Do Lead Directors Enhance Monitoring by the Board?

Mark A. Chen and Han Ma*

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Abstract

A widespread practice among public firms is the designation of an outside board member as *lead director* to help counterbalance the power of a CEO/Chair. We examine whether lead directors matter for the effectiveness of board monitoring as measured by the performance-sensitivity of CEO dismissals. Using unique board structure data from 2000-2015, we document that the likelihood of CEO dismissal after poor performance increases with the presence of a lead director. A causal interpretation is supported by two quasi-natural experiments in which exogenous reforms induced many firms to add a lead director role to the board. We also use detailed data on over 30 different types of assigned lead director duties to examine possible channels of effect. The results show the importance of duties involving control over information flow, authority over meetings, and the right to retain outside experts. Overall, our findings suggest that lead directors improve board monitoring in a manner consistent with theories of how boards communicate and operate.

*Chen is from the J. Mack Robinson College of Business, Georgia State University, Atlanta, GA 30303, USA. Tel.: +1-404-413-7339; Email: machen@gsu.edu. Ma is from the J. Mack Robinson College of Business, Georgia State University, Atlanta, GA 30303, USA. Tel.: +1-404-413-7316; Email: hma3@gsu.edu. We are grateful to Frank Blount, former Lead Director of KBR, Inc. and former Presiding Director of Caterpillar, Inc., for helpful discussions. We also thank Vikas Agarwal, Gerry Gay, Lixin Huang, Omesh Kini, Michelle Lowry, Ron Masulis, Chip Ryan, and seminar participants at Georgia State for helpful comments. Daniel Greene and Qinxi Wu provided excellent research assistance. All errors and omissions are the sole responsibility of the authors.

1. Introduction

The costs and benefits of different board leadership structures have long been a focal point of discussion and debate among top management, regulators, academics, and institutional investors. Corporate boards often claim that having the same individual serve concurrently as both CEO and board Chair improves coordination with respect to major decisions. A unified CEO/Chair role can also avoid problems associated with the costly transfer of critical information between the CEO and Chairman (Brickley, Coles, and Jarrell (1997)). Yet, at the same time, it is commonly argued that a combined CEO/Chair gives too much power to one individual and can weaken the board's ability to serve as an independent monitor of top management (see, e.g., Jensen (1993)).

While most large public firms in the U.S. continue to use a unified CEO/Chairman structure, a striking development in recent years has been the growing practice of assigning some of the important board leadership duties to a nonemployee "lead director". Before 2003, almost no public companies had this type of board role, but now the role has become commonplace. For example, about 70% of S&P 500 companies had a lead director in 2013.[1] In general, shareholder activists and other market participants have taken a favorable view of this development, arguing that lead directors can help provide a check against the concentration of power in the hands of a combined CEO/Chair.[2]

Despite the widespread use of lead directors and the premise that such individuals can help enhance board independence, there is very little systematic evidence on whether they actually do matter for the board's monitoring effectiveness. A key challenge in providing credible evidence

[1] *Korn Ferry/NACD Annual Survey of Board Leadership, 2014 Edition*

[2] See, e.g., "Lead Directors Gain Clout to Counterbalance Strong CEOs", *Wall Street Journal*, Sept. 13, 2010, by Joann S. Lublin; "Lead Directors: A Study of their Growing Influence and Importance", PwC, April 2010;

along these lines is that boards do not choose their leadership structures randomly; rather, they do so in response to many observed and unobserved aspects of their environment. To the extent that board structures are endogenously formed, an empirical association between leadership structures and monitoring decisions could reflect equilibrium choices rather than underlying causal relationships.

In this paper, we use a unique dataset and a number of identification strategies to provide evidence on the effects of lead directorships. Our dataset is based on information from SEC proxy and 10-K filings about the use of lead directorships at S&P 1500 firms during 2000-2015. The data include not only information on when a firm instituted a lead directorship role and who was appointed to the role, but also a comprehensive set of over 27,000 specific instances of duties assigned to lead directors. The granular nature of our data allows us to study in detail which particular types of lead director duties and responsibilities matter most for enhancing the board's independence.

To proxy for the effectiveness of board monitoring, we use the sensitivity of forced CEO turnover to stock performance. Whether or not a board opts to fire a CEO after poor performance can reveal the extent to which the board operates as an independent monitor of management. As one of the most critical decisions that boards make in practice, the decision to dismiss a CEO after poor performance has been studied by a number of researchers either in connection with board independence or board structure, including Weisbach (1988), Dahya, McConnell, and Travlos (2002), Goyal and Park (2002), Fich and Shivdasani (2006), and Guo and Masulis (2015).[3]

[3] Other studies that examine the determinants and implications of performance-based CEO dismissals include Denis, Denis, and Sarin (1997), Parrino (1997), Huson, Parrino, and Starks (2001), Kaplan and Minton (2012), Cornelli, Kominek, and Ljungqvist (2013), Peters and Wagner (2014), Gao, Harford, and Li (2015), and Jenter and Kanaan (2015).

We begin by examining how the probability and performance-sensitivity CEO forced turnover differs before and after firms first switched their board structure to introduce a lead director role. Since the decision to introduce a lead director role is likely not exogenous, we employ propensity score matching to match each switching firm with a set of control firms that are comparable in terms of various firm and board characteristics in the pre-switch year. Using the resulting panel dataset, we find a highly significant, negative association between the presence of a lead director and the sensitivity of forced CEO to stock performance. This indicates that firms with lead directors are more likely to dismiss CEOs after poor stock performance. This relation is robust to controlling not only for CEO age and tenure, CEO/Chairman duality, board size, and board composition, but also for firm and year fixed effects. This negative relation is also economically significant. Our estimates imply that, under a hypothetical drop in the firm's industry-adjusted stock performance from the 75^{th} to the 25^{th} percentiles, having a lead director versus not having one is associated with more than a one-third increase in the probability of forced CEO turnover.

To further explore the causal effects of lead directors on CEO forced turnover, we study two distinct quasi-natural experiments that occurred several years apart during the sample period. The two experiments include (1) a significant change in 2004 to the vote recommendation policies of Institutional Shareholder Services (ISS); and (2) a change in 2010 to the SEC's proxy disclosure rules. Importantly, both reforms specifically addressed the topic of board leadership structure, and both contained explicit requirements related to lead directors. Furthermore, these reforms are convenient for our study because they were primarily aimed at firms with combined CEO/Chair leadership structures. Thus, the two experiments offer natural control groups consisting of firms that did not have a combined CEO/Chair structure at the time the reforms

became effective. We show that both reforms were followed by large, immediate increases in the adoption of lead director roles among treated firms, while the corresponding impact on control firms appears to have been minimal.

