CEO Power	−0.199***	−0.031	−0.053	−0.041	−0.011	−0.005	−0.029	−0.005	−0.004
	[0.009]	[0.149]	[0.221]	[0.223]	[0.378]	[0.603]	[0.190]	[0.295]	[0.416]
Only Insider	−0.049	0.077	0.097	0.162*	0.058	0.046	−0.084*	−0.018**	−0.006
	[0.639]	[0.165]	[0.221]	[0.056]	[0.101]	[0.132]	[0.071]	[0.034]	[0.387]
CPS	−0.209	−0.020	0.084	0.049	0.058	0.007	−0.250	−0.055	−0.001
	[0.601]	[0.893]	[0.709]	[0.834]	[0.530]	[0.923]	[0.142]	[0.193]	[0.982]
Dual Class	−0.573	−0.036	−0.129	−0.179	−0.101	−0.095	0.217	0.034	−0.007
	[0.148]	[0.818]	[0.579]	[0.518]	[0.206]	[0.156]	[0.271]	[0.215]	[0.645]
Institutional Holdings	−1.157**	0.061	0.096	0.532	−0.131	−0.083	−0.264	−0.069**	0.014
	[0.041]	[0.777]	[0.781]	[0.100]	[0.176]	[0.287]	[0.151]	[0.036]	[0.753]
SOX Indicator	Y	Y	Y	Y	Y	Y	Y	Y	Y
Baseline Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	N	N	Y	Y	Y
Observations	4249	3464	3464	3464	3464	3464	1159	1159	871
R^2	0.897	0.817	0.755	0.802	0.725	0.705	0.698	0.763	0.338

Table 13: *Continued*

Panel B: High-Dimensional Fixed Effects

Dependent variables	*[RD(t + 1)/Asset (t)] × 100*	*Patents*	*Citations*	*Value of Innovation*	*75th Percentile Return*	*Product Announcement Return*	*CAR*
Model *(1)*		*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
SOX × CEO Power	0.161***	0.028*	0.055**	0.050*	0.060***	0.016***	0.006*
	[0.000]	[0.090]	[0.031]	[0.063]	[0.009]	[0.002]	[0.079]
CEO Power	−0.136***	−0.017	−0.019	0.022	−0.027	−0.006	−0.002
	[0.003]	[0.161]	[0.332]	[0.240]	[0.146]	[0.134]	[0.568]
Baseline Controls	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y
Industry × Year FE	Y	Y	Y	Y	Y	Y	Y
Observations	6998	5211	5211	5211	1344	1344	1443
R^2	0.881	0.879	0.843	0.843	0.729	0.798	0.402

Panel C: Additional Firm and CEO-level Controls

Dependent variables	*[RD(t + 1)/Asset (t)] × 100*	*Patents*	*Citations*	*Value of Innovation*	*75th Percentile Return*	*Product Announcement Return*	*CAR*
SOX × CEO Power	0.161***	0.028*	0.055**	0.050*	0.060***	0.016***	0.006**
	[0.000]	[0.090]	[0.031]	[0.063]	[0.009]	[0.002]	[0.033]
CEO Power	−0.136***	−0.017	−0.019	0.022	−0.027	−0.006	−0.001
	[0.003]	[0.161]	[0.332]	[0.240]	[0.146]	[0.134]	[0.808]
Log(1 + Delta)	−0.105	0.025	−0.003	−0.036	0.005	−0.008*	−0.002
	[0.111]	[0.311]	[0.941]	[0.354]	[0.814]	[0.091]	[0.437]
Log(1 + Vega)	0.102***	0.015	0.010	0.022	0.000	0.004	0.002
	[0.010]	[0.495]	[0.800]	[0.506]	[0.997]	[0.132]	[0.291]
Log(Total Pay)	0.017	0.012	0.062	0.043	−0.005	−0.003	−0.000
	[0.829]	[0.596]	[0.121]	[0.238]	[0.847]	[0.620]	[0.983]
Capital Expenditures	0.852	−0.153	−0.806	−0.078	−0.435	−0.244*	−0.039
	[0.558]	[0.616]	[0.243]	[0.897]	[0.551]	[0.092]	[0.535]
Dividend Payer	0.196	−0.023	−0.116	−0.094	−0.033	0.001	−0.009

