Corporate Governance Responses to Director Rule Changes

Benjamin S. Kay
Department of Treasury, Office of Financial Research

Cindy M. Vojtech
Federal Reserve Board

U.S. stock exchanges and the Sarbanes–Oxley Act mandated minimum standards of director independence to mitigate agency problems. The consequences are studied using a new dataset with a much larger range of firm size. Firms most treated by the director rules decrease CEO stock ownership (6 percent) and decrease the share of stock compensation (30–60 percent). The average treated firm also added two interlocking directorships. Additionally, the rules failed to reduce CEO misbehavior like excess compensation or low turnover. Because treated firms do not outperform the market, these results are more consistent with governance reoptimization than governance improvement.

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. Some principal governance strategies used include: 1) CEO incentive pay, 2) equity ownership structure, and 3) independent (outside, non-employee) directors on the board. This paper examines how firms change such agency problem mitigants 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. In particular, we analyze CEO ownership, the composition of CEO compensation, and various measures of CEO self-dealing behavior.

Previous studies explore the relationship between governance mechanisms or the relationships between governance and firm performance (Hermalin & Weisbach, 1991; Bathala & Rao, 1995; Agrawal & Knoeber, 1996; Shleifer & Vishny, 1997; Klein, 1998; Core, Holthausen, & Larcker, 1999; Gompers, Ishii, & Metrick, 2003; Brown & Caylor, 2006; Boone, Field, Karpoff, & Raheja, 2007; Bebchuk, Cohen, & Ferrell, 2009). 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 their governance choices and obscure the true trade-offs that each firm faces. Industry, manager, financing options, and firm complexity may all influence the pricing and selection of monitoring tools. In fact, this endogeneity concern is often mentioned by these 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 and generally find changes in performance depend on firm characteristics such as size, complexity, and growth opportunities (Akhigbe & Martin, 2006; Ahmed, McAnally, Rasmussen, & Weaver, 2010; Wintoki, 2007; Chhaochharia & Grinstein, 2007; Li, Pincus, & Rego, 2008; Duchin, Matsusaka, & Ozbas, 2010). This paper examines the effects of the rules on mechanisms used to mitigate agency problems 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" (Glassman, 2002) (hereafter, the improvement hypothesis). 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 members 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 & 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, & Yang, 2008; Duchin et al., 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 a more extensive dataset than generally used 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 on samples 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, by two interlocking directorships. 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, CEO ownership decreased 0.8 percentage points at treated firms relative to untreated firms which is equivalent to a 6 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 managerial divestment of shares.

Finally, we find the share of CEO compensation that are equity shares decreased 1–2 percentage points at treated firms, which is about one-third to one-half of the average share. Overall, these results suggest that CEO incentive pay moved away from long-term incentives based on ownership. This is consistent with those of Chang, Choy, and Wan (2012). They find an overall decrease in CEO ownership and pay-performance sensitivity after SOX. However, they do not include measures of the extent to which individual firms were treated by SOX, and the sample is limited to the S&P 1500. They interpret the reduction in CEO ownership as a reaction to the more stringent regulatory environment. Our results suggest that this adaptation is more specifically tied to the Director Rules.

CEOs have been singled out in the academic and popular press for self-dealing behavior. For tests of 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. The first result is consistent with Guthrie, Sokolowsky, and Wan (2012) who find that independent directors do not constrain CEO compensation.

To complete the analysis, we test the performance of firms by treatment group.[1] Firms most heavily affected by these regulatory changes (using the methods of Wintoki (2007); Li et al. (2008); and Chhaochharia and Grinstein (2007)) also do not outperform their peers. 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 the reoptimization hypothesis.

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 corporate fraud. Those announcements arguably helped propel the law through Congress relatively quickly (Oppel, 2002; Oppel & Altman, 2002; Li et al., 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.