Using differences-in-differences (DID) estimation, we find that both reforms had a statistically and economically significant effect on the performance-sensitivity of forced CEO turnover for treated firms relative to control firms. Our regressions control for firm fixed effects as well as year fixed effects to mitigate concerns that observed shifts in the performance-turnover relationship could be due to aggregate shocks in a given year or to unobserved, time-invariant differences among firms. The estimates suggest that, for a hypothetical drop in industry-adjusted stock return from the 75^{th} to the 25^{th} percentile, treatment firms experience a 1.03% (1.23%) greater percentage-point rise in the probability of forced CEO turnover after the ISS (SEC) reform, compared to control firms.

To shed light on whether the increase in performance-turnover sensitivity is largely due to the increased use of lead directors, we use an instrumental variables (IV) approach in which a treated firm's lack of a lead director in the latest pre-shock year predicts the appointment of one after the shock. Under the plausible assumption that the reforms were not anticipated well in advance, a treated firm's post-reform use of a lead director—when it had none immediately before the reform—can be attributed to the exogenous shock rather than to unobserved firm characteristics. In two-stage least squares regressions that control for time and firm fixed effects, we find a strong positive effect of lead directorships on the performance-sensitivity of forced CEO turnover.

One potential concern with our main IV strategy is that the treated and control samples of firms could differ systematically in ways that confound our estimates, despite controlling in our

regressions for firm fixed effects and time-varying firm characteristics. Indeed, an underlying premise of our empirical approach is that control firms and treated firms would have exhibited similar trends absent the reforms. While this "common trends" assumption is critical for interpreting DID estimates, it is also important to the validity of our IV approach (see, e.g., Atanasov and Black (2016), Roberts and Whited (2013)). To address possible violation of the common trends assumption, we use propensity score matching to construct a new control sample that is closely matched to the treatment firms in the year prior to each reform year. We find that our main results are robust to using the propensity score matched samples.

Next, we examine which specific types of lead director duties and responsibilities matter most for enhancing board independence. Our dataset includes 27,789 instances of lead director duties spanning 33 different types. We classify the various types of duties into six broad functional areas: control over agendas and meetings, information flow, contact with major shareholders, oversight of management, oversight of other directors, and retention of outside experts. We then exploit the fact that the exogenous reforms often impacted different categories of duties to different degrees. For example, in the year prior to reform, a firm's lead director may have had extensive control over meetings, but no oversight of management. For this firm, the occurrence of a reform shock yields independent variation in management oversight duties, and thus we are able to use an IV approach to estimate how a lead director's oversight of management per se affects forced CEO turnover.

A challenging econometric aspect of this analysis is that, because a single reform event would tend to impact most or all categories of lead director duties in the same direction, changes in duties could be highly correlated. Therefore, studying the effects of all classes of duties in a single regression would give rise to multicollinearity problems that could mask the effects of

individual regressors. An alternative approach would be to use simplified regressions in which each duty category is studied in isolation. However, using simplified models would also be problematic because of an omitted variables bias: excluding some duty categories from a regression could give rise to inconsistent estimates of the true causal effects of the included category. We develop a novel approach that overcomes both the multicollinearity problem and the omitted variables problem in our setting. In essence, our approach relies on purging from a category's instrumental variables any unwanted correlation with respect to the omitted categories. Then, with this set of "refined" instruments, we can examine the effects of each duty category in isolation from the others.

The analysis reveals that not all duties of lead directors are equally important for the performance-sensitivity of CEO dismissals. In particular, we find that duties related to information flow and meeting/agenda control have significant effects around both reform periods. Interestingly, being the point of contact for shareholders (being able to retain outside experts) also appears to matter, but only in the earlier period (later period). Other categories of duties do not appear to affect performance-sensitivity of forced CEO turnover. Overall, we conclude that lead directors matter for independence mainly on account of their authority over meetings, agendas, and information flow between the CEO and the board. These findings are consistent with the implications of theoretical models showing how a board's overall monitoring effectiveness depends on its ability to communicate and obtain information (see, e.g., Hermalin and Weisbach (1998), Adams and Ferreira (2007), and Malenko (2014)).

Our paper offers a number of contributions to the literature on internal governance and boards of directors. First, our findings shed light on a mainstream corporate governance practice that has heretofore received very limited attention by academic researchers. While there has been

a considerable amount of research on the subject of CEO/Chairman duality (e.g., Pi and Timme (1993), Brickley, Coles, and Jarrell (1997), and Booth, Cornett, and Tehranian (2002)), much of the literature precedes the dramatic shift towards use of lead directors in the U.S. that has occurred in only the past few years. The findings of our study thus fill a gap in the literature on boards of directors and contribute to a more complete understanding of how organizational structure can influence a board's monitoring of top management.

Second, to the best of our knowledge, ours is the first paper to provide clean estimates of the causal impact of lead directors—and their specific duties—on CEO forced turnover sensitivity. Currently, we are aware of only two other academic studies that examine the role of lead directors. Penbera (2009) documents the types of duties and responsibilities assigned to lead directors at S&P 500 firms in 2003-2004 and 2006-2007, but he does not empirically analyze the effects of such duties on corporate outcomes. Lamoreaux, Litov, and Mauler (2014) conduct a study of lead directors using data from *BoardEx* over 1999-2009. Similar to our findings, they document that firms with a lead director appear to be more likely to terminate poorly performing CEOs. However, they do not employ the exogenous ISS and SEC reforms that we do to obtain estimates of causal effects. Also, they do not examine data on lead directors' duties, and they do not distinguish between cases where a "lead director" has a key functional role as opposed to playing a minor "presiding director" role (i.e., being tasked only with presiding at non-executive director meetings).

Third, our econometric approach to addressing multicollinearity and omitted variables inconsistency may be of independent interest in the area of shock-based IV studies (see Atanasov and Black (2016) for a survey of shock-based IV studies in corporate finance). In some corporate finance contexts, a single exogenous shock (e.g., regulatory reform) can affect multiple response

variables at the same time. Understanding the causal effects of any one of these response variables on the outcome of interest is complicated by the fact that responses can be correlated, and neglecting to account for this correlation can lead to either very inefficient estimates (multicollinearity) or overstated effects (the omitted variables problem). Our method of refining IVs to account for correlation among response variables can potentially be of use in obtaining more efficient and reliable estimates of causal effects around exogenous shocks.