Table 13: *Continued*

Panel C: Additional Firm and CEO-level Controls

Dependent variables	*[RD(t + 1)/Asset (t)] × 100*	*Patents*	*Citations*	*Value of Innovation*	*75th Percentile Return*	*Product Announcement Return*	*CAR*
	[0.203]	[0.769]	[0.435]	[0.471]	[0.687]	[0.930]	[0.323]
Cashflow Volatility	5.382**	0.479	0.727	0.862	−0.414	0.055	−0.060
	[0.024]	[0.446]	[0.527]	[0.252]	[0.502]	[0.665]	[0.514]
Advertising Expenditures	−0.373***	−0.001	−0.010	0.006	−0.016***	0.001	−0.287
	[0.000]	[0.892]	[0.327]	[0.449]	[0.000]	[0.563]	[0.380]
Stock Returns	0.149	0.177**	0.298**	0.066	0.129	0.020	0.013
	[0.745]	[0.035]	[0.038]	[0.653]	[0.176]	[0.275]	[0.523]
Baseline Controls	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Observations	5533	5159	5159	5159	1522	1522	1298
R^2	0.876	0.836	0.776	0.807	0.662	0.732	0.236

NOTES: This table represents the effect of better governance on noncompliant firms with powerful CEOs after addressing other potential sources of CEO power and concern for omitted variables bias. The sample consists of publicly traded, nonregulated, noncompliant S&P1500 firms. "CEO Power" is an index: the sum of five indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median," and "CEO Ownership above Industry Median." "SOX" is an indicator that equals one if the observation occurs in 2002 or later and zero otherwise. "Only Insider" is an indicator equals one if the CEO is the only insider in the corporate board of the firm, zero otherwise. "CPS" is the CEO pay slice—the percentage of the total compensation of the top five executives received by the CEO. "Institutional holdings" is the proportional ownership of institutional investors. "Dual Class" is an indicator that equals one for firms with dual-class shares, zero otherwise. Other variables are defined in Table A7. All models include baseline controls and firm fixed effects. Panel B also includes industry–year interacted joint fixed effects. SEs are clustered at the firm level in panel A. Panel C includes additional Control variables. SEs are clustered at the industry–year level in panel B. *p*-values are in brackets. Significance levels: * = 10%; ** = 5%; *** = 1%.

Table 14: Powerful CEOs and Corporate Policies: Generalized Triple Difference

Dependent variables	*$[RD_{(t+1)}/Asset_{(t)}] \times 100$*	*Patents*	*Citations*	*Value of Innovation*	*Radical_90*	*Radical_95*	*75th Percentile Return*	*Product Announcement Return*	*CAR*
Model	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
SOX × Noncompliant × CEO Power	0.228***	0.093***	0.309***	0.168***	0.025**	0.023**	0.088***	0.016**	0.006*
	[0.008]	[0.002]	[0.000]	[0.001]	[0.042]	[0.030]	[0.003]	[0.012]	[0.088]
Noncompliant × CEO Power	−0.178**	−0.055***	−0.110***	−0.080**	−0.019*	−0.017*	−0.042*	−0.007	−0.002
	[0.026]	[0.007]	[0.009]	[0.013]	[0.059]	[0.054]	[0.052]	[0.179]	[0.615]
SOX × Noncompliant	−0.090	−0.149*	−0.492***	−0.214	−0.057*	−0.049*	−0.212***	−0.043***	−0.013
	[0.687]	[0.082]	[0.008]	[0.104]	[0.075]	[0.075]	[0.001]	[0.004]	[0.125]
CEO Power × Year	Y	Y	Y	Y	Y	Y	Y	Y	Y
SOX Indicator	Y	Y	Y	Y	Y	Y	Y	Y	Y
Baseline Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	N	N	Y	Y	Y
Observations	14,987	11,883	11,883	11,883	11,883	11,883	3992	3992	3638
R^2	0.850	0.838	0.772	0.824	0.760	0.740	0.609	0.682	0.292

NOTES: This table presents the regression estimates capturing the differential effects of improved governance on corporate policies of powerful CEO-managed noncompliant firms relative to compliant firms. "CEO Power" is an index: the sum of five indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median," and "CEO Ownership above Industry Median." "SOX" is an indicator that equals one if the observation occurs in 2002 or later and zero otherwise. "Noncompliant" is an indicator that equals one for the firms which did not have the fully independent audit committee or majority board independence before 2002. Other variables are defined in Table A6. All models include baseline control variables, firm fixed effects, and interactions between year fixed effects and "CEO Power." SEs are clustered at the firm level. *p*-values are in brackets. Significance levels: * = 10%; ** = 5%; *** = 1%.

drive our interpretations of the findings. To address this concern, in Table A4, we repeat our analysis by reconstructing the CEO power index where we iteratively omit one of these sources of power at a time. We include the excluded component of the power index as an additional control variable. We continue to find consistent results, suggesting that a single source of CEO power does not drive our results.[20]

