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**Abstract**

In 2002, U.S. stock exchanges and the Sarbanes–Oxley Act established minimum standards for director independence. The laws induced changes in firm agency controls is studied on a two new datasets (The Director Database and Equilar Executive Compensation) with a much larger range of firm size than previous studies. Firms most treated by the director rules increase leverage and decrease CEO stock ownership. This suggests that leverage complements and CEO ownership substitutes for outside director supervision. The average treated firm also increased interlocking directorships, the number of other boards its directors serve. The rules failed to reduce CEO misbehavior like excess compensation, heavy use of incentive-compensation, or low turnover. Additionally, treated firms do not outperform the market. These results are more consistent with governance optimization than either managerial entrenchment or compliance cost explanations.

JEL: G18, G30, G34, G38

Key words: Independent directors; Governance; Sarbanes-Oxley Act; Executive compensation; Agency costs; Managerial entrenchment

# 1 Introduction

U.S. publicly traded firms have adopted many practices to control CEO behavior with the intent of directing CEO actions to increase shareholder value. The principal strategies used include: 1) incentive pay, 2) debt financing, 3) equity ownership structure, and 4) independent (outside, non-employee) directors on the board. This paper examines how firms change these mechanisms in response to the Sarbanes-Oxley Act (SOX) of 2002 and contemporaneous stock exchange rule changes that constrain the floor level of monitoring done through the use of independent directors.

Previous studies explore the relationship between governance mechanisms or the relationships between governance and firm performance.[1] However, there is reason to doubt that such studies can recover the structural relationship between inputs in the governance production function. Firms likely have differing costs and benefits of agency control tools. This would be reflected in the ultimate governance selection and obscure the true trade-offs that each firm faces.[2] In fact, this endogeneity concern is often mentioned by earlier studies. The director requirements of SOX and the exchanges provide exogenous variation in independent board member monitoring, seemingly mitigating the problem of selection on unobserved criteria.

Recent papers have used these director rule changes to analyze corporate governance relationships. Cicero, Wintoki, and Yang (2013) and Dah, Frye, and Hurst (2014) look at the direct effects on directors and board structure; and Linck, Netter, and Yang (2009) analyze the broader impact on the supply and demand for directors. Many papers have looked at effects on firm value and performance (Akhigbe and Martin, 2006; Ahmed, McAnally, Rasmussen, and Weaver, 2010; Wintoki, 2007; Chhaochharia and Grinstein, 2007; Li, Pincus,

[1] See for example Hermalin and Weisbach (1991), Bathala and Rao (1995), Agrawal and Knoeber (1996), Shleifer and Vishny (1997), Klein (1998), Core, Holthausen, and Larcker (1999), Gompers, Ishii, and Metrick (2003), Brown and Caylor (2006), Boone, Field, Karpoff, and Raheja (2007), and Bebchuk, Cohen, and Ferrell (2009).

[2] Industry, manager, financing options, and firm complexity may all influence the pricing and selection of monitoring tools.

and Rego, 2008; Duchin, Matsusaka, and Ozbas, 2010) and generally find changes in performance depend on firm characteristics such as size, complexity, and growth opportunities. This paper examines the effects of the rules on broader mechanisms used to mitigate agency problems—leverage, CEO ownership, and CEO incentive compensation—to understand whether such tools are complements or substitutes for independent directors. This work is similar in spirit to Becher and Frye (2011) who examine whether regulation substitutes for governance monitoring mechanisms.

The stated purpose of SOX was to "channel corporate decisions in the right direction" (hereafter the improvement hypothesis).[3] Another view considers corporate governance as a production input and, like other inputs, an optimizing firm will choose the combination of strategies that minimizes the cost of a given level of control (reoptimization hypothesis). From this perspective, the director rules were quixotic, expected merely to reconfigure corporate governance rather than improve it.

Following the methodology of (Chhaochharia and Grinstein, 2007) we categorize firms by the extent to which they needed to make changes to comply with the four requirements (hereafter, "Director Rules"): a majority of independent board and three independent committees (audit, nominating, and compensation). Firms required to make two or more changes are considered treated by the Director Rules. Other firms are the control group. However, given the endogeneity of board structure (Hermalin and Weisbach, 2003), the firms treated by the rules likely have characteristics that made them select that governance structure. Furthermore, firms had been increasingly adopting independent boards (Linck, Netter, and Yang, 2008; Duchin, Matsusaka, and Ozbas, 2010). Because the treated firms had still "chosen" to have a non-independent board, we include additional controls for the compositional differences between treated and untreated firms. First, we use two, more extensive, datasets for executive compensation (Equilar Executive Compensation) and director independence (The Director Database) than generally used

[3]Speech by SEC Commissioner Cynthia A. Glassman: Sarbanes-Oxley and the Idea of 'Good' Governance http://www.sec.gov/news/speech/spch586.htm

in the corporate governance literature. These data capture smaller firms that disproportionately tended to be more treated by the rule changes. Second, we run alternative tests limited to treated firms and a matched subsample of untreated firms. Finally, we hand-collect data to proxy for management entrenchment. The results are robust to these controls.

Our primary results test for changes in governance and provide a unique insight on the production function for governance. We find three economically significant changes. First, interlocking directorships increased at treated firms. This is consistent with Jiraporn, Singh, and Lee (2009) who document an increase in multiple board seats post-SOX across all firms. Because treated firms in our sample did not increase their board size on average, the interlock result suggests that these firms replaced inside directors with outside directors that serve on boards of other companies.

Second, treated firms increased their leverage relative to untreated firms by about 1 percentage point which is equivalent to a 7 percent increase in leverage for the average treated firm before the Director Rules. Since debts role in governance is to provide outside monitoring, much as outside directors, a positive relationship between board independence and leverage may be surprising. However, Bradley and Chen (2015) find that board and audit committee independence decrease the cost of debt post-SOX for firms with low leverage and good credit conditions. Earlier studies find that board independence is tied to lower cost of debt (Anderson, Mansi, and Reeb, 2004; Bhojraj and Sengupta, 2003; Ertugrul and Hegde, 2008). Therefore the law may induce complementarity of outside directors and leverage by decreasing the cost of that leverage. Since this change is properly thought of as a complementarity in the production function and not a cost shock because the debt cost faced by the firm is endogenous to the firms governance decision.

Finally, CEO ownership decreased 0.7 percentage points at treated firms relative to untreated firms which is equivalent to a 5 percent decrease. Given that tests on turnover rates show that treated firms were no more likely to change management, the decrease in CEO ownership was the result of

continuing management divesting shares. Guthrie, Sokolowsky, and Wan (2012) show that board independence did not constrain CEO pay. Our results suggest that board independence did not force CEOs to maintain ownership holdings.

Given that our data set extends beyond the usual suspects...

CEOs have been singled out in the academic and popular press for self-dealing behavior. To further test the improvement hypothesis we focus on three varieties of suspected self-dealing: excess compensation, low turnover, and incentive-compensation. Because at least some self-dealing is presumed to exist under the improvement hypothesis, all three measures should improve in response to reforms. In particular, CEO compensation and turnover are the clear responsibility of the board of directors. However, treated firms do not lower compensation nor do they tend to fire CEOs at a faster rate than untreated firms after the rule changes.

Firms most heavily affected by these regulatory changes also do not outperform their peers.[4] Since shareholders would be expected to capture much of the benefits of governance improvement, this non-outperformance is evidence against the improvement hypothesis and is a serious problem for the backers of the rule changes. In total, we reject the improvement hypothesis in favor of reoptimization hypothesis.

The next section provides more background on SOX and the exchange rule changes. Section 3 will review more of the related literature. Section 4 discusses the data. Testing results are reported in sections 5–7. Section 5 tests the change in governance mix, section 6 tests the change in governance outcome, and section 7 tests market valuation. Section 8 concludes.

[4]We try the methods of Wintoki (2007), Li, Pincus, and Rego (2008), and Chhaochharia and Grinstein (2007). As reported in section 7, our results differ from Chhaochharia and Grinstein (2007). We believe this is driven by sample differences as our data contain more smaller- and medium-sized firms. However, licensing issues on the data prevented the other authors from sharing a data sample with us to rule out other explanations. A cross-sectional variation explanation for why our results differ is consistent with Wintoki (2007).

# 2 Overview of Regulation Changes

SOX was signed into law on July 30, 2002 in the midst of earnings restatements by several firms and many allegations of fraud. Those announcements arguably helped propel the law through Congress relatively quickly (Oppel (2002), Oppel and Altman (2002), Li, Pincus, and Rego (2008)). The exchanges were similarly motivated to act in their "commitment to restoring confidence in the markets through enhanced disclosure and transparency" (NASDAQ, 2003). Both SOX and the exchanges established specific requirements for U.S. public firms.

## 2.1 The Sarbanes–Oxley Act (SOX)

As other papers have discussed at length (for example, Coates (2007) and Romano (2005)), SOX increased reporting requirements. The stated motivation behind SOX was to improve the quality of information disclosed to investors.[5] In addition to improvements in the audit process (Section 404), all firms were required to have an audit committee, and the members of that committee were required to be independent. To be independent, the director could not "(i) accept any consulting, advisory, or other compensatory fee from the issuer; or (ii) be an affiliated person of the issuer or any subsidiary thereof."[6] SOX required the SEC to implement an audit committee rule by April 26, 2003. The SEC finalized the rule by early April. However, firms did not have to comply until whichever came first, their first annual shareholders meeting after January 15, 2004, or October 31, 2004.[7]

[5] According to the title page of the act, SOX is "an act to protect investors by improving the accuracy and reliability of corporate disclosures made pursuant to the securities laws, and for other purposes" U.S. Congress (2002).