Finally, our analysis complements recent theoretical work on how boards of directors function. The finding that an independent director's authority over information flow can impact CEO turnover decisions underscores the central role played by information sharing in theoretical models of boards (Raheja (2005), Adams and Ferreira (2007), Harris and Raviv (2008), and Malenko (2014)). Moreover, our work suggests that incorporating other rights and responsibilities of board members (e.g., authority to hire outside consultants or to interact with large external shareholders) into theoretical models could be a fruitful avenue for future research.

The rest of the paper is organized as follows. In Section 2, we provide a discussion of the ways in which lead directors and their specific duties can matter for forced CEO turnover and board independence. Section 3 describes our data. Section 4 presents our main empirical results, including background on the two quasi-natural experiments that we use to identify causal effects. In Section 5, we use data on lead director duties to explore possible channels of effect. Section 6 concludes.

2. Lead Directors, Board Independence, and Forced CEO Turnover

The idea that boards should select one of the independent directors as a lead director can be traced to at least as far back as Lipton and Lorsch (1992), who argued that "if independent

directors are to be effective, they need some form of leadership from among their own number. While this is true in normal times, it is especially valid if the CEO is incapacitated or is failing in his or her duties."[4] More recently, a number of organizations have advocated the use of lead directors to provide a check on the CEO/Chair's possible domination of the board.[5]

A contrary view, however, is that the lead director role is either unnecessary or does not go nearly far enough to ensure independent board leadership. For instance, at the 2008 Chairmen's Forum conference sponsored by the Millstein Center for Corporate Governance and Performance, one non-executive chairman stated, "The lead director is better than nothing. But on a scale of 1 to 10, having a [non-executive] chairman is 10, and having a lead director is about a 4."[6] Among companies that have a combined CEO/Chairman, the choice not to designate a lead director is often justified on grounds that such an arrangement offers few benefits in terms of facilitating communication and coordination.[7]

Note that even if a lead director has sufficient vested authority to counterbalance the CEO's power, it is not *a priori* obvious that this would necessarily lead to greater overall board independence. As Hermalin and Weisbach (1998) argue, individual directors may naturally have an aversion to taking actions that are hostile to top management. Over time, the board may become "captured" as the CEO effectively gains increased power over the individual directors. When much of the board's power is concentrated with a lead director, it is possible that the CEO can capture and sway the board more easily because there is effectively only a single point of failure.

[4] Lipton and Lorsch (1992), p. 70.
[5] See, for instance, the *Report of the NACD Blue Ribbon Commission on the Effective Lead Director* (NACD, 2011).
[6] Policy Briefing No. 4: *Chairing the Board: The Case for Independent Leadership in Corporate North America* (Millstein Center for Corporate Governance and Performance, 2009).
[7] For example, Ralph Lauren Corp.'s 2013 proxy filing explains the lack of a lead director as follows: "As stated in our Corporate Governance Policies, our Board of Directors believes that appointing a lead director is not desirable because the Board's size makes interaction among all members relatively easy. As a result, we do not have a lead director."

This consideration suggests that lead directors could, in principle, reduce board independence rather than enhance it.

If lead directors do indeed enhance board independence, then what are the specific means by which they do so? Extant research suggests that control over information flow between the CEO and the board is likely to be a critical aspect of the lead director's role. In Adams' and Ferreira's (2007) theoretical model of CEO-board interactions, the CEO may be reluctant to share precise information about the firm's prospects with directors because such information would enable the board to monitor too closely. Indeed, as Jensen (1993) argues, combined CEO/Chair structures create a conflict of interest since the CEO has an incentive to withhold critical information from the board. A lead director could serve as a conduit of information between the CEO and the board, which could have the dual effect of increasing the quality of the board's advice but also increasing its willingness to terminate the CEO when circumstances warranted it.

Direct authority over meeting agendas and the scheduling of meetings can also confer power to a lead director. Much of the work that boards and their committees do appears to be related to meetings (Vafeas (1999)). The ability of the lead director to call for a meeting of directors on short notice can enable the board to quickly coordinate and decide whether to terminate the CEO amid poor stock performance, whereas a Chairman who is also CEO would not have incentives to call such a meeting.

In some cases, a lead director might be given the authority to oversee management in various ways, oversee evaluation of the board, or both. In effect, many of the duties that would have been distributed among outside directors or committee chairs could be concentrated in the hands of a single individual. This concentration of authority can help the board to act decisively in crisis situations wherein dismissal of the CEO turns out to be the best course of action. On the other

hand, to the extent that the lead director's own independence were compromised, such an arrangement could lead to a less independent board and a weaker turnover-performance relation.

Another way in which lead directors might matter for independence is through their ability to interface with external constituents, particularly institutional investors and shareholder activists. In recent years, activism by hedge funds and other large shareholders has become a prominent form of external governance (see, e.g., Brav, Jiang, and Kim (2009), Ertimur, Ferri, and Muslu (2010), and Denes, Karpoff, and McWilliams (2016)). However, engaging in overt activism, such as by launching a proxy contest, can be costly (Gantchev (2013)). Direct access to the board via a lead director can bypass the CEO/Chairman, allowing a shareholder to privately convey concerns and place greater pressure on the board to dismiss the CEO.

Finally, the board's willingness to take the drastic step of dismissing a poorly-performing CEO might depend on whether the lead director has authority to hire outside experts. There are two possible reasons for this. First, in an uncertain business environment, the board may rationally take into account the availability of a replacement CEO when deciding whether or not to dismiss the current one (Hermalin and Weisbach (1998), Parrino (1997)). By hiring an external consultant, the lead director can reduce search frictions associated with finding a suitable replacement, thus lowering the costs of replacing the current one. Second, when an outside expert opinion is solicited by management, the opinion will generally be ignored compared to when the opinion is solicited by non-management directors (Walton (2012)). Thus, giving authority over the hiring of outside experts to a lead director can ensure that the board receives unbiased third-party assessments of the CEO, which can in turn increase the likelihood of performance-based dismissal.