The Sarbanes--Oxley Act (SOX)

As other papers have discussed at length (Coates, 2007; Romano, 2005), SOX increased reporting requirements. The stated motivation behind SOX was to improve the quality of information disclosed to investors.[2] 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" (15 U.S.C. 78f(m)(3)(B)). 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 (U.S. Securities and Exchange Commission, 2003).

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 mandated and to be staffed 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).

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. We assume that investors and managers negotiate a package of compensation, monitoring, and financing tools whereby each party maximizes their utility. While 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, and the costs of contracting and monitoring differ by firm characteristics like industry and firm life-cycle stage and by managerial attributes. Both investors and managers have the proper incentives to minimize the costs (pecuniary and otherwise) because they can split any surplus created from selecting more efficient forms of supervision. In this setting, 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 categories of agency problem mitigants. 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.[3] Fama (1980) and Fama and Jensen (1983) argue that directors provide monitoring services based on reputation and specialization. More recent work has questioned the effectiveness of directors in monitoring, especially given CEO power (Shivdasani & Yermack, 1999; Baldenius, Melumad, & Meng, 2014) or board composition (insiders and outsiders) and size (Yermack, 1996; Boone et al., 2007; Harris & Raviv, 2008; Linck et al., 2008).

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.[4] Interlocking directorships developed an early association with poor governance dating back at least as far as Brandeis (1914). Hallock (1997) finds that CEOs of interlocked firms have higher compensation. Krantz (2004) describes interlocks as a "web of cronyism." Core et al. (1999) also find interlocks are associated with higher CEO compensation and additionally with lower firm performance. Core et al. (1999) and Shivdasani and Yermack (1999) argue that multiple directorships lower the effectiveness of director monitoring. In light of these papers, the improvement hypothesis predicts that interlocks should decline in response to the law.

However, in addition to monitoring, directors also provide advisory services (Mace, 1971). These types of skills may be more associated with 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. The archetypal interlocking director is a retired CEO, and perhaps this sort of director can provide exactly the expertise lost when replacing insiders on the board.[5] Overall, the mix of director services is endogenous to CEO power and firm characteristics (Baldenius et al., 2014). As a result, firm behavior in response to the Director Rules can provide insight into the relationships between these characteristics.

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.[6] 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.

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.[7]

Director information comes from the Directors Database Archive (DDA), a product of Corporate Board Member Magazine, since acquired and offered for purchase by the New York Stock Exchange. 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.[8] This leaves 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 as of January 2, 2002.

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

	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

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.

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 et al. (2009). The E index is constructed using 6 of the 24 provisions followed by the Investor Responsibility Research Center (IRRC, acquired by RiskMetrics who is now owned by MSCI): staggered boards, poison pills, golden parachutes, supermajority requirements for mergers, and shareholder limits to either charter amendments or bylaw amendments. 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. Appendix A describes in detail how the E index data are constructed and the firm matching methodology. 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 the Director Rules to improve their governance) on average already had relatively more shareholder power.

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
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	5.8	10.5	1,654	12.7	15.8	6,598	4.8	9.0	1,204	10.8	15.0
Turnover rate	10,495	5.0	21.9	1,656	3.4	18.1	10,780	9.1	28.7	2,038	7.1	25.7
Share stock	10,547	6.1	14.4	1,640	3.3	12.7	6,604	9.2	17.9	1,200	5.0	14.5
Ln(Award value)	10,547	14.4	1.3	1,640	13.6	1.2	6,604	14.4	1.2	1,200	13.7	1.3
Share risky pay	10,547	41.4	32.1	1,640	23.7	30.8	6,604	35.2	29.9	1,200	20.6	27.4
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 in Before and After Director Rules												
D. Director Database Archive												
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 for variable definitions.

TABLE 3
E INDEX BY LEVEL OF GOVERNANCE CHANGE

	E Index Score							High E Index (=0) 0-3	High E Index (=1) 4-6	Total	Average
	0	1	2	3	4	5	6				
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

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 more entrenched governance. Further details on the index are in appendix A.

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, CEO stock ownership, and CEO turnover.