[6] 15 U.S.C. 78f(m)(3)(B).

[7] SEC final rule "Standards Relating to Listed Company Audit Committees," April 9, 2003, file no. S7-02-03.

## 2.2 Exchange Rule Changes

While SOX was working its way through Congress, the NYSE and NASDAQ were in the process of changing the corporate governance rules required for firms listed on those exchanges. Among the new rules was a mandate requiring that listed firms have a majority of independent directors on their board. This meant that *more than* 50 percent of the board had to be independent. The exchanges also passed rules that strengthened the role of independent directors. Audit, nominating, and compensation committees were to exist and to be filled by independent directors. These exchange rule changes then had to be passed by the SEC. The SEC approved the rules in November 2003. The new rules generally took effect with a firm's first annual meeting occurring after January 15, 2004, but not later than October 31, 2004 (NASDAQ, 2003).

# 3 Related Literature and Agency Problems

Many mechanisms have been suggested to mitigate agency problems in public firms. They can be generally classified into three basic categories: management contracts, organizational structure, and capital structure. Essentially, management can be paid to need less controlling, management can be directly supervised, or the firm can be configured to use supervision from capital markets. We assume that investors and managers negotiate a package of compensation, monitoring, and financing tools whereby each party maximizes their utility. Investors care only about firm value. The manager cares about firm value and private benefits such as compensation and perquisites. Agents and principals can use a variety of contracting and supervisory mechanisms to generate surplus which they can then split. The costs of contracting and monitoring differ by firm characteristics like industry and firm life cycle stage and by managerial attributes. Regardless of the level and type of supervision they choose, both investors and managers have the proper incentives to minimize the costs (pecuniary and not) of achieving a particular

level of monitoring because they can split any surplus created from selecting more efficient forms of supervision. We have no strong prior beliefs on how governance mechanisms interact.

Managerial contracts and incentive alignment is probably the most deeply studied of the three mechanism categories. This category includes equity based compensation plans (with stock or options), non-equity incentive plans (various performance bonuses), and requiring executives to hold an investment portfolio concentrated in the employer's stock. It has been understood since at least Jensen and Meckling (1976) that pay influences managerial decision making. Because managers bear only the cost equal to their proportional ownership while they get the full benefit of any self-serving behavior such as shirking and perquisites, increased managerial ownership will help align incentives. Compensation plan specifics are important. Guay (1999) shows options strongly increase the risk-taking incentives of executives compared with a comparable dollar value of stock holdings. The shift in recent years from time to performance vesting in executive compensation likely does something similar. But short of giving away the whole firm, the agency problem cannot be eliminated with compensation.

Direct monitoring through organizational structure is a second key tool in managerial control. The Director Rules at the core of this paper are of this type. Fama and Jensen (1983) argue the agency problem resulting from a separation of ownership and control can be mitigated by decision systems that separate the two functions of managing and control for important decisions. For public corporations, the managing function is performed by top management, and the board provides control services. For example, the board must ratify major decisions; has hiring, firing, and compensation power over management; and provides monitoring services. Fama (1980) describes outside directors as "professional referees" that are compensated in the labor market based on the quality of those services. Direct monitoring also includes such mechanisms as independent auditors, credit rating and equity research opinions, and supervisory boards of directors.[8] However, understanding the

[8]Other examples of additional monitoring of the manager include punching a time clock

relationship between directors and governance is difficult given the endogeniety of selection (Hermalin and Weisbach, 2003).

Sometimes members of the board of directors serve on the boards of multiple firms, deemed interlocking directorships. Because of the significant board reorganizations induced by the Director Rules, there may be consequences of that reorganization on interlocking directorships. Interlocking directorships developed an early association with poor governance dating back at least as far a Brandeis (1914). Hallock (1997) finds that CEOs of interlocked firms have higher compensation. Krantz (2004) describes interlocks as a "web of cronyism." Core, Holthausen, and Larcker (1999) also find interlocks are associated with higher CEO compensation and additionally with lower firm performance. In light of these papers, the improvement hypothesis predicts that interlocks should decline in response to the law.

Others, however, see benefits in interlocking directorships. Dooley (1969) highlights that interlocks are most common among large firms, and this may be in part because they can select the most capable and accomplished directors. Schoorman, Bazerman, and Atkin (1981) also note that an interlocking outside director "...is likely to have information and skills from which the focal organization can benefit." Insiders, by virtue of their careers and current positions, have valuable information and expertise to provide the board of directors. When they are removed from the board, that knowledge is lost. The archetypal interlocking director is a retired CEO,[9] and perhaps this sort of director can provide exactly the expertise lost when replacing insiders on the board.

The third key tool is choice of capital structure, debt in particular.[10] Jensen (1986) suggests that debt can help mitigate agency problems by pulling "free

(the Mars Corporation), retention of all employee emails, splitting the job of CEO and chairman of the board, and mandatory retirement ages.

[9]Lee (2011) finds that retired CEOs are in decline as directors after SOX but does not study the subpopulation studied here.

[10]See Harris and Raviv (1991) for an extensive review of capital structure literature. While this paper will focus on debt, research such as Jensen (1986) and Easterbrook (1984) show that dividend payments can also mitigate agency problems.

cash flow" out of the firm through interest payments and forcing the firm to go back to the market for financing. Debt has also been attributed a primary role in mitigating agency conflicts. Grossman and Hart (1982) argue that the threat of bankruptcy will help keep management seeking high profits. Bankruptcy would cause the manager to lose salary and perquisites. Harris and Raviv (1990) show how debt generates information for investors, improving their ability to oversee management.

# 4 Data

Firm financial statement data come from the Compustat North America Fundamentals Annual database (Compustat). These data contain firm characteristics and financial statement information for U.S. public firms. To focus on the companies treated by both SOX and the exchange rules, only firms that trade on either the NYSE or NASDAQ are included in this study.

Data on CEO compensation and ownership come from Equilar. These data include details on the top five executive officers' compensation and ownership—salary, bonus, options, restricted shares, and standard shares. Equilar doubled its universe of firm coverage from 2,600 firms in 1999 to approximately 4,700 firms in 2003 when they began their guaranteed coverage of current and former Russell 3000 firms.[11] Equilar data are used for the 1999–2008 period. Equilar firm coverage in 1999–2002 was driven by firm size; initially data for the largest firms was collected and smaller firms were added over time.

[11]Equilar data cover many firms outside of the S&P 1500 that is the primary population for S&P's Capital IQ ExecuComp data more commonly used in compensation research. This broader coverage is important to capture the behavior of small firms where the costs of SOX compliance were likely large. Among executive compensation consultants we spoke to, Equilar had a superior reputation to ExecuComp for accuracy and depth of information captured such as vesting schedules of restricted stock and stock options in addition to a much larger universe of firms and executives. Equilar lacks coverage of the 1992-1999 period covered by ExecuComp, but that is not relevant to the questions of interest here.

To identify only one executive as the CEO each year, we select the executive with a *Role Code* field of CEO and a *Title* field that lacks former CEO identifiers. If this still leaves more than one CEO, we select the executive with the highest compensation from among those with the *Role Code* of CEO.[12]

Director information comes from the Directors Database Archive (DDA), a product of Corporate Board Member Magazine.[13] DDA consists of board snapshots beginning in 2000 with information on director independence. The data are archived approximately every quarter. In order to create our sample, we linked firms in the DDA as of January 2002 to firms in the DDA as of January 2005. January 2002 is the latest database snapshot prior to drafts of SOX being discussed before Congress. The January 2005 snapshot is the first snapshot after both the exchange regulations and SOX committee rules were in full force and when the DDA is completely updated with any board composition changes. We exclude firms that are not in the DDA for both periods (January 2002 and January 2005). This provides us board of director insider and outsider information on nearly 4,800 firms.

We then merge the board data with the Compustat and Equilar data. About 4,000 firms are matched. We exclude firms that have boards with fewer than four directors (likely abnormal firms or firms with bad data), that are missing primary regression data, that are not in the data set before and after the law change, and that have fewer than six years of data.[14] This leaves

[12]There can be multiple officers listed as CEO in the same year for two primary reasons: 1) There was a transition to a new CEO, 2) The CEO position is shared by two people. Because the title field is constructed from proxy descriptions of titles that potentially contain unreliable descriptions of managerial transitions, we did a number of robustness checks with alternative specifications using the shortest serving CEO, the longest serving CEO, and dropping firms with multiple CEOs. These specifications gave similar results to those presented in the results section. However, we checked a random subsample of firm management transitions and found that this method using "former" in the *Title* was the most reliable method of detecting CEO transitions.

[13]The magazine has been acquired by the New York Stock Exchange, but the archive data are still available for purchase `www.nyse.com/governance`.

[14]Primary variables include market capitalization, asset growth, firm value, and earnings. There were 9 firms with fewer than four directors, 69 firms which do not have Compustat data available before and after SOX, and 163 firms with fewer than six years

approximately 3,800 firms in the sample.