3. Data

3.1 Sample Construction and Data Collection

Our dataset covers S&P 1500 firms over the period 2000-2015. We obtain data on lead directors and their duties by searching filings in the Securities Exchange Commission (SEC) Electronic Data Gathering, Analysis, and Retrieval (EDGAR) system. For each firm-year in the sample, we perform a keyword search using the terms "lead director", "lead independent director", "lead outside director" or "presiding director" in forms DEF 14A, DEFM14A, DEFC14A, or PREC14A. From these proxy filings, we collect information on whether there exists a lead or presiding director and, if one exists, which director fulfills that role, how they are appointed or elected to that role, and their exact role title. We also collect information on all individual duties assigned to the lead director. For a handful of firms that do not file proxy statements in certain years, we search through 10-K filings to check for the existence of a lead or presiding director. In none of these cases was a lead director disclosed in the 10-K filing. Overall, in our sample, there are 10,006 firm-year observations in which a lead director or a presiding director is present.

Throughout our empirical analysis, we define lead directors in functional terms. That is, we deem an individual to be a *lead director* if and only if the board assigns at least one duty to the director that goes beyond the NYSE's minimal requirement that an independent director be designated to preside over the executive sessions. Our rationale for using a functional definition rather than relying on role titles in proxy statements is that the former more accurately captures the extent to which an independent director has significant duties and responsibilities that set him or her apart from a presiding director role.

Indeed, we observe in the data that some firms designate a "lead director" with the same baseline duties that would be handled by a presiding director. For example, in fiscal year 2004, Mr. Gordon Lohman served as "Lead Director" of Beam Inc. Since his duties did not go beyond the NYSE requirement of presiding over executive sessions, we do not classify him as a lead director. At the same time, some firms named a presiding director whose responsibilities make him effectively a lead director. For instance, Mr. Eugene V. Fife served as "Presiding Director" for Caterpillar, Inc. in 2011. However, in addition to chairing executive sessions, he was also tasked with setting board meeting agendas and reviewing information flows in advance of meetings. We thus classify him as a lead director based on our criteria. Based on our functional definition, a total of 6,705 firm-years in the sample are associated with a lead director.

From information gathered about lead directors' duties (above and beyond the standard duties of presiding directors), we obtain a total of 27,789 instances of assigned duties. Among these instances, we identify 33 distinct duty types. We then classify these types into the following broad functional categories: (1) agenda and meeting control; (2) information flow; (3) shareholder contact; (4) oversight of management; (5) oversight of the board; and (6) retention of consultants and advisors. In Table A1 in the Appendix, we provide a detailed breakdown of how we classified the duties into these six categories. Appendix B shows examples of typical lead director duty information extracted from the proxy statements of three sample companies: Applied Materials, Inc., AT&T, Inc., and Home Depot, Inc.

Next, we obtain data on forced CEO turnovers from the Execucomp database. We first identify all the CEO in the Execucomp database based on the annual CEO flag. For each firm, we compare the CEO of current fiscal year with the CEO of next fiscal year. If the CEO is a different person for the firm, we record the change as a turnover event. For our purposes, it is important to

identify those turnover events that are forced rather than voluntary. In the literature on CEO turnover, a popular approach for identifying CEO dismissals is to rely on news stories as in Parrino (1997) or Denis, Denis, and Sarin (1997).

While this news-based approach will yield a conservative estimate of which turnover events are truly forced, we instead rely on an age-based approach to classifying turnovers. We do so for two reasons. First, according to Peters and Wagner (2014), an age-based turnover classification scheme is robust to biases resulting from variation in the extent of press coverage. For example, if there has been an increase in press coverage of CEO turnovers, it may be a result of an increase over time in the extent of press coverage rather than an increase in the occurrence of forced turnover. Second, press releases seldom report that the turnover of a CEO is "forced". Therefore, using news stories may underestimate the true probability of forced CEO turnover. Peters and Wagner (2014) compare a range of age thresholds and argue that a threshold of 56 closely matches the average dismissal rate resulting from the press-based classification. Based on this, we use 56 as a cutoff age and define a turnover as forced if the CEO leaves the firm at an age equal to or less than 55.

We also obtain data on individual director characteristics from the *Boardex* database. From Compustat and CRSP, we obtain accounting information and stock return information, respectively. Our overall sample consists of 20,950 firm-year observations spanning the time period 2000-2015.

3.2 Summary Statistics

Table 1 reports summary statistics for our sample. Panel A of table 1 reports information on firm characteristics. On average, firms have total assets of about $7.37 billion and a market

capitalization of about $8.26 billion. For the whole sample period, a lead director (according to our functional definition) is present at about 32% of firm-year observations. In 66% of firm-years, the CEO and Chairman roles are combined, indicating that having a unitary CEO/Chair role has been a popular board leadership structure in US corporations. About 24% of firm-years have both a lead director and a combined CEO/Chairman.

On average, each firm has about nine directors sitting on the board, of which about three-quarters are independent. The mean value of forced CEO turnover indicator in our sample is about 3.3% and comparable to the CEO dismissal rates documented in recent studies. For example, Peters and Wagner (2014) and Jenter and Kanaan (2015) each report a mean forced turnover rate of 2.7%. The slightly higher frequency in our sample appears reasonable since classification of turnovers based on news stories is likely to underestimate the true incidence of forced turnover.

Panel B reports statistics on director characteristics. Across director-years in our sample, directors on average are 60.42 years old and have a tenure of 8.59. About 3.4% of the director-year observations coincide with a lead director role, while in about 5% of cases the board member is serving as CEO of a different firm. About 8% of directors have an external Chairman role. Panel C reports details about the characteristics and duties of lead directors. We note that, in the upper half of Panel C, there is a decrease in the number of observations. The reason for this is that we obtain some individual lead director characteristics (e.g., the number of external board seats held or the number of external CEO positions) from merging our sample with *BoardEx*. This data merge is based on directors' last names and first initials, which reduces the sample size to about 4,500 firm-years with lead directors. (We note, however, that these lead director characteristics are for descriptive purposes, and we currently do not use them in our main analysis.) From the director characteristics, we see that lead directors are generally older and longer-tenured than the

average director. This may indicate that boards tend to prefer more experienced individuals to serve in the lead director role.

In the bottom part of Panel C, we report summary statistics for the frequencies with which lead directors are assigned at least one duty from each of the six major categories. The most commonly-represented categories of duties in the sample are agenda/meeting control and the control of information flow. About 82% of lead directors have at least one duty related to agenda or meeting control, while 73.3% of the lead directors have at least one duty pertaining to information flow. 18% of the lead directors are tasked with being the sole shareholder contact for the board or for the independent directors. The remaining three categories are less prevalent in the sample, but they nevertheless account for a meaningful share of lead director duties. Among all lead-director years, 14.6% involve duties related to the oversight of management; 17.7% involve oversight of the board; and 10.3% involve the authority to retain outside advisors or consultants.