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:

$$Board\ size = \alpha_i + \beta_1 SOX\ dummy + \beta_2 treated \times SOX + \beta_3 \ln(market\ cap.) + \beta_4 asset\ growth + \beta_5 \frac{value}{assets} + \beta_6 \frac{earnings}{assets}. \quad (1)$$

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 respectively. 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
DIRECTOR COUNT REGRESSIONS, FE

VARIABLES	(1) Total	(2) Insiders	(3) Outsiders
SOX	0.0255	-0.360***	0.386***
	(0.0373)	(0.0191)	(0.0368)
Treated*SOX	-0.0647	-0.509***	0.444***
	(0.0811)	(0.0555)	(0.0795)
Observations	6,818	6,818	6,818
R-squared	0.907	0.791	0.907
Adj. R-squared	0.813	0.581	0.813

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

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.

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.

Board Interlocks

We next explore the effects of the Director Rules on the use of interlocks, directors that serve on boards at other firms. We measure interlocks in two ways: 1) director-firm pairs and 2) the number of interlocking directors (number). 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 number 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, the construction of which is detailed in the Matched Sample Construction appendix). This second sample attempts to trade off statistical precision for lower bias in the effect estimates. The estimated effects are generally similar across specifications and the difference between the two is never significant. The testing specification is the same as used for director count:

$$Interlock = \alpha_i + \beta_1 SOX\ dummy + \beta_2 treated \times SOX + \beta_3 \ln(market\ cap.) + \beta_4 asset\ growth + \beta_5 \frac{value}{assets} + \beta_6 \frac{earnings}{assets}. \quad (2)$$

As discussed in Data section, we collect E index information pre-SOX for firms in the matched sample. This allows us to explore how firms with entrenched governance and treated by the Director Rules selected directors. The third specification (Matched w/ EI) is identical to the matched sample specification but includes a dummy for high levels of the E index (index $_e$) and the appropriate interactions:

$$Interlock = \alpha_i + \beta_1 SOX\ dummy + \beta_2 treated \times SOX + \beta_3 index_e \times SOX + \beta_4 index_e \times treated \times SOX + \beta_5 \ln(market\ cap.) + \beta_6 asset\ growth + \beta_7 \frac{value}{assets} + \beta_8 \frac{earnings}{assets}. \quad (3)$$

Table 5 reports the director interlock regression results. Columns (1)--(3) use the director-firm interlock definition. The Treated*SOX interaction variable shows an increase of two director-firm interlocks for treated firms post-law. Given that the last section showed treated firms replaced inside directors with outsiders, these results suggest that the director swapping brought in directors with wider board experience. Because inside directors cannot realistically provide monitoring services, they should be primarily providing advisory services. This result is consistent with experienced directors being close substitutes for inside directors, being valued for their advisory services. Columns (4)--(6) use the interlock definition based on the number of directors that serve on other boards. This effect is smaller and statistically significant only in one specification. That is likely because CEOs typically remained on the board after SOX but were forced off other boards. There was a general shift in corporate practice that sharply curtailed sitting CEOs from serving on other boards. A firm that hires an experienced outside director but has the CEO forced off other boards would experience no change in this measure.

Columns (3) and (6) use the E index specification (equation (3)) to test how entrenched governance affects the selection of interlocking directorships. We find it does. On average, firms with entrenched governance hired directors with fewer positions on other boards. Given that firms with entrenched governance are associated with agency problems, outside directors with more monitoring skills rather than advisory skills could create substantial value. In addition, directors serving on several boards are less likely to serve on committees (Jiraporn, Singh, and Lee (2009)). Less uptake of interlocking directorships by firms with entrenched governance is consistent with those firms increasing outside directors with more monitoring skills relative to advisory skills.