Given the limited committee information in DDA during this period, we hand-collected committee data using SEC filings, company proxies (Def 14A) and annual reports (10K) filed closest to but before June 2002. Some firms did not list the specific directors that participated on one or more committees. Such firms were dropped, leaving about 3,400 firms in the full testing sample. This sample includes approximately 75 percent of the S&P 1500 index firms.[15]

To determine the extent to which firms were affected by the Director Rules, we use the measurement index developed by Chhaochharia and Grinstein (2007) (hereafter, "CG") that captures all the Director Rules. In total, the new rules require four board characteristics: 1) majority independent board of directors, 2) independent audit committee, 3) independent nominating committee, 4) and independent compensation committee. Firms with at least three of these characteristics are labeled high (H). Firms with two characteristics are labeled medium (M), and firms with zero or one are low (L)—firms most affected by the Director Rules. A firm is considered treated under the CG definition if it has an L or M score.

Table 1: Required Level of Governance Change, by Firm Size

The level of governance change is based on how many of the four board characteristics the firm needs to adopt. Firms with at least three of these characteristics are labeled high (H). Firms with two characteristics are labeled medium (M), and firms with zero or one are low (L)—firms most affected by the Director Rules. Small and large are defined as being below or above the sample median market capitalization, respectively.

| | Firm Size | | |
|---|---|---|---|
| Level of governance change | Large | Small | Total |
| L | 34 | 78 | 112 |
| M | 137 | 333 | 470 |
| H | 1,534 | 1,293 | 2,827 |
| Total | 1,705 | 1,704 | 3,409 |

of primary regression data. Note that some firms are in more than one exclusion category.

[15]This calculation is based on the S&P 1500 constituent list as of January 2, 2002.

Table 1 shows the required level of governance change by firm size. As documented by Wintoki (2007) and Chhaochharia and Grinstein (2007), smaller firms tend to be more affected by the Director Rules.

To measure managerial entrenchment before SOX we use the entrenchment index (E index) defined by Bebchuk, Cohen, and Ferrell (2009). The E index is constructed using 6 of the 24 provisions followed by the Investor Responsibility Research Center (IRRC): staggered boards, poison pills, golden parachutes, supermajority requirements for mergers, and shareholder limits to either charter amendments or bylaw amendments.[16] Because gathering E index data requires labor-intensive proxy and corporate charter review, we gather it for 1,048 firms, the treated firms and a matched set of control firms.[17] The index is the summation of six dummy variables, each set to one if the firm has the relevant provision. Therefore, the index number for a firm can range from 0 (least entrenched, best governance) to 6 (most entrenched, worst governance).

Table 2 reports the summary statistics for our sample. Treated firms tend to be smaller and have a higher fraction of stock held by the CEO. However, there is no statistically significant difference in the means of the treated and control populations in the primary controls or response variables.

We first look for evidence that treated firms were more entrenched than untreated firms. Low entrenchment and good governance are not synonymous, but they are related because entrenched management reduces the benefits and raises the costs of monitoring and control. If SOX was intended to help improve governance, it could potentially affect entrenched management more. Table 3 shows the treatment groups by E index score. Though the differences are small, the treated firms have lower scores (are less entrenched). Therefore, if anything, the treated firms (those singled out by these provisions to improve their governance) on average already had relatively more shareholder power.

[16]The database was acquired by RiskMetrics who is now owned by MSCI.

[17]Appendix A describes in detail how the E index data are constructed and the firm matching methodology.

Table 2: Summary Statistics, by Treatment Group

| | Before Director Rules | | | | | | After Director Rules | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Not Treated (H) | | | Treated (L/M) | | | Not Treated (H) | | | Treated (L/M) | | |
| | Obs | Mean | St. Dev. | Obs | Mean | St. Dev. | Obs | Mean | St. Dev. | Obs | Mean | St. Dev. |
| **A. Compustat Data** | | | | | | | | | | | | |
| Ln(Market cap.) | 16,586 | 6.03 | 2.00 | 3,369 | 4.87 | 1.87 | 7,565 | 6.58 | 1.90 | 1,538 | 5.55 | 1.80 |
| Asset growth | 16,586 | 0.40 | 5.88 | 3,369 | 0.39 | 4.87 | 7,565 | 0.17 | 2.71 | 1,538 | 0.17 | 0.54 |
| Value-to-assets ratio | 16,586 | 2.27 | 3.85 | 3,369 | 1.95 | 2.40 | 7,565 | 2.05 | 2.18 | 1,538 | 2.04 | 2.00 |
| Earnings-to-assets ratio | 16,586 | -0.03 | 0.39 | 3,369 | -0.02 | 0.45 | 7,565 | 0.00 | 0.24 | 1,538 | 0.01 | 0.23 |
| Leverage (Long-term debt/assets) | 16,544 | 18.02 | 20.21 | 3,362 | 14.75 | 19.29 | 7,547 | 16.96 | 21.17 | 1,534 | 14.31 | 19.59 |
| Ln(Long-term debt) | 13,622 | 4.29 | 2.88 | 2,536 | 3.08 | 2.76 | 6,050 | 4.75 | 2.88 | 1,146 | 3.73 | 2.66 |
| **B. Equilar data** | | | | | | | | | | | | |
| CEO Ownership | 10,544 | 5.77 | 10.52 | 1,654 | 12.66 | 15.76 | 6,598 | 4.83 | 9.02 | 1,204 | 10.79 | 14.96 |
| Ln(Award value) | 10,547 | 14.38 | 1.28 | 1,640 | 13.64 | 1.20 | 6,604 | 14.45 | 1.18 | 1,200 | 13.73 | 1.30 |
| Share risky pay | 10,547 | 42.4 | 32.0 | 1,640 | 24.2 | 30.9 | 6,604 | 41.2 | 30.2 | 1,200 | 25.0 | 29.0 |
| Turnover rate | 10,495 | 0.05 | 0.22 | 1,656 | 0.03 | 0.18 | 10,780 | 0.09 | 0.29 | 2,038 | 0.07 | 0.26 |
| **C. Regression residuals** | | | | | | | | | | | | |
| Compensation residual, model 1 | 8,792 | 0.02 | 0.65 | 1,288 | -0.12 | 0.77 | 5,307 | 0.02 | 0.56 | 915 | -0.10 | 1.05 |
| Compensation residual, model 2 | 8,792 | 0.04 | 0.87 | 1,288 | -0.28 | 0.94 | 5,307 | 0.04 | 0.69 | 915 | -0.21 | 1.16 |
| **One observation per firm Before and After Director Rules** | | | | | | | | | | | | |
| **D. Director Database Archive data** | | | | | | | | | | | | |
| Board structure (outsiders/total) | 2,827 | 0.79 | 0.10 | 582 | 0.63 | 0.17 | 2,827 | 0.83 | 0.09 | 582 | 0.74 | 0.13 |
| Director-firm interlocks | 2,065 | 9.18 | 13.06 | 389 | 2.98 | 4.48 | 2,065 | 7.05 | 6.74 | 389 | 3.05 | 4.31 |
| Director interlocks | 2,065 | 3.92 | 3.39 | 389 | 1.62 | 2.04 | 2,064 | 3.94 | 3.17 | 389 | 1.90 | 2.35 |
| **E. Hand-collected data** | | | | | | | | | | | | |
| E index | 466 | 2.29 | 1.48 | 582 | 1.58 | 1.50 | | | | | | |

Note: See appendix A.1 for variable definitions.

Table 3: E index by Level of Governance Change

The level of governance change is based on how many of the four board characteristics the firm needs to adopt. Firms with at least three of these characteristics are labeled high (H). Firms with two characteristics are labeled medium (M), and firms with zero or one are low (L)—firms most affected by the Director Rules. Small and large are defined as being below or above the sample median market capitalization, respectively. E index takes a value between 0 and 6 where higher values are associated with a more entrenched government. Further details on the index are in appendix A.2.

| | E index Score | | | | | | | High E index (=0) | High E index (=1) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 0-3 | 4-6 | Total | Average |
| L | 49 | 24 | 12 | 14 | 9 | 7 | 0 | 99 | 16 | 115 | 1.40 |
| M | 137 | 123 | 90 | 71 | 46 | 16 | 3 | 421 | 65 | 486 | 1.64 |
| H | 56 | 106 | 121 | 103 | 68 | 33 | 7 | 386 | 108 | 494 | 2.30 |
| Total | 242 | 253 | 223 | 188 | 123 | 56 | 10 | 906 | 189 | 1,095 | 1.91 |

# 5 Governance Reoptimization

In this section we explore how firms change their governance choices in response to the Director Rules. Given that the rules mandated a floor amount of monitoring from independent directors, firms may have increased (complements) or decreased (substitutes) other forms of monitoring. The rest of this section details our estimates of the consequences of the rule changes on board size, interlocks, leverage, CEO stock ownership, and CEO turnover.

## 5.1 Board Size Outcomes

The Director Rules provide multiple channels of adjustment. Boards can alter their composition (replace insiders with outsiders) and their size (add outsiders leaving insiders in place or firing insiders) to become compliant with the new rules. This adjustment can, in turn, change the effectiveness of board governance. For instance, John and Senbet (1998) remark "[w]hile the board's capacity for monitoring increases as more directors are added,

the benefit may be outweighed by the incremental cost of poorer communication and decision-making associated with larger groups." Yermack (1996) finds that firm valuations are generally declining in board size, suggesting that for normal board sizes (4-10 directors) fewer directors provides better governance.