I. Triple-Difference Analysis

Our analysis mainly concentrates on *noncompliant firms* having weaker governance mechanisms before adopting regulatory imposed board independence. This methodology allows us to avoid problems of DID analysis with multiple subpopulations where some firms are subject to policy intervention (here, *noncompliant firms*) and others are not (here, *compliant firms*) (Athey & Imbens, 2006). Thus, model (1) allows us to get true counterfactuals (*noncompliant firms* without powerful CEOs) to analyze the effect of improved governance on powerful CEO-managed firms (see Bertrand et al., 2004). However, as an additional robustness check, we perform a triple-difference analysis (Diff-in-diff-in-diff) to compare the moderating effect of quasi-exogenous improvement in governance on powerful CEO-managed *noncompliant firms* to *compliant firms*.[21] After using firm and year fixed effects, we find that the coefficient "SOX × Noncompliant × CEO Power" is economically and statistically significant. The results in Table 14 suggest that the moderating effect of the regulatory change on corporate policies is stronger for *noncompliant firms* with powerful CEOs.

J. Excluding Large Firms

One concern is that the sample primarily includes larger firms. Thus, it is important to ensure that the results do not merely concentrate on the sample's larger firms. However, we suggest that this is unlikely to bias our results. Most of our CEO-specific features are from Execucomp, which covers firms in the S&P1500. Our empirical specification controls for firm size, and we also include firm-fixed effects to control for firm-specific features. We also address concerns that large firms drive the results by re-estimating the models for the "small firms" in the sample. Here, we exclude the firms whose asset size is in the top half of the sample. The results in Table A7 are consistent with our full sample results except for the "Product Announcement Return," where the effect is marginally insignificant.

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[20]When we exclude CEO ownership from the CEO power index, our estimates are marginally insignificant for radical innovation.

[21]Table A5 reports the covariate balance test of the treatment and control groups of this analysis. The test shows that the treatment and control groups have balance in all covariates except firm age. We control for firm age and other covariates in the baseline specifications of all models.

VI. Conclusion

This paper explores whether corporate governance improvements can help divert powerful CEOs' misaligned efforts to value-maximizing corporate policies. In so doing, the study interfaces with several key issues in the literature, including how to restrain powerful CEOs and whether, and when, the governance changes mandated in SOX and the NYSE/NASDAQ listing rules have been beneficial. Prior studies suggest that powerful CEOs might harm shareholders either through empire building or through complacency. Furthermore, there is some controversy over the utility of regulations targeting the mandatory adoption of an independent board.

We analyze whether a quasi-exogenous increase in board independence, as mandated by regulatory changes, can mitigate the harms of powerful CEOs. We focus on powerful CEO-managed firms that were not compliant with the provisions of SOX before they were enacted, as the change in regulation introduces a quasi-exogenous variation to the board composition of these preregulation *noncompliant firms*. We hypothesize that an increase in board independence can expose powerful CEOs to outside opinions, thereby mitigating the "echo chamber" effect that might otherwise exacerbate powerful CEOs' actions. Furthermore, independent directors are relatively less beholden to CEOs than are executive directors because they do not rely on the CEO for their sole-to-primary source of employment. Thus, independent directors are relatively more likely to challenge powerful CEOs' decisions than are executive directors. This also manifests in changes to powerful CEOs' compensation contracts.

The study shows that after the exogenous improvement in governance, there is a strategic shift in the investment decisions of powerful CEO-managed *noncompliant firms*. Powerful CEO-managed *noncompliant firms* increase R&D investments in the postregulation period. An increase in R&D investments translates into an increase in innovation outputs, which are scientifically more important (measured by citations) and economically more valuable (measured by patent value). Furthermore, improved governance is associated with the market reacting more positively to new product announcements by powerful CEO-managed *noncompliant firms*. In the postregulation period, M&A announcements in powerful CEO-managed firms have a more positive market reaction. We also find that improved governance increases the likelihood of acquiring innovative targets by powerful CEO-managed firms and that these acquisition announcements experience significantly positive market reactions. In addition, these corporate changes appear to increase corporate value (i.e., Q) and ROA. Overall, the results suggest that the regulatory changes that mandated increased board independence have benefited some firms. In particular, the results suggest that the SOX rule changes can ameliorate value destruction in powerful CEO-managed firms.