TABLE 5
DIRECTOR INTERLOCK REGRESSIONS, FE

	(1)	(2)	(3)	(4)	(5)	(6)
	Director-Firm			Director		
VARIABLES	Full	Matched	Matched w/ EI	Full	Matched	Matched w/ EI
SOX	-2.145***	-2.606***	-1.031	0.0121	-0.0250	-0.223
	(0.205)	(0.272)	(0.885)	(0.0388)	(0.0464)	(0.154)
CG Treated*SOX	2.214***	2.085***	0.715	0.260***	0.251***	0.436**
	(0.266)	(0.257)	(0.938)	(0.0877)	(0.0876)	(0.191)
E-Index*SOX			-0.144			0.0992*
			(0.412)			(0.0583)
E-Index*CG Treated*SOX			0.224			-0.0898
			(0.433)			(0.0770)
Observations	4,902	4,902	1,432	4,902	4,902	1,432
R-squared	0.810	0.811	0.826	0.928	0.929	0.906
Adj. R-squared	0.619	0.621	0.649	0.857	0.857	0.809

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

This table shows the results from regression equations (2) and (3). 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. Treated firms have an M or L level of governance change. Robust standard errors are in parentheses. See appendix A for variable definitions.

CEO Ownership

Managerial stock ownership helps align the incentives of the manager and those of the equity holders. With this incentive alignment in place, equity holders can grant more discretion to the manager because external monitoring is less necessary. To test CEO ownership, we use a specification similar to the one used above, but now the dependent variable is the share of the firm held by the CEO. We also use data over several years so include time dummies.[9] The specific regression equation is:

$$CEO\ ownership = \alpha_i + \beta_1 SOX\ dummy + \beta_2 treated \times SOX + \beta_3 \ln(market\ cap.) + \beta_4 asset\ growth + \beta_5 \frac{value}{assets} + \beta_6 \frac{earnings}{assets} + year\ dummies, \quad (4)$$

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:

$$CEO\ ownership = \alpha_i + \beta_1 SOX\ dummy + \beta_2 treated \times SOX + \beta_3 index_e \times SOX + \beta_4 index_e \times treated \times SOX + \beta_5 \ln(market\ cap.) + \beta_6 asset\ growth + \beta_7 \frac{value}{assets} + \beta_8 \frac{earnings}{assets} + year\ dummies. \quad (5)$$

The regression results of CEO ownership are reported in columns (1)–(3) of table 6. They show that 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 (column (2)) has similar results though a quantitative smaller effect on ownership. Interpreting this result, CEO ownership at treated firms decreased 0.8 percentage points relative to untreated firms after the Director Rules. This is a 6.4 percent decrease in the average ownership share of treated firms.

Based on the entrenchment specification (equation (5), column (3)), treated firms with entrenched management are the drivers in the decrease of CEO ownership. These results are consistent with Chang et al.(2012) who find an overall decrease in CEO ownership and pay-performance sensitivity after SOX. They interpret the reduction in CEO ownership as a reaction to the more stringent regulatory environment. Our results suggest that this adaptation is strongly tied to specific aspects of the regulation, namely independent directors.

The primary mechanism for reduced stock ownership appears to be through reduced stock awards. Stock ownership occurs in large part through time-vesting stock awards but upon vesting it is common for CEOs to divest themselves of much of this formerly restricted stock (Ofek and Yermack (2000)). When new stock awards shrink, the vesting and sales of existing awards continue, leading to a reduction in overall stock ownership. Columns (4)–(6) of table 6 show that treated firms experienced relatively lower fractions of their compensation in stock awards with measured effects of 1-2 percent of compensation. Since average stock awards were 3.3 percent of total CEO compensation for Director Rules treated firms, this is a large decline of 33-58 percent.

Another possible mechanism for treated companies to lower CEO ownership is a change in management. New CEOs tend to have relatively lower stock ownership (Pearson's correlation of 0.4 in our sample), so an increase in turnover could indirectly or even unintentionally lower stock ownership. Greater board independence could allow a board to free itself and exert power over management, creating a spike in turnover and a reduction 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 through retirement.