To test the effect of the Director Rules on board size, we test the makeup of the board just before and just after implementation of the Director Rules (only two points of time), controlling for firm characteristics. The baseline specification is:

$$\begin{aligned} \text{Board size} \;=\; & \alpha + \beta_1 \text{SOX dummy} + \beta_2 \text{treated} + \beta_3 \text{treated*SOX} \\ & + \beta_4 \ln(\text{market cap.}) + \beta_5 \text{asset growth} \\ & + \beta_6 \text{value/assets} + \beta_7 \text{earnings/assets}. \end{aligned} \tag{1}$$

The SOX dummy equals one in the second time period (after implementation). Treated equals one for firms more effected by the Director Rules (M and L) and zero otherwise. Log market capitalization is used to proxy for firm size. The value-to-assets ratio and asset growth proxy for firm investment opportunities and life cycle stage. The value-to-assets ratio, also known as the market-to-book ratio, is similar to Tobin's q. Young companies that are expected to grow and become more profitable in the future are highly valued by the market relative to assets. These companies tend to trade at a higher ratio than older firms. Earnings scaled by assets is used as a profitability measure.

Table 4 shows the regression results. The coefficient of interest is Treated*SOX. Whatever the force of the Director Rules in improving governance, it does not seem to operate by altering the size of the board. Overall board size is essentially unchanged. This is a little surprising given that it would seemingly be easier to just fire inside directors or alternatively just hire outside directors. These results indicate that boards removed on average a half an insider director and hired a half an outside director in response to treatment.

Table 4: Director Count Regressions, OLS

This table shows the regression results using equation (1). The dependent variable is the director count. The constant and firm controls have been suppressed. Firm controls include ln(market capitalization), asset growth, value-to-assets ratio, and earnings-to-assets ratio. Robust standard errors are in parentheses. Treated firms have an M or L level of governance change.

| VARIABLES | (1) Total | (2) Insiders | (3) Outsiders |
|---|---|---|---|
| SOX | -0.207*** | -0.360*** | 0.153** |
| | (0.0671) | (0.0228) | (0.0642) |
| Treated | 0.0373 | 1.151*** | -1.113*** |
| | (0.133) | (0.0689) | (0.130) |
| Treated*SOX | -0.114 | -0.506*** | 0.391** |
| | (0.175) | (0.0826) | (0.171) |
| Observations | 6,818 | 6,818 | 6,818 |
| R-squared | 0.228 | 0.154 | 0.248 |
| Adj. R-squared | 0.228 | 0.154 | 0.247 |

*** p<0.01, ** p<0.05, * p<0.10

## 5.2 Board Interlocks

We next explore the effects of the Director Rules on the use of interlocks. We measure interlocks in two ways: 1) director-firm pairs and 2) the number of directors serving on other boards. For example, if a board has two directors that sit on other boards, the first on two other boards and the second on one other, the interlock variable is coded as three using the director-firm method and coded as a two in the second method.

To test the changes in interlocks and many of the other dependent variables studied in this paper, two samples are constructed: the entire set of valid observations (Full) and a subsample consisting of treated firms and their Mahalanobis distance matched untreated firms (Matched).[18] This second sample attempts to trade off statistical precision for lower bias in the effect estimates. The estimated effects are generally similar across specifications

[18]See appendix A.3 for more information on the matching method.

and the difference between the two is never significant. The first specification is the same as used for director count

$$\begin{aligned} \text{Interlock} \;=\; & \alpha + \beta_1 \text{ SOX dummy} + \beta_2 \text{ treated} + \beta_3 \text{ treated*SOX} \\ & + \beta_4 \ln(\text{market cap.}) + \beta_5 \text{ asset growth} + \beta_6 \text{ value/assets} \\ & + \beta_7 \text{ earnings/assets.} \end{aligned} \tag{2}$$

As discussed in section 4, we collect E index information for firms in the matched sample. The third specification (Matched w/ EI) is identical to the matched sample specification but includes a dummy for high levels ($\geq$4) of the E index ($\text{index}_e$) and the appropriate interactions

$$\begin{aligned} \text{Interlock} \;=\; & \alpha + \beta_1 \text{ SOX dummy} + \beta_2 \text{ treated} + \beta_3 \text{ treated*SOX} \\ & + \beta_4 \text{ index}_e + \beta_5 \text{ index}_e\text{*SOX} \\ & + \beta_6 \text{ index}_e\text{*treated*SOX} + \beta_7 \ln(\text{market cap.}) \\ & + \beta_8 \text{ asset growth} + \beta_9 \text{ value/assets} \\ & + \beta_{10} \text{ earnings/assets.} \end{aligned} \tag{3}$$

Table 5 reports the director interlock regression results. The first three columns use the director-firm interlock definition. The Treated*SOX interaction variable shows an increase of two director-firm interlocks. Given that the last section showed treated firms replaced insider directors with outsiders, these results suggest that the director swapping brought in relatively experienced directors. Columns (4)–(6) use the interlock definition based on the number of directors that serve on other boards. This effect is much smaller and not statistically significant. That is likely because CEOs typically remained on the board after SOX but were forced off other boards. There was a shift in broader practice that sharply curtailed sitting CEOs from serving on other boards.

Columns (3) and (6) use the E index specification (equation (3)) which tests whether the shift towards relatively greater use of interlocking directorships

Table 5: Director Interlock Regressions, OLS

This table shows the results from regression equations (2) and (3). The constant, firm controls, and year dummies have been suppressed. Firm controls include ln(market capitalization), asset growth, value-to-assets ratio, and earnings-to-assets ratio. Treated firms have an M or L level of governance change. Robust standard errors are in parentheses. See appendix A.1 for variable definitions.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | **Director-Firm** | | | **Director** | | |
| | Full | Matched | Matched w/ EI | Full | Matched | Matched w/ EI |
| SOX | -2.145*** | -3.253*** | -2.357*** | 0.0121 | -0.419*** | -0.841*** |
| | (0.324) | (0.298) | (0.688) | (0.102) | (0.0769) | (0.259) |
| Treated | -6.219*** | -2.714*** | -2.142*** | -2.301*** | -0.932*** | -0.827*** |
| | (0.366) | (0.309) | (0.459) | (0.127) | (0.118) | (0.154) |
| Treated*SOX | 2.214*** | 1.922*** | 2.014*** | 0.260 | 0.150 | 0.896*** |
| | (0.452) | (0.426) | (0.653) | (0.188) | (0.165) | (0.287) |
| E index | | | 0.0593 | | | -0.0240 |
| | | | (0.217) | | | (0.0510) |
| E index*SOX | | | 0.188 | | | 0.215** |
| | | | (0.278) | | | (0.1000) |
| E index*Treated*SOX | | | -0.427** | | | -0.314*** |
| | | | (0.209) | | | (0.105) |
| Observations | 4,902 | 4,902 | 1,432 | 4,902 | 4,902 | 1,432 |
| R-squared | 0.045 | 0.324 | 0.273 | 0.061 | 0.461 | 0.333 |
| Adj. R-squared | 0.045 | 0.323 | 0.268 | 0.060 | 0.461 | 0.328 |

*** p<0.01, ** p<0.05, * p<0.10

is moderated by managerial entrenchment. We find it is, but modestly so. Treatment raises the use of interlocking directorships among firms with more and less entrenched management, but more among firms with less-entrenched management.

## 5.3 Leverage

Debt, in addition to serving as a form of external finance for the enterprise, provides channels for external monitoring of the firm. To test the effect of the Director Rules on debt, we use a specification similar to the one used above, but now the dependent variable is leverage. We also use data over several years and include firm fixed effects. The specific regression equation

is

$$\begin{aligned} \text{Leverage} \;=\; & \alpha_i + \beta_1 \text{ SOX dummy} + \beta_2 \text{ treated*SOX} \\ & + \beta_3 \ln(\text{market cap.}) + \beta_4 \text{ asset growth} + \beta_5 \text{ value/assets} \\ & + \beta_6 \text{ earnings/assets} + \text{year dummies}, \end{aligned} \tag{4}$$

where now the SOX dummy takes the value of one for fiscal years ending November 2004 and later.

The E index specification is also similar, but notice that the E index level drops out from the fixed effects regression because we only establish a score before the Director Rules

$$\begin{aligned} \text{Leverage} \;=\; & \alpha_i + \beta_1 \text{ SOX dummy} + \beta_2 \text{ treated*SOX} + \beta_3 \text{ index}_e\text{*SOX} \\ & + \beta_4 \text{ index}_e\text{*treated*SOX} + \beta_5 \ln(\text{market cap.}) \\ & + \beta_6 \text{ asset growth} + \beta_7 \text{ value/assets} \\ & + \beta_8 \text{ earnings/assets} + \text{year dummies}. \end{aligned} \tag{5}$$

Table 6 reports the results of the leverage regressions. In all specifications, the causal effect (the coefficient on the interacted term Treated*SOX) is positive and statistically significant. Firms that were most affected by the Director Rules tended to increase long-term debt after the rules were in full force. Using the results of the matched samples (column (2)), treated firms increased leverage 1 percentage point relative to untreated firms. Because the average treated firm had a leverage of 15 percent just prior to SOX, this suggests treated firms increased leverage 7 percent and that leverage is a complement with independent directors. According to the third specification (equation (5), row (3)), there is weak evidence that firms with entrenched management increased leverage further than firms with less-entrenched management.