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APPENDIX A

The appendix contains the variable definitions and additional robustness tests. A summary is as follows:

- Table A1: The table in this section estimates the impact of better governance on the innovation of powerful CEO-managed *noncompliant firms* at time$_{(t+1)}$.
- Table A2: The table in this section estimates the impact of better governance on powerful CEO-managed *noncompliant firms* after excluding highly overconfident CEOs.
- Table A3: The table in this section contains results for the shorter event window (1997–2006).
- Table A4: The table in this section estimates the impact of better governance on powerful CEO-managed *noncompliant firms* after reconstructing CEO Power Index.
- Table A5: The table in this section reports the covariate balance test between treatment firms (*noncompliant firms*) and control firms (other firms).
- Table A6: The table in this section reports the impact of better governance on powerful CEO-managed *noncompliant firms* after excluding large firms from the sample.
- Table A7: The table in this section contains the variable definitions.

Table A1: Robustness Test on Firm's Innovation$_{(t+1)}$

Dependent variables	*Patents*	*Citations*	*Value of Innovation*	*Radical_90*	*Radical_95*
Model	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
SOX × CEO Power	0.020*	0.081**	0.037*	0.013*	0.015**
	[0.076]	[0.045]	[0.088]	[0.081]	[0.016]
CEO Power	−0.007	−0.025	−0.001	−0.008	−0.010**
	[0.431]	[0.416]	[0.960]	[0.177]	[0.038]
SOX Indicator	Y	Y	Y	Y	Y
Baseline Controls	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	N	N
Observations	5609	5609	5609	5609	5609
R^2	0.906	0.800	0.876	0.805	0.789

NOTES: This table represents results of examining the effect of better governance on the innovation of the firms with powerful CEOs at time$_{(t+1)}$. The sample consists of publicly traded, nonregulated, noncompliant S&P1500 firms from 1992 to 2008. "Patents" are the natural logarithm of one plus number of patents applied by a firm at time$_{(t+1)}$. "Citations" are the natural logarithm of one plus number of citations attributed to a firm's patents at time$_{(t+1)}$. "Value of Innovation" is the natural logarithm of one plus the average value of a firm's patents at time$_{(t+1)}$. "Radical_90" is the natural logarithm of one plus number of a firm's patents at time$_{(t+1)}$ with citations in the 90th percentile of the technology–class–year citation distribution. "Radical_95" is the natural logarithm of one plus number of a firm's patents at time$_{(t+1)}$ with citations in the 95th percentile of the technology–class–year citation distribution. "CEO Power" is an index: the sum of five indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median," and "CEO Ownership above Industry Median" and thus the index value ranges from 0 to 5. "SOX" is an indicator that equals one if the observation occurs in 2002 or later and zero otherwise. All models include baseline control variables and firm fixed effects. SEs are clustered at the firm level. *p*-values are in brackets. Significance levels: * = 10%; ** = 5%; *** = 1%.

Table A2: Powerful CEOs, and Corporate Policies: After Excluding Highly Overconfident CEOs

Dependent variables *Model*	*$[RD_{(t+1)}/Asset_{(t)}] \times 100$* *(1)*	*Patents* *(2)*	*Citations* *(3)*	*Value of Innovation* *(4)*	*Radical_90* *(5)*	*Radical_95* *(6)*	*75th Percentile Return* *(7)*	*Product Announcement Return* *(8)*	*CAR* *(9)*
SOX × CEO Power	0.231**	0.045*	0.122***	0.090**	0.026**	0.025**	0.043*	0.009*	0.006*
	[0.011]	[0.074]	[0.009]	[0.025]	[0.037]	[0.022]	[0.081]	[0.081]	[0.098]
CEO Power	−0.144*	−0.017	−0.021	0.012	−0.004	−0.005	−0.019	−0.002	−0.002
	[0.085]	[0.384]	[0.561]	[0.698]	[0.622]	[0.531]	[0.299]	[0.538]	[0.466]
SOX Indicator	Y	Y	Y	Y	Y	Y	Y	Y	Y
Baseline Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	N	N	Y	Y	Y
Observations	5642	4384	4384	4384	4384	4384	1372	1372	1371
R^2	0.863	0.827	0.770	0.806	0.744	0.728	0.645	0.720	0.295

NOTES: This table represents results for examining the effect of better governance on firms with powerful CEOs after excluding highly overconfident CEOs. The sample consists of publicly traded, nonregulated, noncompliant S&P1500 firms. Models (1) and (9) include analyses during 1992–2011. Models (2)–(6) include analyses for the available information on innovation from Kogan et al. (2017) during 1992–2008. Models (7)–(8) include analyses during 1992–2006 with available data on the market reaction to a new product announcement from Mukherjee et al. (2017). "CEO Power" is an index: the sum of five indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median," and "CEO Ownership above Industry Median." "SOX" is an indicator that equals one if the observation occurs in 2002 or later and zero otherwise. Confidence measures how in the money the CEO's stock option is (Malmendier et al., 2011). Other variables are defined in Table A7 of Appendix. All models exclude highly overconfident CEOs–CEOs holding at least 95% in the money average vested option. All models include baseline controls and firm fixed effects. SEs are clustered at the firm level. *p*-values are in brackets. Significance levels: * = 10%; ** = 5%; *** = 1%.