TABLE 6
CEO-RELATED REGRESSIONS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	CEO Ownership			Share Stock			Turnover: Baseline		Turnover: With board	
VARIABLES	Full	Matched	Matched w/ EI	Full	Matched	Matched w/ EI	OLS	FE	OLS	FE
SOX	0.364	1.148*	0.798	4.359***	4.053***	3.547***	0.0186*	0.0225*	0.0190*	0.0229*
	(0.243)	(0.647)	(0.673)	(0.597)	(1.110)	(1.118)	(0.0111)	(0.0120)	(0.0111)	(0.0120)
Treated							-0.00719		-0.0161***	
							(0.00577)		(0.00519)	
Treated*SOX	-1.361***	-0.816**	-0.560	-1.076**	-1.903***	-1.431*	-0.00915	-0.00283	-0.00561	-0.00463
	(0.251)	(0.345)	(0.416)	(0.516)	(0.736)	(0.770)	(0.00817)	(0.00872)	(0.00810)	(0.00859)
High E Index* SOX			1.685***			2.425				
			(0.381)			(1.616)				
High E Index* Treated*SOX			-0.864			-1.932				
			(0.585)			(2.173)				
Obs	20,000	5,223	5,223	19,991	5,205	5,205	24,652	24,652	24,652	24,652
R-sqd	0.855	0.856	0.856	0.436	0.448	0.449	0.015	0.158	0.014	0.158
Adj. R-sqd	0.83	0.828	0.828	0.339	0.34	0.34	0.014	0.0432	0.0134	0.0433

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

This table shows the results from using regression equations (4), (5), and (6). The constant, firm controls, and year dummies have been suppressed. Firm controls include ln(market capitalization), asset growth, value-to-assets ratio, earnings-to-assets ratio, and lagged earnings-to-assets ratio (for turnover only). 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. Treated firms have an M or L level of governance change. Robust standard errors are in parentheses. See appendix A for variable definitions.

TABLE 7
TURNOVER RATE, BY LEVEL OF GOVERNANCE CHANGE

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

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.

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:

$$\begin{aligned}\mathbf{1}_{turnover} = {} & \alpha_{[i]} + \beta_1 SOX\ dummy + \beta_2 treated + \beta_3 treated \times SOX \\ & + \beta_4 \ln(market\ cap.) + \beta_5 asset\ growth + \beta_7 \frac{value}{assets} + \beta_8 \frac{earnings}{assets} \\ & [+\beta_9\ lagged\ baord\ composition + \beta_{10}\ lagged \frac{earnings}{assets}] + year\ dummies. \end{aligned} \quad (6)$$

where $\mathbf{1}_{\text{turnover}}$ 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. Board composition is defined as the share of the board that consists of outsiders. These variables are supposed to capture the general level of turnover explained by the independence of the board and by bad firm performance.

Columns (7)–(10) of table 6 show 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.

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. Since reduced self-dealing is exactly the sort of governance improvement better monitoring could cause, both measures should improve in response to the Director Rules reforms if the improvement hypothesis holds.

Total Compensation

Motivated by Murphy (1999) and Core et al. (1999), we construct a measure of idiosyncratic CEO compensation by using the residuals from the following regression:

$$\begin{aligned} ln(award\ value_t) = {} & \alpha + \beta_1 \ln(market\ cap._t) + \beta_2 \ln(longterm\ debt_t) + \beta_3 \frac{earnings_{t-1}}{assets_{t-1}} \\ & + year\ dummies + industry\ dummies. \end{aligned} \quad (7)$$

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.

However, Cheng et al. (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):

$$ln(award\ value_t) = \alpha + \beta_1 \ln(market\ cap._t) + \beta_2 \ln(longterm\ debt_t) + \beta_3 \frac{earnings_{t-1}}{assets_{t-1}} + \beta_3 \frac{risky\ pay_{t-1}}{total\ pay_{t-1}} + year\ dummies + industry\ dummies. \quad (8)$$

Table 8 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, 54–72 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 CEO ownership (equations (4) and (5)) except now the compensation residual is the dependent variable.[10]

TABLE 8
COMPENSATION REGRESSION

VARIABLES	(1) Model 1	(2) Model 2
Ln(Market cap)	0.426***	0.293***
	(0.00560)	(0.00497)
Ln(Long-term debt)	0.0516***	0.0563***
	(0.00381)	(0.00276)
Lagged Earnings/Assets	-0.130***	0.00537
	(0.0459)	(0.0230)
Share risky pay		0.0191***
		(0.000268)
Observations	15,995	15,995
Year dummies?	Yes	Yes
R-squared	0.543	0.718
Adj. R-squared	0.541	0.716

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

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 for variable definitions.