These results are surprising given the monitoring characteristics attributed to debt. However, both Bhojraj and Sengupta (2003) and Anderson, Mansi, and Reeb (2004) find that board independence is associated with lower cost

## Table 6: Leverage and CEO Ownership Regressions

This table shows the results from using regression equations (4) and (5) with leverage or CEO ownership as the dependent variable. The constant, firm controls, and year dummies have been suppressed. Firm controls include ln(market capitalization), asset growth, value-to-assets ratio, and earnings-to-assets ratio. Treated firms have an M or L level of governance change. Robust standard errors are in parentheses. See appendix A.1 for variable definitions.

| | | | SOX | | Treated*SOX | | High E index*SOX | | High E index* Treated*SOX | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LHS Variable | Sample | Coef | SE | Coef | SE | Coef | SE | Coef | SE | Obs | R-sqd | Adj. R-sqd |
| (1) | Leverage | Full | -0.00268 | (0.448) | 0.713** | (0.320) | | | | | 28,987 | 0.759 | 0.727 |
| (2) | | Matched | -0.347 | (0.913) | 1.086** | (0.464) | | | | | 8,849 | 0.798 | 0.770 |
| (3) | | Matched w/ EI | -0.586 | (0.947) | 0.953* | (0.533) | 1.078 | (0.787) | 1.880* | (1.105) | 8,849 | 0.798 | 0.770 |
| (4) | CEO Ownership | Full | 0.368 | (0.243) | -1.336*** | (0.250) | | | | | 20,003 | 0.857 | 0.832 |
| (5) | | Matched | 1.041 | (0.648) | -0.730** | (0.345) | | | | | 5,224 | 0.856 | 0.828 |
| (6) | | Matched w/ EI | 0.672 | (0.674) | -0.443 | (0.417) | 1.777*** | (0.383) | -1.026* | (0.586) | 5,224 | 0.856 | 0.828 |

*** p<0.01, ** p<0.05, * p<0.10

of debt financing. Leverage complementarity is consistent with firms increasing debt levels given that the servicing costs decreased. Furthermore, Armstrong, Guay, and Weber (2010) describe the endogenous nature of both debt contracts and corporate governance, and Bharath, Sunder, and Sunder (2008) find improved accounting quality lowers debt costs. Treated firms had both a sudden increase in board independence and the improved reporting requirements mandated by SOX. These changes can help mitigate agency conflicts and information asymmetry which then facilitate debt contracts.

## 5.4 CEO Ownership

If a manager has an ownership stake in the firm, this helps align the incentives of the manager and those of the equity holders. With this incentive alignment, the manager can be given more discretion because external monitoring is arguably less necessary. To test this response, we use the same regression specifications as shown in equation (4) and equation (5) except the dependent variable is now the ownership share of the firm held by the CEO.

The regression results of CEO ownership are reported in rows (4)—(6) of table 6. CEO ownership decreases at the treated firms after the Director Rules are in full force. That is, firms that were forced to adopt more external governance lowered CEO share holdings, allowing managers to divest and diversify their holdings. Given the increase in overall oversight coming from specific mandates, this is consistent with the Director Rules lowering the marginal benefits of incentive alignment. The matched sample (row (2)) has similar results though a quantitative smaller effect on ownership. Interpreting these results, CEO ownership at treated firms decreased 0.7 percentage points relative to untreated firms after the Director Rules. This is a 5 percent decrease in the average ownership share of treated firms.

Based on the entrenchment specification (equation (5), row (6)), treated firms with entrenched management are the drivers in the decrease of CEO owner-

ship. Guthrie, Sokolowsky, and Wan (2012) show that board independence did not constrain CEO pay. Our results suggest that board independence also did not force CEOs to maintain ownership holdings.

## 5.5 Robustness Test: Turnover

Table 7: Turnover Rate, by Level of Governance Change

The turnover rate is equal to the number of firms with a CEO change divided by the total number of firms in a given year. The level of governance change is based on how many of the four board characteristics the firm needs to adopt. Firms with at least three of these characteristics are labeled high (H). Firms with two characteristics are labeled medium (M), and firms with zero or one are low (L)—firms most affected by the Director Rules.

| Percent | L | | M | | H | | Total | |
|---|---|---|---|---|---|---|---|---|
| Year | Obs | Turnover Rate | Obs | Turnover Rate | Obs | Turnover Rate | Obs | Turnover Rate |
| 1999 | 36 | 5.6 | 176 | 2.3 | 1,588 | 4.6 | 1,800 | 4.4 |
| 2000 | 44 | 2.3 | 224 | 3.1 | 1,891 | 5.6 | 2,159 | 5.3 |
| 2001 | 50 | 0.0 | 260 | 3.1 | 2,067 | 4.8 | 2,377 | 4.5 |
| 2002 | 64 | 1.6 | 311 | 4.8 | 2,236 | 5.2 | 2,611 | 5.1 |
| 2003 | 72 | 2.8 | 339 | 3.8 | 2,323 | 5.0 | 2,734 | 4.8 |
| 2004 | 76 | 2.6 | 352 | 6.3 | 2,365 | 6.2 | 2,793 | 6.1 |
| 2005 | 81 | 4.9 | 352 | 7.4 | 2,347 | 9.7 | 2,780 | 9.3 |
| 2006 | 82 | 2.4 | 351 | 8.0 | 2,291 | 9.3 | 2,724 | 9.0 |
| 2007 | 78 | 6.4 | 338 | 8.0 | 2,128 | 9.2 | 2,544 | 8.9 |
| 2008 | 79 | 7.6 | 329 | 7.9 | 2,039 | 10.4 | 2,447 | 10.0 |
| Total | 664 | 3.8 | 3,034 | 5.8 | 21,346 | 7.1 | 25,044 | 6.8 |

One possible mechanism for treated companies to lower CEO ownership is a change in management. New CEOs tend to have lower stock ownership, so an increase in turnover could indirectly or even unintentionally lower stock ownership.[19] Greater board independence could allow a board to free itself and exert power over management, creating a spike in turnover and a reduc-

[19]The correlation in our sample of percent stock owned by the CEO and CEO tenure is 0.4.

tion in CEO stock ownership. Additionally, CEOs could experience board independence as a meddling distraction from their duties and some may decide that the job is not worth the additional aggravation, leading to higher turnover.

The Director Rules were in full force by November 2004. Given the likely lag between a new board and the time for CEO removal, any increase in the turnover rate would likely begin in 2005. Table 7 shows the turnover rate of firms between 1999 and 2008 grouped by the required level of governance change. As expected, the turnover rate does increase in 2005, but it occurs across all groups. While the sample sizes are smaller, generally the turnover rate for the treated firms (L and M) are lower than for the untreated firms (H) both before and after the Director Rules are in full force.

To empirically test the effect of the rules on CEO turnover, we tried multiple specifications of CEO turnover as a function of performance, time fixed effects, firm attributes, and our treatment variables. The following formula captures the four types of specifications reported in the table below

$$\begin{aligned} \mathbf{1}_{turnover} \;=\; & \alpha_{[i]} + \beta_1 \text{ SOX dummy} + \beta_2 \text{ treated} + \beta_3 \text{ treated*SOX} \\ & + \beta_4 \ln(\text{market cap.}) + \beta_5 \text{ asset growth} + \beta_6 \text{ value/assets} \\ & + \beta_7 \text{ earnings/assets} + \beta_8 \text{ lagged earnings/assets} \\ & [+ \beta_9 \text{ lagged board composition} \\ & + \beta_{10} \text{ lagged earnings/assets} * \text{lagged board composition}] \\ & + \text{year dummies}, \end{aligned} \tag{6}$$

where $\mathbf{1}_{turnover}$ equals one when there was a turnover during the year and zero otherwise. The $\alpha_{[i]}$ term indicates that both OLS and fixed effects specifications are used. The other change in specification is shown by the brackets: lagged board composition and lagged board composition interacted with performance.[20] These variables are supposed to capture the general level of turnover explained by the independence of the board and by bad

[20]Board composition equals the share of the board that consists of outsiders.

firm performance.

Table 8 shows the results from the four regression specifications. Consistent with Kaplan and Minton (2012) we find that turnover did indeed spike after the passage of SOX and remain higher. However, the firms treated by the Director Rules did not experience differentially higher turnover. The point estimate on Treated*SOX is actually negative though not statistically significant. This suggests the ownership changes we find were not driven by turnover. Instead, these results are driven by compensation and stock holding practices of CEOs that remained in charge after SOX. Lower ownership was the result of CEOs divesting themselves of restricted stock and liquidating options.

# 6 Management Outcomes

Management and, in particular, CEOs are often criticized in the academic and popular press for self-dealing behavior. In line with Shleifer and Vishny (1989) and Weisbach (1988), we might think more established managers have greater capacity for self dealing, but as previously noted, there is no detectable effect through the turnover channel. To further test the improvement hypothesis we focus on two varieties of suspected self-dealing: excess compensation and incentive-based compensation. Because at least some self-dealing is assumed to exist under the improvement hypothesis, both measures should improve in response to the Director Rules reforms.