Table A3: Powerful CEOs and Corporate Policies: Using Shorter Event Window

Dependent variables *Model*	*[RD(t + 1)/Asset (t)] × 100* *(1)*	*Patents* *(2)*	*Citations* *(3)*	*Value of Innovation* *(4)*	*Radical_90* *(5)*	*Radical_95* *(6)*	*75th Percentile Return* *(7)*	*Product Announcement Return* *(8)*	*CAR* *(11)*
SOX × CEO Power	0.199***	0.043**	0.132***	0.078**	0.020**	0.019**	0.055**	0.010*	0.006**
	[0.002]	[0.042]	[0.001]	[0.016]	[0.018]	[0.020]	[0.024]	[0.052]	[0.033]
CEO Power	−0.172***	−0.026	−0.060*	−0.032	−0.005	−0.005	−0.025	−0.004	−0.006*
	[0.008]	[0.132]	[0.089]	[0.265]	[0.532]	[0.519]	[0.155]	[0.362]	[0.050]
SOX Indicator	Y	Y	Y	Y	Y	Y	Y	Y	Y
Baseline Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	N	N	Y	Y	Y
Observations	4826	3820	3820	3820	3820	3820	1300	1300	1160
R^2	0.881	0.874	0.800	0.859	0.799	0.779	0.666	0.763	0.334

NOTES: This table represents the results of examining the effect of better governance on firms with powerful CEOs during 1997–2007. The sample consists of publicly traded, nonregulated, noncompliant S&P1500 firms. "CEO Power" is an index: the sum of five indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median" and "CEO Ownership above Industry Median." "SOX" is an indicator that equals one if the observation occurs in 2002 or later and zero otherwise. Other variables are defined in Appendix A7. All models include baseline controls and firm fixed effects. SEs are clustered at the firm level. *p*-values are in brackets. Significance levels: * = 10%; ** = 5%; *** = 1%.

Table A4: Powerful CEOs, and Corporate Policies: After Reconstructing CEO Power Index

Dependent variables	*[RD(t + 1)/ Asset(t)] × 100*	*Patents*	*Citations*	*Value of Innovation*	*Radical_90*	*Radical_95*	*75th Percentile Return*	*Product Announcement Return*	*CAR*
Model	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
Panel A: Excluding "Founder CEO" from CEO Power									
SOX × CEO Power[a]	0.191***	0.046*	0.157***	0.098**	0.025**	0.020**	0.054**	0.012**	0.006*
	[0.004]	[0.066]	[0.001]	[0.016]	[0.025]	[0.037]	[0.039]	[0.030]	[0.063]
CEO Power[a]	−0.171***	−0.027	−0.071*	−0.032	−0.017**	−0.014**	−0.027	−0.005	−0.003
	[0.004]	[0.138]	[0.057]	[0.296]	[0.026]	[0.046]	[0.157]	[0.210]	[0.256]
Panel B: Excluding "CEO-Chair Duality" from CEO Power									
SOX × CEO Power[b]	0.198***	0.070**	0.181***	0.120**	0.026*	0.025*	0.061**	0.013**	0.006*
	[0.010]	[0.018]	[0.001]	[0.010]	[0.083]	[0.070]	[0.029]	[0.040]	[0.074]
CEO Power[b]	−0.125*	−0.031	−0.043	−0.045	−0.016	−0.014	−0.014	−0.006	−0.004
	[0.079]	[0.195]	[0.376]	[0.269]	[0.152]	[0.122]	[0.497]	[0.268]	[0.240]
Panel C: Excluding "Title Concentration" from CEO Power									
SOX × CEO Power[c]	0.158**	0.052**	0.132***	0.090**	0.018*	0.018*	0.052**	0.010**	0.005*
	[0.015]	[0.032]	[0.006]	[0.024]	[0.087]	[0.061]	[0.037]	[0.047]	[0.086]
CEO Power[c]	−0.110*	−0.004	−0.014	0.009	−0.008	−0.008	−0.021	−0.004	−0.005*
	[0.059]	[0.849]	[0.719]	[0.776]	[0.420]	[0.357]	[0.242]	[0.305]	[0.091]
Panel D: Excluding "CEO Tenure above Industry Median" from CEO Power									
SOX × CEO Power[d]	0.172***	0.044**	0.127***	0.085**	0.020**	0.018**	0.045**	0.009*	0.005**
	[0.004]	[0.046]	[0.003]	[0.017]	[0.042]	[0.042]	[0.042]	[0.054]	[0.046]
CEO Power[d]	−0.152**	−0.004	−0.024	0.012	0.003	0.001	−0.033*	−0.009**	−0.005*
	[0.030]	[0.868]	[0.567]	[0.731]	[0.765]	[0.924]	[0.099]	[0.035]	[0.096]
Panel E: Excluding "CEO Ownership above Industry Median" from CEO Power									
SOX × CEO Power	0.192***	0.028*	0.086*	0.062*	0.033	0.026	0.060**	0.011*	0.006**
	[0.004]	[0.092]	[0.087]	[0.089]	[0.124]	[0.158]	[0.035]	[0.094]	[0.044]
CEO Power[e]	−0.171***	−0.011	−0.019	−0.024	0.012	0.013	−0.024	−0.004	−0.004
	[0.002]	[0.374]	[0.610]	[0.393]	[0.539]	[0.483]	[0.277]	[0.471]	[0.171]
R^2	0.873	0.816	0.753	0.804	0.743	0.728	0.660	0.732	0.331