In Table 2, we report means and medians of basic firm, board, and CEO characteristics for those firms with a lead director role and those without one. Firms with lead directors are significantly larger, both in terms of total book value of assets and market capitalization. Also, firms with lead directors also tend to have larger boards, a higher fraction of independent directors, and older CEOs. The incidence of a combined CEO/Chairman is higher for firms with lead directors, which is consistent with the argument that lead directors are often chosen to counterbalance the power of combined CEO and chairman. Nevertheless, the presence of a lead director is associated with a lower average and median industry-adjusted stock return. Finally, comparing firms with and without lead directors, there does not appear to be a statistically significant difference in the unconditional probability of forced CEO turnover. Overall, the large

differences in Table 2 underscore the importance of controlling in our empirical tests for various firm, CEO, and board characteristics that could influence the choice of board leadership structure.

4. Main Results

4.1 Effect of a Lead Director on CEO Forced Turnover

Our basic empirical specification for testing the effects of a lead director on the strength of association between CEO turnover and performance is as follows:

$$Turnover_{i,t+1} = \alpha + \beta LD_{i,t} * R_{i,t} + \delta LD_{i,t} + \varphi R_{i,t} + \gamma' X_{i,t} + \lambda_i + \lambda_t + \varepsilon_{i,t} \qquad (1)$$

where $Turnover_{i,t+1}$ is a dummy variable that equals one if a forced CEO turnover occurs for firm i at time t + 1. $LD_{i,t}$ is an indicator equal to one if a lead director is present at firm i in time t. $R_{i,t}$ is the performance of firm i at time t, measured by the industry-adjusted stock return.[8] (Industry-adjusted returns are calculated as total returns minus the median contemporaneous return in the same 2-digit SIC industry.) $X_{i,t}$ is a vector of firm-level control variables, λ_i captures firm fixed effects, and λ_t captures year fixed effects. Our main interest is in the coefficient of the interaction term, β, which captures the incremental performance-sensitivity of forced CEO turnover with a lead director versus without one. We would expect a negative value for β if having a lead director raises the CEO turnover-to-performance sensitivity by virtue of enhancing board independence. On the other hand, β should be positive if having a lead director weakens the turnover-performance relation.

[8] Following Peters and Wagner (2014), for firm-years with a forced CEO turnover, we measure the stock return over the 12-month period ending in the month prior to the month of the turnover event. For all other firm-years, the return is measured over the most recent fiscal year.

The linear probability model in (1), which is similar to the approach of Cornelli, Kominek, and Ljungqvist (2012) and Guo and Masulis (2015), offers two advantages over a nonlinear specification such as logit or probit. First, it is straightforward in a linear probability model to use firm fixed effects to rule out the effects of unobserved time-invariant heterogeneity across firms. However, for a nonlinear probability model, including the firm fixed effects into the regression generally leads to inconsistency of the maximum likelihood estimator. Second, the linear probability model facilitates interpretation of marginal effects on turnover-performance sensitivity. In contrast, interpreting the economic and statistical significance of interactions in a nonlinear model are less straightforward.

A key obstacle to interpreting β in causal terms is the endogeneity of firms' choice of board leadership structure. For instance, firms in which the CEO/Chair is strongly entrenched might be less likely to appoint a lead director. Likewise, the matter of which director is chosen to be the lead director and what duties are assigned to them could also depend on various firm-level and board-level characteristics. In that case, even if we were to obtain a statistically significant and negative estimate for β, we would not be able to validly infer that it is the presence of a lead director that increases CEO turnover-to-performance sensitivity.

We thus begin our analysis by estimating panel data regressions that account for time fixed effects, firm fixed effects, and other firm, CEO, and board characteristics. First, we identify cases in the sample where a firm switched for the first time to having a lead director role and maintained that role for at least four years. For each of these treatment firms, we employ propensity score matching to identify a set of control firms that are comparable in terms of firm and board characteristics in the pre-switch year. Specifically, for each treatment firm, we first identify all other firms that did not have a lead director in the switch year and for the subsequent five years.

These non-switching firms constitute the group of potential control firms. We then estimate logit regressions in the year prior to a switch to predict whether or not a firm is in the treatment sample. Covariates in these regressions include all of the variables in Table 2. Control firms are then chosen based on how close their predicted log odds are relative to the predicted log odds of the associated treatment firm.[9] Upon identifying all treatment and control firms, for each firm we keep all fiscal years from five years before to five years after the relevant switch year.

Table 3 shows the results of our panel regressions. In Columns (1) and (3), the regressions include a baseline set of controls for industry-adjusted stock return and firm size. Columns (2) and (4) also control for the log of CEO age, log of CEO tenure, log of board size, CEO/Chair duality, and whether the board is independent (i.e., consists of at least 75% independent directors). The regressions in Columns (1) and (2) (Columns (3) and (4)) are estimated without (with) firm fixed effects. T-statistics, based on robust standard errors clustered at the firm level, are reported in parentheses below each coefficient estimate.

Overall, the results from Table 3 support the view that monitoring effectiveness increases with the presence of a lead director. The coefficient estimates on the interaction term are negative and highly statistically significant in all four regressions. The introduction of firm fixed effects into the estimation results in a slight reduction in magnitude for the coefficient on the interaction term, but estimates remain significant with p-values well below 0.001. Moreover, the magnitudes of the coefficients indicate that the effects are economically significant. As a quick gauge of the economic magnitude of impact, we assume a hypothetical drop in the firm's adjusted stock performance from the 75th percentile to 25th percentile. For such a hypothetical drop, Column (2) implies that the probability of forced CEO turnover is 1.56 percentage points higher for firms

[9] We use 10:1 nearest-neighbor matching (with replacement), based on the predicted log-odds of being a switching firm in the match year.

with a lead director versus firms without one. Even after controlling for firm fixed effects in Column (4), the CEO forced turnover probability is still 1.31 percentage points higher with a lead director.

4.2 Evidence from Two Quasi-Natural Experiments

Despite controlling for firm fixed effects and for likely predictors of lead director usage in our panel regressions, it is nevertheless possible that one or more unobserved factors could affect a firm's use of a lead director while also affecting the board's monitoring quality. Thus, to further explore the relation between lead directors and monitoring, we consider two distinct quasi-natural experiments that arguably had a substantial impact on the cost of not having a lead director. To the extent that different firms were affected differently by these exogenous reform shocks, we can use this variation to help identify the causal effects of lead directors.