## 6.1 Total Compensation

Motivated by Murphy (1999) and Core, Holthausen, and Larcker (1999), we construct a measure of idiosyncratic CEO compensation by using the

## Table 8: Turnover Regressions

This table shows the results from the specifications shown in equation (6). The constant, firm characteristics variables, and year dummies have been suppressed. Firm characteristics variables are ln(market capitalization), asset growth, value-to-assets ratio, earnings-to-assets ratio, and lagged earnings-to-assets ratio. The "with board composition" specification also includes pre-SOX board structure and the interaction between lagged earnings-to-assets ratio and pre-SOX board structure. Robust standard errors are in parentheses. See appendix A.1 for variable definitions.

| | | | SOX | | Treated | | Treated*SOX | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Specification | Model | Coef | SE | Coef | SE | Coef | SE | Obs | R-sqd | Adj. R-sqd |
| (1) | Baseline | OLS | 0.0186* | (0.0111) | -0.00719 | (0.00577) | -0.00915 | (0.00817) | 24,652 | 0.015 | 0.0140 |
| (2) | | FE | 0.0225* | (0.0120) | | | -0.00283 | (0.00872) | 24,652 | 0.158 | 0.0432 |
| (3) | With board | OLS | 0.0190* | (0.0111) | -0.0161*** | (0.00519) | -0.00561 | (0.00810) | 24,652 | 0.014 | 0.0134 |
| (4) | composition | FE | 0.0229* | (0.0120) | | | -0.00463 | (0.00859) | 24,652 | 0.158 | 0.0433 |

*** p<0.01, ** p<0.05, * p<0.10

residuals from the following regression:

$$\begin{aligned} \ln(\text{award value}_t) &= \alpha + \beta_1 \ln(\text{market cap.}_t) + \beta_2 \ln(\text{long-term debt}_t) \\ &\quad + \beta_3 \text{ earnings}_{t-1}/\text{assets}_{t-1} + \text{year dummies} \\ &\quad + \text{industry dummies.} \end{aligned} \tag{7}$$

The resulting residuals serve as our measure of overpayment because performance and firm attributes do not explain this portion of pay. Cheng, Hong, and Scheinkman (2010) show that these residuals are highly persistent at the firm level and, therefore, might correspond to persistent corporate features like the level of corporate governance.

Table 9: Compensation Regression

This table shows the results from the regression equation (7). Year dummies, industry dummies, and the constant have been suppressed. Robust standard errors are parentheses. See appendix A.1 for variable definitions.

| VARIABLES | (1) Ln(Awardvalue) OLS | (2) Ln(Awardvalue) OLS |
|---|---|---|
| Ln(Market cap) | 0.433*** | 0.287*** |
| | (0.00561) | (0.00518) |
| Ln(Long-term debt) | 0.0537*** | 0.0555*** |
| | (0.00382) | (0.00277) |
| Lagged Earnings/Assets | -0.131*** | 0.00506 |
| | (0.0459) | (0.0231) |
| Share risky pay | | 0.0192*** |
| | | (0.000282) |
| Observations | 15,995 | 15,995 |
| R-squared | 0.551 | 0.722 |
| Adj. R-squared | 0.549 | 0.721 |

*** p<0.01, ** p<0.05, * p<0.10

However, Cheng, Hong, and Scheinkman (2010) provide an alternative interpretation on the residual. They argue that it is a proxy for firm risk appetite

and find that this payment residual is strongly correlated with several measures of financial firm risk-taking. We believe that a key channel for firm risk-taking is through CEO pay that rewards taking risks. CEOs are likely risk adverse. Because they are being asked to hold an undiversified wealth portfolio heavily concentrated in their employer, they should demand a substantial discount on compensation sensitive to firm performance. Boards that desire greater firm risk-taking do so by paying CEOs with more incentive-based compensation. These two forces will confound our pay residual measure. Firms making greater than average use of incentive-based compensation will look similar to those firms that overpay.

To address this we extend the compensation model with a proxy for risk in compensation packages: the percentage of award value from stock and option grants (share risky pay)

$$\begin{aligned} \ln(\text{award value}_t) \;=\; & \alpha + \beta_1 \ln(\text{market cap.}_t) + \beta_2 \ln(\text{long-term debt}_t) \\ & + \beta_3 \text{ earnings}_{t-1}/\text{assets}_{t-1} + \beta_4 \text{ risky pay}_{t-1}/\text{total pay}_{t-1} \\ & + \text{year dummies} + \text{industry dummies}. \end{aligned} \tag{8}$$

Table 9 reports the results from both specifications (equations (7) and (8)). Column (2) shows that percent risky pay greatly increases the predictive power of the compensation model and is an economically important determinant of compensation. In the literature, these regression variables tend to explain a large fraction of CEO compensation, and they do in our sample as well, 55–72 percent of total variation.

To test for corporate governance improvement, we see if firms that regularly overpay reduce their overpayment in response to the Director Rules. We use the residuals from equations (7) and (8) as proxies for CEO overpayment. Specifically, firms that have an average positive residual before 2004 are considered overpayers. We use the overpayer subsample of firms to study the consequences on post-SOX compensation. We use similar regression specifications as used for leverage (equations (4) and (5)) except now

the compensation residual is the dependent variable.[21]

Table 10 reports the results of the compensation residual regressions. Using the model 1 residuals (equation (7), row (1)), the coefficient on the interacted term is positive and significant. This result suggests that treated firms that tended to overpay further increased their CEO compensation in response to the law. Using the second model residuals (equation (8), row (2)), the point estimate is positive but not statistically different from zero.[22] These findings contradict the predictions of the improvement hypothesis, but they are consistent with the findings of Guthrie, Sokolowsky, and Wan (2012): independent directors are ineffective in constraining CEO compensation.[23]

## 6.2 Incentive-Based Compensation

Because the percent risky pay is endogenous, we are concerned that percent risky pay itself may be treated by the law. If the reforms caused percent risky pay to go down then the residuals in second pay model would understate the effect of the law on compensation. To test for this, we regress percent risky pay on treatment using the same specifications as in equations (4) and (5).

Rows (3)—(5) in table 10 show that the Director Rules have little effect on percent risky pay and the point estimates tend to be positive. A more independent board does not seem to change risky pay, if anything independence increases it slightly. In summary, CEOs may have been overpaid and induced to take excess risk by their compensation packages, but we find that the Director Rules addressed neither problem.

[21] Because being an overpayer already limits the sample, we do not use the specification with the matched panel and E index.

[22] These standard errors are too small because this is an IV-style estimate and the second stage has not been corrected. Because the second stage is a subsample of the first stage we cannot use standard IV. However, our interest is in rejecting that the estimates are negative here, not proving that they are positive, and so showing that the point estimates are positive suffices.

[23] Chhaochharia and Grinstein (2009) find that firms more affected by the Director Rules decreased CEO compensation. However, Guthrie, Sokolowsky, and Wan (2012) show that this result is purely driven by two outliers.

## Table 10: Compensation Residual and Risky Pay Regressions

This table shows the results from the regression equations (4) and (5) with the compensation residual or percent risky pay as the dependent variable. The constant, firm controls, and year dummies have been suppressed. Firm controls include ln(market capitalization), asset growth, value-to-assets ratio, and earnings-to-assets ratio. Robust standard errors are in parentheses. See appendix A.1 for variable definitions.

| | LHS Variable | Model/ Sample | SOX | | Treated*SOX | | High E index*SOX | | High E index* Treated*SOX | | Obs | R-sqd | Adj. R-sqd |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Coef | SE | Coef | SE | Coef | SE | Coef | SE | | | |
| (1) | Comp. residual | 1 | -0.0657 | (0.0480) | 0.0903** | (0.0421) | | | | | 7,158 | 0.395 | 0.281 |
| (2) | | 2 | -0.0234 | (0.0356) | 0.0399 | (0.0328) | | | | | 7,158 | 0.405 | 0.293 |
| (3) | Risky pay | Full | -1.725 | (1.209) | 1.871* | (1.037) | | | | | 19,991 | 0.505 | 0.420 |
| (4) | | Matched | -0.785 | (2.365) | 0.355 | (1.429) | | | | | 5,205 | 0.507 | 0.410 |
| (5) | | Matched w/ EI | -0.276 | (2.439) | 0.268 | (1.598) | -2.462 | (2.402) | -0.665 | (3.748) | 5,205 | 0.507 | 0.410 |

*** p<0.01, ** p<0.05, * p<0.10

# 7 Valuation and Market Reaction

Bebchuk, Cohen, and Ferrell (2009) find that the E index has a strong relationship with firm value (value to assets). We next explore if the valuation of the firms in the period before the rules changed varied by treatment. Table 11 shows the value-to-assets ratio by entrenchment group and treatment. Firms most heavily treated by the law (L and M) had essentially the same valuations pre-SOX as those weakly treated (H). If anything their valuations are higher but the differences are not significant. Even controlling for existing entrenchment preserves this effect. Measured by either market valuations or a governance measure prominent in the literature, there is no clear problem for the Director Rules to address. However, there may be important confounding and unobserved variation between the treatment and control groups. We therefore next look at changes in valuation (cumulative abnormal returns) for evidence that the governance improvements of the Director Rules resulted in increasing shareholder value.[24]

Several other papers have looked at changes in valuations in response to SOX. See for example Wintoki (2007), Zhang (2007), Li, Pincus, and Rego (2008), and Chhaochharia and Grinstein (2007). Given that our sample has better coverage of smaller firms, this analysis is meant to verify prior results and to potentially find further insights on smaller firms.