Table A4: *Continued*

SOX Indicator	Y	Y	Y	Y	Y	Y	Y	Y	Y
Baseline Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	N	N	Y	Y	Y
Observations	7128	5472	5472	5472	5472	5472	1762	1762	1191

NOTES: This table represents the results of examining the effect of better governance on the firms with powerful CEOs after reconstructing the "CEO Power Index." The sample consists of publicly traded, nonregulated, noncompliant, nondual class S&P1500 firms. Models (1) and (9) include analyses during 1992–2011. Models (2)–(6) include analyses for the available information on innovation from Kogan et al. (2017) during 1992–2008. Models (7)–(8) include analyses during 1992–2006 with available data on the market reaction to a new product announcement from Mukherjee et al. (2017). Panel A includes "Founder CEO" indicator. Panel B includes "CEO-Chair Duality" indicator. Panel C includes "Title Concentration" indicator. Panel D includes "CEO Tenure above Industry Median" indicator. Panel E includes "CEO Ownership above Industry Median" indicator. "SOX" is an indicator that equals one if the observation occurs in 2002 or later and zero otherwise. Other variables are defined in Appendix A7. All models include baseline controls and firm fixed effects. SEs are clustered at the firm-level. *p*-values are in brackets. Significance levels: * = 10%; ** = 5%; *** = 1%.

[a]"CEO Power" is an index: the sum of four indicators—"CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median" and "CEO Ownership above Industry Median."

[b]"CEO Power" is an index: the sum of four indicators—"Founder CEO," "Title Concentration," "CEO Tenure above Industry Median" and "CEO Ownership above Industry Median."

[c]"CEO Power" is an index: the sum of four indicators—"Founder CEO," "CEO-Chair Duality," "CEO Tenure above Industry Median" and "CEO Ownership above Industry Median."

[d]"CEO Power" is an index: the sum of four indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," and "CEO Ownership above Industry Median."

[e]"CEO Power" is an index: the sum of four indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," and "CEO Tenure above Industry Median."

Table A5: Covariate Balance Test for Generalized Triple-difference

	Treatment Firms			*Control Firms*			
Variables	*Mean*	*Median*	*SD*	*Mean*	*Median*	*SD*	t-*test*
Firm Size	6.984	6.774	1.455	7.079	6.912	1.518	−1.08
Firm Age	21.028	15.000	17.951	23.970	17.000	20.290	−2.55**
Profitability	0.037	0.053	0.123	0.035	0.051	0.124	0.43
Leverage	0.196	0.166	0.189	0.203	0.181	0.187	−0.62
Tobin's Q	0.650	0.535	0.602	0.672	0.512	0.631	−0.66

NOTES: This table reports the balance of covariates between treatment and control firms during the preregulatory period. The sample consists of publicly traded, nonregulated firms that were available from Execucomp. The sample excludes missing data on CEO power components and firms with missing information on corporate board structure before the year 2002. The noncompliant firms are firms without a fully independent audit committee or majority board independence before the year 2002. "CEO Power" is an index: the sum of five indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median" and "CEO Ownership above Industry Median." Treatment firm sample includes the noncompliant firms. Control firm sample includes the other firms. Variables are defined in the Appendix A7. SEs are clustered at the firm-level for the *t*-test.