Table 9 reports the results of the compensation residual regressions. Using the model 1 residuals (equation (7), column (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), column (2)), the point estimate is positive but not statistically different from zero.[11] These findings contradict the predictions of the improvement hypothesis, but they are consistent with the findings of Guthrie et al. (2012): independent directors are ineffective in constraining CEO compensation. Chhaochharia and Grinstein (2009) find that firms more affected by the Director Rules decreased CEO compensation. However, Guthrie et al. (2012) show that this result is purely driven by two outliers.

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).

Columns (3)—(5) in table 9 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.

TABLE 9
COMPENSATION RESIDUAL AND RISKY PAY REGRESSIONS

	(1)	(2)	(3)	(4)	(5)
	Compensation residual		Risky pay		
VARIABLES	Model 1	Model 2	Full	Matched	Matched w/ EI
SOX	-0.0570	-0.0726**	0.479	1.683	2.520
	(0.0484)	(0.0351)	(1.210)	(2.346)	(2.419)
Treated*SOX	0.106***	0.0419	2.896***	-0.327	-0.697
	(0.0408)	(0.0293)	(1.005)	(1.397)	(1.559)
High E Index*SOX					-4.032*
					(2.395)
High E Index* Treated*SOX					0.432
					(3.697)
Obs	7184	7184	19991	5205	5205
R-sqd	0.391	0.42	0.499	0.51	0.511
Adj. R-sqd	0.276	0.31	0.414	0.414	0.415

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

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 for variable definitions.

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 stock compensation.

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.

In 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.

ENDNOTES

1. As noted above, several papers have done this. We do not consider this a core result but do the analysis to confirm the finding on our larger sample. The results are not reported here but are available from the authors upon request.
2. 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).
3. Direct monitoring also includes such mechanisms as independent auditors, credit rating and equity research opinions, and supervisory boards of directors. Other examples of additional monitoring of the manager include punching a time clock at the Mars Corporation, retention of all employee emails, splitting the job of CEO and chairman of the board, and mandatory retirement ages.
4. Jiraporn, Singh, and Lee (2009) analyze how the relationship between committee membership and interlocks changed before and after SOX but not how interlocks changed based on being treated by SOX.
5. Lee (2011) finds that retired CEOs are in decline as directors after SOX but does not study the subpopulation studied here.
6. 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.
7. 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.

8. 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 of primary regression data. Note that some firms are in more than one exclusion category.
9. Guthrie, Sokolowsky, and Wan (2012) find that the outliers of Apple and Fossil drive the results reported by Chhaochharia and Grinstein (2009). Apple and Fossil are also in our data. For all CEO compensation related formulas (ownership, share stock, total compensation, and risky pay) we also test winsorized data and test data with these two companies excluded. The results are robust to these changes.
10. Because being an overpayer already limits the sample, we do not use the specification with the matched panel and E index.
11. 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.

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APPENDIX: DATA COLLECTION AND CONSTRUCTION

Variable Definitions

TABLE 10
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)
Share stock	Restricted Stock Awards + Performance Stock)/Award value*100
Turnover rate	Number of firms with a CEO change/total number of firms*100
Variables constructed from SEC data	
Entrenchment index (E index)	The 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.

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. We use three alternative methods of propensity score matching which are discussed further in the Matched Sample Construction Appendix. This means about 1,300 firms need E index scores. Bebchuk et al. (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. 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.

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. 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 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.