If the changes mandated by the Director Rules improve governance, it is likely that shareholders would benefit. To measure this benefit, we analyze cumulative abnormal returns (CAR) associated with the timing of the rule changes. All public companies are affected by SOX and the exchange rules in some manner. As a result, the covariance among their abnormal returns is not zero, making the aggregation of individual stocks problematic. To mitigate this clustering issue, we follow Campbell, Lo, and MacKinlay (1997)

[24]For testing purposes, the E index is transformed into a dummy variable. This high E index variable is set to one for firms with a score of 4 or more and set to zero otherwise. While using the E index produces similar testing results, using a binary variable simplifies the interpretation and exposition of regression results.

Table 11: Value-to-Assets Ratio, by E index and Level of Governance Change

The value-to-assets ratio is the ratio of the market value of the firm to total assets, where the market value of the firm = total assets - book equity + market capitalization. The level of governance change is based on how many of the four board characteristics the firm needs to adopt. Firms with at least three of these characteristics are labeled high (H). Firms with two characteristics are labeled medium (M), and firms with zero or one are low (L)—firms most affected by the Director Rules. Small and large are defined as being below or above the sample median market capitalization, respectively. E index takes a value between 0 and 6 where higher values are associated with a more entrenched government. Further details on the index are in appendix A.2.

| | **L/M** | **H** | **Total** |
|---|---|---|---|
| E index 4+ | 1.690 | 1.507 | 1.584 |
| | (0.279) | (0.110) | (0.133) |
| E index 3- | 1.809 | 1.830 | 1.818 |
| | (0.086) | (0.121) | (0.071) |
| All | 1.793 | 1.758 | 1.777 |
| | (0.083) | (0.098) | (0.063) |

by creating portfolios that group firms based on the extent of treatment. Our calculations for abnormal market return follow the general methods in the finance literature (Fama and French (1993); Carhart (1997); and Campbell, Lo, and MacKinlay (1997)). Assuming that expected returns can be modeled using the Fama-French three-factor model (size (SML), growth (HML), and market (MKT)) with a momentum factor (UMD), the following model can be written:

$$\begin{aligned} R_{P,t} - R_{f,t} &= \alpha_P + \beta_{1,P}\, MKT_t + \beta_{2,P}\, SMB_t \\ &\quad + \beta_{3,P}\, HML_t + \beta_{4,P}\, UMD_t + \varepsilon_{P,t}, \end{aligned} \tag{9}$$

where $R_{P,t}$ is the return of portfolio $P$ in period $t$ and $R_{f,t}$ is the risk-free rate.[25] Daily returns are used.

The treatment portfolios are constructed using CRSP data. The sample starts with firms trading on either NASDAQ or the NYSE and actively traded

[25]Note that $MKT$ is the return of the market net of the risk-free rate.

for all of 2001 and 2002. These firms are then merged with the Compustat-DDA-E index database. Various portfolios are constructed based on the extent of treatment and firm characteristics. Both value- and equal-weighted portfolios are tested.[26] For the interval on which to measure abnormal returns, either specific key dates can be used or an event window. We try both methods with the same general results.[27]

The top panel of table 12 reports the results using a long event window of November 2001 to October 2002 as done by Chhaochharia and Grinstein (2007). Contrary to Chhaochharia and Grinstein (2007), our sample of firms show a negative CAR ($\alpha_P$) for the value-weighted L portfolio—the firms most treated by the Director Rules. Using the equal-weighted portfolio, the CAR is even lower and statistically different from zero. Overall, the CARs generally become more positive moving from the most-treated to the least-treated firms.

The top panel also compares the CAR of the entrenched firms (E index 4+) with that of less entrenched firms (E index 3-). Here, a difference in the response across firm type is not as clear. The value-weighted entrenchment portfolios do not have a CAR that is statistically different from zero. The entrenched portfolio has a lower CAR but the difference between the CARs is not significant. The equal-weighted portfolios both have negative and not significant CARs with the entrenched portfolio having the higher (less negative) CAR. No detectable difference between the two groups (entrenched versus less entrenched) is consistent with the summary statistics on the value-to-assets ratio (table 11).

These results suggest that Director Rules did not provide a net benefit for

[26]Value-weighted returns are winsorized at 1 percent to reduce the effect of outliers.

[27]Specifically, for SOX-related research, Li, Pincus, and Rego (2008); Zhang (2007); Wintoki (2007); and Li, Pincus, and Rego (2008) use specific dates that are generally consistent with each other while Chhaochharia and Grinstein (2007) uses a one-year window. To model specific dates, dummy variables are included in equation (9). The CAR is then calculated based on the coefficient(s) of the dummy variable(s). With one long event window, the constant term $\alpha_P$ is multiplied by the 252 trading days in the window to calculate the annualized CAR estimate.

Table 12: Average Daily Abnormal Returns, by Portfolio Type

The top panel shows the results of the using equation (9) for the portfolios L, M, and H then for the portfolios E index $\geq 4$ and $\leq 3$. Value-weighted portfolios are used for the results on the left side, equal-weighted portfolios for the right side. The bottom panel provides a further dimension of portfolio division by firm size (large vs. small). The level of governance change is based on how many of the four board characteristics the firm needs to adopt. Firms with at least three of these characteristics are labeled high (H). Firms with two characteristics are labeled medium (M), and firms with zero or one are low (L)—firms most affected by the Director Rules. Small and large are defined as being below or above the sample median market capitalization, respectively. E index takes a value between 0 and 6 where higher values are associated with a more entrenched government. Further details on the index are in appendix A.2.

| | Value-weighted | | | | Equal-weighted | | | |
|---|---|---|---|---|---|---|---|---|
| Level of Gov. Change | $\alpha_P$ | SE | T-stat | Annual Effect | $\alpha_P$ | SE | T-stat | Annual Effect |
| L | -0.0007 | 0.0006 | 1.032 | -0.17 | -0.0019*** | 0.0005 | 4.104 | -0.49 |
| M | 0.0002 | 0.0005 | 0.298 | 0.04 | -0.0014*** | 0.0002 | 7.182 | -0.35 |
| H | 0.0002*** | 0.0001 | 2.966 | 0.05 | -0.0002* | 0.0001 | 1.769 | -0.05 |
| E index 4+ | -0.0003 | 0.0005 | 0.5233 | -0.07 | -0.0011 | 0.0002 | 4.7010 | -0.28 |
| E index 3- | 0.0003 | 0.0004 | 0.7606 | 0.07 | -0.0014 | 0.0002 | 8.1434 | -0.35 |
| Firm Size | Level of Gov. Change/E index | | Different? | | $\alpha_P$ | SE | T-stat | Annual Effect |
| Large | L/M | | No | | 0.0008 | 0.0011 | 0.7009 | 0.19 |
| | H | | | | -0.0004* | 0.0002 | 1.7830 | -0.10 |
| Small | L/M | | Yes | | -0.00669*** | 0.0010 | 6.8323 | -1.69 |
| | H | | | | -0.0011*** | 0.0003 | 3.6474 | -0.27 |
| Large | E index 4+ | | Yes | | 0.0095*** | 0.0025 | 3.8565 | 2.39 |
| | E index 3- | | | | -0.0003 | 0.0003 | 0.9456 | -0.06 |
| Small | E index 4+ | | Yes | | -0.0243*** | 0.0036 | 6.8236 | -6.12 |
| | E index 3- | | | | -0.0131*** | 0.0019 | 6.7645 | -3.30 |

the shareholders of the treated firms in this study. To the extent that earnings increased from improved monitoring, governance reoptimization offset it. Our results differ from Chhaochharia and Grinstein (2007), likely because our sample of firms has many more smaller firms. Smaller firms tend to be both younger and produce less free cash flow. For these reasons it is plausible that their governance needs also differ. In particular, the benefits of having expert insiders provide advice on the board may be particularly valuable to these firms.

To explore the role of firm size in our results, the portfolios are further divided into large (above median total assets as of the last period before the Director Rules were in full force) and small (below median). The bottom panel of table 12 reports the results. Given that size might be driving the CAR results, only equal-weighted portfolios are considered.[28] Consistent with the firm lifecycle story, the large, most-treated firms do have a more positive CAR than the large less-treated firms. For the small portfolios, the relationship is reversed and the differences between the small firm portfolios are statistically significant (-0.007 versus -0.001). This same pattern holds using the entrenchment index dummy. Large, entrenched firms have a more positive CAR than large, less-entrenched firms, while small firms have the relationship reversed. Additionally, notice that for both large and small firms the CAR coefficient for the more-treated or more-entrenched portfolio has a statistically different mean value than the coefficient for the less-treated or less-entrenched portfolio.[29]

An important alternative to rule out is that the benefits of improved governance were lost among higher compliance costs. It is well documented that SOX substantially raised compliance costs of listed firms.[30] Ceteris paribus, in the presence of higher costs, profits will be lower and with a smaller surplus perhaps less monitoring is required. In part, our difference-in-difference identification strategy ameliorates this problem. Much of the SOX costs are associated with increased signoff and compliance costs, costs that affected all listed firms (Coates, 2007). To attribute governance changes to higher costs,

[28]To simplify the comparisons, the L and M treated firms are grouped together.

[29]The results using the Wintoki (2007) dates to estimate portfolio CARs are similar and not shown.