Table A6: Powerful CEOs and Corporate Policies: Excluding Large Firms

Dependent Variables	*$[RD_{(t+1)}/Asset_{(t)}] \times 100$*	*Patents*	*Citations*	*Value of Innovation*	*75th Percentile Return*	*Product Announcement Return*	*CAR*
Model	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
SOX × CEO Power	0.103**	0.055*	0.117**	0.084**	0.074*	0.010	0.009**
	[0.032]	[0.082]	[0.036]	[0.048]	[0.081]	[0.110]	[0.018]
CEO Power	−0.142***	−0.028	−0.039	−0.001	−0.029	−0.004	−0.002
	[0.001]	[0.248]	[0.385]	[0.970]	[0.325]	[0.535]	[0.483]
SOX Indicator	Y	Y	Y	Y	Y	Y	Y
Baseline controls	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Observations	3570	2746	2746	2746	884	884	820
R^2	0.916	0.810	0.737	0.818	0.625	0.718	0.350

NOTES: This table represents the results of examining the effect of better governance on noncompliant firms with powerful CEOs after excluding large firms. The sample consists of publicly traded, nonregulated, noncompliant S&P1500 firms. Models (1) and (7) include analyses during 1992–2011. Models (2)–(4) include analyses for the available information on innovation from Kogan et al. (2017) during 1992–2008. Models (5)–(6) include analyses during 1992–2006 with available data on the market reaction to a new product announcement from Mukherjee et al. (2017). Large firms are firms with above sample median size. "CEO Power" is an index: the sum of five indicators—"Founder CEO," "CEO-Chair Duality," "Title Concentration," "CEO Tenure above Industry Median," and "CEO Ownership above Industry Median." "SOX" is an indicator that equals one if the observation occurs in 2002 or later and zero otherwise. Other variables are defined in Table A7. All models include baseline controls and firm fixed effects. SEs are clustered at the firm level. *p*-values are in brackets. Significance levels: * = 10%; ** = 5%; *** = 1%.

Table A7: Variable Definition

Powerful CEO Index	
Founder CEO	Indicator variable that equals one if any source explicitly mentions that the current CEO is one of the original founders of the firm or was the main executive at the time the company was founded. Source: hand-collected data.
CEO-Chair Duality	Indicator variable taking the value of one if the CEO is also the chairman of the firm and zero otherwise. Source: Execucomp.
Title Concentration	Indicator variable taking the value of one if the CEO, who is also the chairman of the firm, additionally holds any one, or more, other senior posts (titles), including COO, President, and CFO. Source: Execucomp.
CEO Tenure	CEO tenure in years. Source: Execucomp and hand-collected data
CEO Tenure above the Industry Median	Indicator variable taking the value of one if the tenure is above the median tenure of CEOs in the industry–year distribution of tenure where the industry is defined using two-digit SIC code, zero otherwise.
CEO Ownership	Percentage of share ownership held by CEOs. Source: Execucomp.
CEO Ownership above the Industry Median	Indicator variable taking the value of one if the ownership is above the median ownership of CEOs in the industry–year distribution of ownership where the industry is defined using two-digit SIC code, zero otherwise.
CEO Power	An index which is an aggregate measure of the five components of CEO power-Founder CEO, CEO-Chair Duality, Title Concentration, CEO Tenure above Industry Median, and CEO Ownership above Industry Median and thus the index value ranges from 0 to 5.
CEO Power Top Q	Indicator variable taking the value of one if the CEO power index is in the top 25% of the industry–year distribution, zero otherwise.
Delta	The change in the dollar value of the executive's wealth for a 1 percentage point change in stock price (following Core & Guay, 2002; Coles et al., 2006).
Vega	The change in the dollar value of the executive's wealth for a 0.01 change in the annualized SD of stock returns (following Core & Guay, 2002; Coles et al., 2006). Source: Coles et al. (2006).
Total Pay	The dollar value of the executive's total annual compensation (ExecuComp: "tdc1"). Source: ExecuComp.
Firm characteristics and control variables	
Firm Size	The natural logarithm of the book value of total assets. Source: Compustat.
Firm Age	Firm's age since incorporation. Sources: CRSP.
Profitability	Earnings before interest and tax scaled by the book value of a firm's total assets. Source: Compustat.
Leverage	Firms total debt in the year t scaled by the book value of total assets in the year $t-1$. Source: Compustat.
Tobin's Q	The natural logarithm of the book value of debt plus the market value of equity scaled by the book value of assets. Source: Compustat.
RD(t)	Research and development expenditures in the year t scaled by the total assets in the year $t-1$. Sources: Compustat.
Free Cashflow	Operating income less interest expense, taxes, and capital expenditures scales by assets. Source: Compustat.
Capital Expenditures	Capital expenditures scaled by assets. Source: Compustat.
Dividend Payer	An indicator equals one if the firm pays dividend, otherwise zero. Source: Compustat.