For the first experiment, we focus on a particular change to the proxy voting guidelines put forth by Institutional Shareholder Services (ISS). ISS is the single largest proxy advisory service, and its vote recommendations and guidelines are widely recognized as having a substantial influence on the voting practices of mutual funds, pension funds, and other institutional investors.[10] In early 2004, ISS substantially changed several of its proxy voting policies for the 2004 proxy season. One of the changes pertained to ISS's stance on a common type of corporate governance proposal used by shareholder activists: proposals to separate CEO and Chairman roles.[11] Prior to 2004, ISS had generally recommended in favor of such "Independent Chair"

[10] Academic research documents that ISS vote recommendations have a substantial influence on shareholder voting in uncontested director elections (Cai, Garner, and Walkling (2009)), proxy contests (Alexander, Chen, Seppi, and Spatt (2010)), management proposals (Bethel and Gillan (2002)), and shareholder proposals (e.g., Ertimur, Ferri, and Oesch (2013), and Malenko and Shen (2016)). Other papers showing that ISS recommendations significantly affect vote outcomes include Larcker, McCall, and Ormazabal (2014) and Iliev and Lowry (2015).

[11] In 2014, Independent Chair proposals were the most common type of shareholder proposal related to corporate governance (ISS Shareholder Proposals data).

proposals. In the new policy, ISS stated that it would continue to support Independent Chair proposals, unless a firm counterbalanced the combined CEO/Chairman by designating a lead director who has clearly delineated duties. This change in ISS policy was incorporated into in the *ISS Proxy Voting Manual* by the end of January 2004 and became effective for all U.S. companies with annual meeting dates on or after February 1, 2004. We argue that the shift in ISS voting policy made it more favorable for some firms to institute a lead director role to minimize the chance of being targeted by Independent Chair proposals which, if well-supported, could open the door to heightened shareholder pressure and scrutiny or future ISS "withhold" recommendations.[12]

The second experiment relates to rules adopted in December 2009 by the SEC that require firms to provide enhanced proxy statement disclosure. The rules became effective as of February 28, 2010. One of the rules (amendment to SEC Item 22(b)) requires firms to provide new disclosure about the structure of their board leadership "to provide investors with insights about why the company had chosen that particular leadership structure."[13] Specifically, the rule requires firms to disclose (1) whether the company has a combined or separate CEO/Chair position and why the company believes that structure is the most appropriate for the company; and (2) if the CEO and Chair roles are combined, whether and why the company has a lead independent director and what role that individual plays in the leadership of the company. For our purposes, the crucial aspect of the new rule is that it forces firms with a combined CEO/Chair but no lead director to justify to shareholders why they had chosen that structure. We argue that this placed pressure on some firms to consider appointing a lead director (or expanding the authority of an already-present

[12] A prominent illustration of this is the experience of Bank of America in 2009. At the annual shareholder meeting in April 2009, a majority of shareholders voted in favor of a binding bylaw proposal to separate the CEO and Chair. As a result, CEO Kenneth Lewis was stripped of the Chair title and effectively forced to resign by year end.
[13] SEC Release No. 33-9089, published in the *Federal Register* on December 23, 2009 (74 FR 68334).

lead director) to deflect shareholder scrutiny and remedy any perceived lack of board independence.[14]

Figures 1 and 2 show the incidence of lead director roles among firms with a combined CEO/Chair and firms with a separate CEO/Chair. The time period covered by Figure 1 includes all years prior to the second (SEC) reform, while Figure 2 covers years after the first (ISS) reform. As Figure 1 indicates, lead director roles were virtually nonexistent prior to 2003: only eight firms with a combined CEO/Chair structure also had a lead director in 2002. However, the appointment of lead directors among firms with a CEO/Chair exhibited a sharp increase over the next two years, rising to 64 cases in 2003 and then to 200 cases in 2004. Subsequently, the trend leveled out and exhibited a gradual, steady rise. Among firms with separate CEO/Chair roles, there was only one lead directorship in 2002, increasing to two in 2003 and then to 16 in 2004. After 2004, the growth continued at a steady rate slightly below the rate of increase for combined CEO/Chair firms.

Figure 2 shows that the use of lead directors experienced a sharp, above-trend increase around the SEC reform, but only for firms with a combined CEO/Chair. Between 2009 and 2010, the number of lead directorships among this group of firms rose from 328 to 496, after which it stabilized around 500. In contrast, firms with a separate CEO and Chair did not seem to experience any meaningful break in trend during 2009-2010. These patterns provide support for our premise that the increase in lead directors during 2009-2010 was driven in large part by the rule change that, *a priori*, placed a meaningful pressure on many firms with a combined CEO/Chair.

[14] This is supported anecdotally by the views of market participants. For instance, the *Wall Street Journal* quotes Jeffrey Stein, senior partner in the corporate governance group at law firm King and Spalding LLP, regarding the new SEC requirement: "[The new requirement] has prompted many boards to enlarge the duties of their lead directors." (Lublin, (2010)).

In Figures 3 and 4, the number of firms in the sample assigning at least one lead director duty within each of the six major duty categories is graphed. We see that some of the categories exhibited more growth than others over time, but all categories experienced sharp, above-trend increases in the two year periods around the ISS reform (2003-2004) and the SEC reform (2009-2010).

Overall, we can draw two main conclusions from the figures. First, the frequency of lead directorships showed a large, immediate post-reform increase for firms with combined CEO/Chairs but not for firms with separate CEO/Chairs. This pattern is consistent with our premise that the reforms did indeed prompt some firms to alter their leadership structures. Second, individual categories of duties assigned to lead directors generally increased sharply around the two reforms.