[30]Current research suggests that the net benefits of the financial reporting aspects of SOX exceeded their costs for a subset of firms depending on firm characteristics (Wintoki, 2007; Li, Pincus, and Rego, 2008). Small firms especially have seen costs exceed benefits (Wolkoff, 2005; Kamar, Karaca-Mandic, and Talley, 2006; Engel, Hayes, and Wang, 2007). Since the firms treated by the governance rules are on average only 35% of the size of the untreated firms (by assets, 50% by market capitalization), we expect them to have negative net benefits from the financial controls section of SOX (Section 404). In scale, SOX internal control and financial certification costs have been estimated as one million dollars per billion dollars of revenues (Coates, 2007). There is reason to believe that the pecuniary costs of compliance with the independence rules and audit committee rules are much lower.

the difference-in-difference setting would require significant costs from just the director mandates which only affected some firms. While director costs were real, they are estimated to be much smaller and are unlikely to drive the larger adjustments we uncover. A Conference Board survey of outside directors contemporaneous to the implementation of the SOX governance rules (Bates, 2004) suggests that the cost of an independent director was on the order of $50,000–$70,000. This is relatively inexpensive for most treated firms. Further, if inside directors are also compensated for their board activities and the risk they take in serving, then the pecuniary costs may be approximately zero.

# 8 Concluding Remarks

Much of the corporate governance literature to date has been plagued by endogeneity problems. This paper adds to the literature by using a law change as a natural experiment to test how firms adjust the choice and magnitude of governance tools given a floor level of monitoring from independent directors. On average, treated firms do not increase the size of their board, instead inside directors are replaced with outside directors. More specifically, treated firms tended to hire outside directors who also serve on boards of other companies, increasing interlocking directorships. Additionally, measuring firm responses to the Director Rules provides evidence that independent directors are substitutes for CEO ownership and complement firm leverage.

We also look for direct evidence that firm agency problems are ameliorated by these reforms. CEOs are not overpaid less, not given less risky compensation, and not more likely to be dismissed in response to these reforms. This probably explains why the treated firms studied do not outperform their untreated peers in terms of market valuation. In fact, both small and treated firms underperform. These firms are likely younger and faster growing plausibly having greater need for the skills and knowledge of insider directors.

It total, these results are likely disappointing for advocates of director reform. These substitution effects among governance strategies and sub-optimal homogenization of firm specific governance choices are notable unintended consequences of the reforms. A major policy implication of this work is that regulators must take into account countervailing corporate action when trying to improve specific areas of governance. Failing to do so is likely to raise costs (pecuniary and otherwise) without improving governance. Instead, we advocate a holistic approach where governance is assessed based on the portfolio of governance strategies employed and taking into account the life cycle of the firm.

We suggest a system modeled on the Leadership in Energy and Environmental Design (LEED) certification for buildings. Under the LEED system firms are rated from worst to best as Uncertified, Certified, Silver, Gold, and Platinum based on a hundred point system with points awarded for various building technological and design features. Designers can choose an optimal bundle of features to cost effectively achieve a desired level of certification which is then assessed independently. Under a similar system in governance, firms might choose among varying financial, incentive, monitoring, and other governance strategies with points awarded for each to achieve a baseline level of governance. Regulators would raise overall governance by raising the minimum required score for listed firms rather than specifying methods per se, ensuring cost minimizing improvements in corporate governance.

# A Data Collection and Construction

## A.1 Variable Definitions

Table 13: Variable Definitions

| | **Description / Definition** |
|---|---|
| Variables from Compustat | |
| Asset growth | Growth rate of Total Assets (#6) between year t and year t-1. |
| Book equity | Stockholder's Equity (#216) [or Common Equity (#60) + Preferred Stock Par Value (#130)] - Preferred Stock |
| Earnings | Earnings Before Extraordinary Items (#18) |
| Leverage | Long Term Debt (#9) divided by Total Assets (#6) * 100 |
| Long term debt | Debt that matures in over one year (#9). |
| Market capitalization | Stock Price (#199) * Shares Outstanding (#25) |
| Preferred stock | Preferred Stock Liquidating Value (#10) [or Preferred Stock Redemption Value (#56), or Preferred Stock Par Value (#130)] |
| Value-to-assets | Market value of the firm to total assets. Market value of the firm = Total Assets - Book Equity + Market Capitalization |
| Variables from Director's Database Archive | |
| Board structure | Number of outside directors/Total number of directors |
| Variables from Equilar | |
| Award value | Base Salary + Bonus + Other Annual Comp + Restricted Stock Awards + Options (derived) |
| CEO ownership | Shares Owned Percent*100 (units are percentage points) |
| Options | Black Scholes Grant Date Options PV [or Binomial Grant Date Options PV, or FAS123R Grant Date Options PV] |
| Percent risky pay | Risky pay/Award value*100 |
| Risky pay | Restricted Stock Awards + Performance Stock + Options (derived) |
| Turnover rate | Number of firms with a CEO change/total number of firms*100 |
| Variables constructed from SEC data | |
| Entrenchment index (E index) | summation of 6 binary variables, where each variable tests for a different policy/characteristics: staggered boards, poison pills, golden parachutes, supermajority requirements for mergers, and shareholder limits to either charter amendments or bylaw amendments |

Compustat data items are identified by the annual data code number in parentheses.

## A.2 Entrenchment Index

We use the E index as a way to proxy for the level of firm governance before the SOX was passed. To focus attention on the firms of interest, we limit E index analysis to treated firms and firms matched to treated firms.[31] This means about 1,300 firms need E index scores. Bebchuk, Cohen, and Ferrell (2009) publishes E index figures based on IRRC for even years for the companies in their sample. Because we are interested in the E index as of the first half of 2002, we only use the Bebchuk et al. data if the value does not change between 2000 and 2002. Furthermore, because the IRRC data is primarily collected for large firms, only about one-fifth of the firms in our sample are covered by this database.

The hand-collected data are based on the proxy (Def 14A) and annual report (10K) filed closest to but before June 2002. The proxy contains information on whether the board is elected each year or staggered and generally contains information on the CEO's compensation and whether it includes a golden parachute. The 10K can contain direct information on anti-takeover provisions such as supermajority requirements for voting and the existence of poison pills. If not directly available, the 10K also lists the exhibits where the remaining E index provisions can be found. The main exhibits needed are the bylaws and the charter (articles of incorporation). Shareholder rights agreements (legal name for poison pill) are also listed if applicable. These two (or three) documents are then pulled separately.

For each of the six provisions, a zero or one is entered where a one indicates the existence of the provision. For instance, having a staggered board would lead to a one versus having the entire board elected each year would lead to a zero. The E index score is the summation of all six provisions, meaning a high score indicates a higher level of management entrenchment.

Generally, all SEC filings were obtained using the online Edgar system (`www.`

[31] We use three alternative methods of propensity score matches which are discussed further in section A.3.

sec.gov/edgar/searchedgar/companysearch.html). However, many of the bylaws and charters were filed more than 20 years ago, before existence of the online system. Thomson One was used to obtain earlier documents. However, a charter could not be located for 13 percent of firms, and bylaws could not be located for 12 percent of firms. In these cases, a zero was entered if no other evidence of the provision could be found in the proxy or annual report.

To ensure consistency with IRRC definitions, we randomly compared 102 Bebchuk E index scores to scores based on hand collection. The average difference between the two methods is -0.14 with an exact match 55 percent of the time. As indicated by the average difference, the hand-collected score is biased upward.

## A.3 Matched Sample Construction

In addition to our basic regressions on the full sample of firms with complete data (3,400 firms) we also construct a more limited sample of treated firms and those that are most like the firm treated under the CG definitions (L or M, a total of 1,095 firms). This serves two purposes. First, we believe the common trend assumption of the difference-in-difference setting, while quite reasonable in the full sample, is stronger in a matched sample. Second, we wanted to study the effects of entrenchment on our basic results, but gathering E index data takes about 15 minutes per observation. As such, we wanted to focus attention on those firms most like the treated sample. We use a minimized Mahalanobis distance measure as our matching criteria.[32] Generally speaking, this technique finds the untreated firm that is closest to each treated firm in the space of observed characteristics.

To implement the matching, we use the Stata program mahascore.ado developed by David Kantor. Firm observables used for distance are the same ones used in the regression tests: log market capitalization, value-to-assets, asset growth, and earnings-to-assets. These variables are taken as of the

[32]We are grateful to Julian R. Betts for this idea.

last reporting period prior to the law change. We look for a match within the treated firm's industry. The industries are defined as the Fama French 17. We also try two alternative methods. The first alternative method uses dummy variables for the 17 industries and includes the dummy variables in the distance calculation. The second alternative method looks across all firms without industry information to find the closest match. These other methods give the same general results.

Additionally, we performed a propensity score technique for constructing a matched sample. Inspection of the propensity histograms of the treated and control populations showed substantial overlap and balance. The results (not shown) are essentially unchanged by using this approach but we had two concerns with this approach. First, our observables proved quite poor at predicting propensity. Pseudo r-squares were below 10-percent even with the addition of additional Compustat variables like log sales and sales growth. Without a good model for propensity the matches were not of high confidence and thus potentially not better than the full sample. Second, this was before we had collected entrenchment data, and we were concerned that entrenchment was potentially correlated with both observables and an important omitted predictor of treatment. Since we planned on gathering entrenchment data of the matched firms we were worried this would introduce undesirable selection effects. The Mahalanobis approach, by not using the treatment information, potentially avoids this problem.

Having gathered the entrenchment data we learned this is not a concern. Entrenchment is not a statistically significant or economically important predictor of treatment. Including entrenchment, as a control variable, in our regressions leads to small changes in parameter estimates. As such, the propensity score, Mahalanobis distance, and full sample estimates are all quite similar.

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