Table A7: *Continued*

Firm characteristics and control variables	
Cashflow Volatility	The SD of the firm's return on assets over the last 5-year period. Source: Compustat.
Advertising Expenditures	The advertising expenditures scaled by sales. Source: Compustat.
Stock Volatility	The annualized value of stock returns excluding dividends. Source: CRSP.
CPS	The percentage of the total compensation of the top five executives that goes to the CEO. Source: Execucomp.
Only Insider	An indicator that equals one if the CEO is the only insider on the board, zero otherwise. Source: ISS.
Dual Class	An indicator that equals one for firms with dual-class shares, zero otherwise. Source: ISS.
Institutional Holdings	Proportional ownership of institutional investors. Source: Thomson 13f Institutional holdings.
SOX	The indicator that equals one if the observation occurs in 2002 or later, zero otherwise.
Placebo Shock	The indicator equals one if the observation occurs during 1996–2000 and zero if the observation occurs before 1996.
Holder67	An indicator that equals one if the average vested option of the CEO is at least 67% in the money on at least two occasions, zero otherwise. Source: Execucomp and CRSP.
Highly Overconfident CEOs	An indicator that equals one if the CEO belongs to the top 5% of the *Holder67* measure, zero otherwise. Source: Execucomp and CRSP.
Dependent Variables	
$RD(t+1)/Asset(t)$	R&D expenditures$(t+1)$ scaled by Assets(t). Source: Compustat.
CAR	The 3-day CAR $(-1, 1)$ calculated using the market model. Source: SDC platinum and CRSP.
Patent	The natural logarithm of one plus number of patents applied by a firm at time $(t+2)$. Source: KPSS (2017).
Citations	The natural logarithm of one plus number of citations attributed to a firm's patents at time $(t+2)$. Source: KPSS (2017).
Patent Value	The natural logarithm of one plus the average value of a firm's patents at time $(t+2)$. Source: KPSS (2017).
Radical_90	The natural logarithm of one plus a number of a firm's patents at time $(t+2)$ with citations in the 90th percentile of the technology-class-year citations distribution. Source: KPSS (2017).
Radical_95	The natural logarithm of one plus a number of a firm's patents at time $(t+2)$ with citations in the 95th percentile of the technology-class-year citations distribution. Source: KPSS (2017).
Product Announcement Return	The natural logarithm of the sum of all positive CARs over the year. Source: Mukherjee et al. (2017).
75th Percentile Return	The natural logarithm of one plus the number of announcements with the CARs above the 75th percentiles. Source: Mukherjee et al. (2017).
Option Intensity	The proportion of the CEO's total annual compensation that comes from option grants. This is the value of annual option awards (ExecuComp: "option_awards_blk_value" before FAS 123R and "option_awards_fv" after FAS 123R) scaled by the amount of total annual compensation (ExecuComp: "tdc1"). Source: Execucomp

Table A7: *Continued*

Dependent Variables	
Stock Intensity	The proportion of the CEO's total annual compensation that comes from stock grants. This is the value of restricted stock granted to the executives (ExecuComp: "rstkgrnt" before FAS 123R and "stock_awards_fv" after FAS 123R) scaled by the amount of total annual compensation (ExecuComp: "tdc1"). Source: Execucomp
Deal Specific Features	
Relative Deal Size	The transaction value over the acquirer's market capitalization on 11 days before the announcement date. Source: SDC platinum.
Friendly Deal	An indicator that equals one if the deal is friendly, zero otherwise. Source: SDC platinum.
Subsidiary Target	An indicator that equals one if the target company is a subsidiary company, zero otherwise. Source: SDC platinum.
Public Target	An indicator that equals one if the target company is a public company, zero otherwise. Source: SDC platinum.
All Cash Deal	An indicator that equals one if the deal is fully cash financed, zero otherwise. Source: SDC platinum.
Stock Deal	An indicator that equals one if the acquirer pays a positive fraction of the transaction value using stocks, zero otherwise. Source: SDC platinum.
Innovative Target	An indicator that equals one if the target has been awarded with at least one patent prior to acquisition, zero otherwise. Source: Li et al. (2018).
Likelihood of Acquiring Innovative Target	An indicator that equals one if the firm acquires a target that has been awarded with at least one patent prior to acquisition, zero otherwise.