4.2.1 Differences-in-Differences

Before proceeding to our main instrumental variables approach, we provide differences-in-differences (DID) estimates of the effects of the ISS and SEC reforms on board independence (as proxied for by the performance-sensitivity of forced CEO turnover). To implement this approach, we define a treated group of firms to be those firms that have a combined CEO/Chairman but no lead director in the year prior to reform. Control firms are defined as those firms with a separate CEO/Chairman in the year prior to each shock.[15] The effect of adopting a lead director on CEO turnover-performance sensitivity is identified by the difference in the pre- versus post-reform

[15] We do not include in the control group those firms that have a combined CEO/Chairman as well as a lead director in the latest pre-shock year. The reason for not including these firms as controls is that many of them likely increased the assigned lead director duties in response to the ISS policy change and the SEC amendment.

change in turnover-performance sensitivity between the two groups. We estimate the following linear probability model for each of the shocks:

$$Turnover_{i,t+1} = \alpha + \delta Treated_i * Post_t + \beta Treated_i * Post_t * R_{i,t} + \varphi\, Treated_i * R_{i,t} + \gamma' X_{i,t} + \lambda_i + \lambda_{,t} + \varepsilon_{i,t} \quad (2)$$

Our main interest is in β, the coefficient on the triple interaction term. The variable $Treated_i$ equals one if the firm i had combined CEO and Chairman but did not have a lead director in the latest pre-shock year. $Post_t$ is an indicator for the post-treatment period. In the case of the ISS reform, $Post_t$ equals one for fiscal years ending December 2003 or later. For the SEC reform, $Post_t$ equals one for fiscal years ending December 2009 or later. To permit a clean analysis of the two shocks separately, we restrict the sample period to 2000-2008 for the first shock and 2005-2014 for the second shock.

Table 4 presents the results from the DID regression. In columns (1) and (2), we define the treated group and control group based on the 2004 ISS policy change. In column (1), we control for stock return and firm size. The coefficient on the interaction term is negative and significant at 5%. In Column (2), we introduce as additional controls CEO characteristics and board characteristics. The coefficient on the interaction remains negative and significant. The negative coefficients in the first two columns indicate that, after the 2004 ISS policy change, forced CEO turnover-to-performance sensitivity did increase for firms with a combined CEO and Chairman previous to the shock. Column (3) and (4) repeat the same test with the 2010 SEC rule change. Estimates on the interaction coefficient in Columns (3) and (4) are also negative and statistically significant, confirming that the shocks were followed by enhanced board independence. Although the interaction of *Treated* and *Post* is not of primary interest, it is positive and significant in all

four columns in Table 4. This indicates that, for firms with a combined CEO/Chairman but no lead director at the time of the shock (treated group), the pre-to-post increase in the rate of forced CEO turnover was higher than the baseline increase experienced by other firms (control group).

A disadvantage of our DID test is that it cannot help us to identify the exact mechanism by which board independence improves. For example, in addition to requirements pertaining to lead directors, the 2010 SEC rule change also required enhanced disclosures on compensation consultants, stock and option awards for executives, and the board's role in risk oversight. One or more of these other rule changes could also be partly responsible for changes to turnover-performance sensitivity. While our DID approach does not allow us to draw firm conclusions about the main channel of effect, it nevertheless reveals an increased CEO turnover-to-performance sensitivity for the group of firms that were ostensibly affected by the provisions relating to lead directors.

4.2.2 Instrumenting for the Presence of a Lead Director

In this section, we use the two reform shocks as the basis for an instrumental variables approach to help identify the causal effects of lead directors. Because the reforms induced some firms to rationally alter their leadership structures but did not mandate such changes, we are effectively carrying out an "encouragement design", which is a commonly-used approach for examining causal effects of a change in behavior.[16]

To implement the IV approach, we define control firms as those firms that have a separate CEO and chairman in the year before the shock. Treated firms are defined as those firms that have

[16] Examples of recent papers in finance that use shock-based encouragement designs include Duchin, Matsusaka and Ozbas (2010), Dharmapala, Foley, and Forbes (2011), Perez-Gonzalez and Yun (2013), Giannetti, Liao, and Yu (2015), and Norli, Ostergaard, and Schindele (2015). For a general survey of papers that use shock-based IV methods in corporate finance, see Atanasov and Black (2016).

a combined CEO/Chair but no lead director in the latest pre-shock year.[17] For each of the two experiments, we estimate the following first-stage regressions:

$$LeadDirector_{i,t+1} = \alpha_1 + \beta_1 Treatment_{i,t} + \gamma_1' X_{i,t} + \lambda_{i,1} + \lambda_{t,1} + \varepsilon_{i,t,1} \quad (3)$$

$$LeadDirector_{i,t+1} * R_{i,t} = \alpha_2 + \beta_2 Treatment_{i,t} * R_{i,t} + \gamma_2' X_{i,t} + \lambda_{i,2} + \lambda_{t,2} + \varepsilon_{i,t,2}$$

where *Treatment* is the product of two dummy variables *Treated* and *Post*. As before, *Post* is a binary variable equal to one for fiscal years ending after December 2003 for the first shock and after December 2009 for the second shock. Note that the equations in (3) do not include *Treated* and *Post* individually because these terms are absorbed by year fixed effects and firm fixed effects. We expect the coefficient ω to be positive since both the ISS reform and the SEC reform should increase the probability that a treated firm will designate a lead director. Once again, we distinguish the two shocks by restricting the sample period to 2000-2008 for the first shock and 2005-2014 for the second shock.

Table 5 presents the results of the first stage regressions. In Column (1), the ISS policy change in 2004 is found to have a positive effect on the probability of having a lead director. The coefficient of the treatment variable is also economically significant. For instance, all else equal, there is a 12.5% probability that a treated firm with combined CEO-Chairman will adopt the role of lead director after the ISS policy change. In Column (2), we use the interaction of the ISS policy change and the stock return to instrument the interaction between the presence of a lead director and the stock return. Column (3) and column (4) repeat the previous test with the second

[17] We do not include in the control group firms that have a combined CEO and Chairman as well as a lead director. The rationale for excluding such firms is that even companies that already have a lead director role could be induced by the shock to further increase the duties assigned to that role.

shock the 2010 SEC rule change. The results in Column (3) and (4) are similar to the results in the first two columns. Firms with a combined CEO-Chairman are 31.2% more likely to adopt the role of lead director after the SEC rule change. In the last two columns of Table 5, we estimate a combined model over the entire sample period. The estimates show that the two shocks together are effective in encouraging firms to adopt the role of lead director.

Overall, the results in Table 5 confirm that the two shocks have meaningful effects, both individually and combined, on firms' use of a lead director.

4.2.3 Results from Instrumental Variables Estimation

Having established that shocks did induce many firms to use lead directors, we now turn to the main instrumental variables analysis. Table 6 presents the results of our second-stage regressions as specified by Equation (1), where *LD* is instrumented by *Post*Treated* as described above. In Column (1) of Table 6, we first report the results of a baseline OLS regression. The interaction between lead director and stock return is not statistically different from zero (t-value = -0.84). The industry-adjusted stock return is negative and significant, indicating that the better the firm's performance, the lower the probability of a forced CEO turnover. Next, we estimate the 2SLS regressions in Columns (2) through (4) in Table 6. Consistent with our hypothesis, Lead Director × Adj. stock return is found to be negative and statistically significant at 1% in all three specifications. The coefficients are also economically significant. When we instrument the presence of a lead director using the ISS policy change in Column (2), the coefficient of the interaction term is -0.153. This indicates that, compared to other firms, a firm with a lead director will have a 1.53% increase in the probability of forced CEO turnover if the stock return of the

firm decreases by 10%. In economic terms, this is a large effect compared with the 3.3% sample mean rate of forced CEO turnover.

Although our main interest is in the coefficient of the interaction term, the coefficient on the lead director indicator is also worth noting. In Columns (2) through (4), the coefficient is positive and statistically significant. This indicates that the overall level of forced CEO turnover increases after a firm adopts the role of lead director. The fact that the level of forced CEO turnover is non-decreasing with the lead director indicator enables us to infer that turnover-performance sensitivity is rising because boards are becoming more willing to dismiss the CEO after bad performance, not because CEOs are becoming less likely to leave their firm after good stock performance.

Our results on the control variables are economically reasonable and largely consistent with the previous literature. The industry-adjusted return is negatively related with the likelihood of forced CEO turnover (marginally significant in column (2) and significant in columns (3) and (4)), in line with the findings of Jenter and Kanaan (2015) and Peters and Wagner (2014).

4.2.4 Comparability of Treatment and Control Samples

We show above that having a lead director increases CEO turnover-performance sensitivity. However, the decision whether to combine or separate the CEO and Chairman roles could be endogenously determined by firm characteristics. In Panel A of Table 7, we report the summary statistics of the firm characteristics for the treated group and control group at the pre-shock year. The asterisks in columns (2) and (4) indicate that the corresponding characteristic of the control firms is statistically different with the treated firms. In both shocks, the control firms are smaller in size and have younger CEOs. For the ISS policy change, the treated firms also have CEOs with

longer tenure and larger board. Thus, there is reason to believe that differences in firm characteristics could be driving different choices of board leadership.

To mitigate the potential bias, we implement a propensity score matching method. Specifically, we first estimate a logit model to predict the likelihood that a firm is in the treatment group. In other words, for each of the two pre-shock years, we estimate the probability that a firm has a combined CEO/Chairman but no lead director as opposed to a separate CEO/Chair. Using the predicted log odds, we use a 1:1 nearest-neighbor match to generate the control sample. That is, for each treated firm, we choose one firm from the control group that has the closest propensity score. This procedure enables us to have a match for each of the treated firms. Finally, as our treated group has many more observations than the control group (885 vs 248 for the ISS policy change and 673 vs 597 for the SEC rule change), we do not drop the control firm from the matching pool after identifying a match. Panel B of Table 7 compares the firm characteristics of the treated sample and control sample after the propensity score matching. It is evident that the matching results in a high degree of similarity between the two samples: none of the mean differences among the main firm characteristics is significant at the 10% level.

Table 8 reports the effect of lead directors on turnover-performance sensitivity estimated with the propensity score matched samples. The interaction between lead director and performance is still negative and statistically significant for either the two reform experiments. The coefficients are comparable with results reported in Table 6. Although the coefficient on the lead director indicator is not statistically significant, the fact that it is not negative allows us to conclude that lead directorships increase the performance-sensitivity of forced CEO turnover.

5. Channels of Effect

In this section, we explore possible channels of effect by analyzing data from SEC proxy filings on the specific duties assigned to lead directors. Based on the total of 27,789 assigned duties in the sample, we identify 33 different types, which we divide into six major categories: (1) Meeting/agenda control; (2) Information flow; (3) Shareholder contact; (4) Oversight of management; (5) Oversight of the board; and (6) Retention of outside experts. (Appendix Table A1 shows a detailed classification of duty types.) We create a raw index for each category by summing up the total number of duties present in that category for a given firm-year. Panel A, Table 9 reports the maximum possible index level for each category and provides summary statistics for observed index levels (as percentages of the maximum possible).

To obtain standardized indices, we subtract from each index its mean level in the sample and then divide by its standard deviation. This results in six standardized indices with zero mean and unit variance: *INFO*, *MEET*, *SHHD*, *MGMT*, *BOARD*, and *RETAIN*. We also form *TOTAL*, a standardized index that captures the total number of assigned duties in a given firm-year. Panel B shows pairwise correlations for the standardized index values. Most of the pairwise correlations are relatively small in magnitude. There are, however, two pairwise correlations that are high: the correlation between *INFO* and *MEET* (0.587) and the correlation between *MGMT* and *BOARD* (0.414). These correlations are sufficiently high that we expect multicollinearity to be a concern when estimating regressions with all of the indices included as covariates.

5.1 Two-Stage Least Squares Estimation

An initial attempt at studying the effects of the six categories of duties is to use two-stage least squares (2SLS) to estimate the following regression model:

$$
\begin{aligned}
Turnover_{i,t+1} = {} & \alpha + \beta_{INFO} INFO_{i,t} + \delta_{INFO} INFO_{i,t} * R_{i,t} \\
& + \beta_{MEET} MEET_{i,t} + \delta_{MEET} MEET_{i,t} * R_{i,t} \\
& + \beta_{SHHD} SHHD_{i,t} + \delta_{SHHD} SHHD_{i,t} * R_{i,t} \\
& + \beta_{MGMT} MGMT_{i,t} + \delta_{MGMT} MGMT_{i,t} * R_{i,t} \\
& + \beta_{BOARD} BOARD_{i,t} + \delta_{BOARD} BOARD_{i,t} * R_{i,t} \\
& + \beta_{RETAIN} RETAIN_{i,t} + \delta_{RETAIN} RETAIN_{i,t} * R_{i,t} \\
& + \varphi R_{i,t} + \gamma' X_{i,t} + \lambda_i + \lambda_t + \varepsilon_{i,t}
\end{aligned}
\quad . \qquad (4)
$$

In principle, 2SLS with the twelve IVs should yield consistent estimates of the twelve duty-related coefficients. However, as shown earlier in Table 9, high correlations likely exist among the six indices. In addition to this, the six interaction terms in (4) are likely to be highly correlated with each other because each index is interacted with a common performance measure. Thus, as a practical matter, a regression based on (4) would likely suffer from multicollinearity and would have low power with which to estimate the effects of various duties.

Alternatively, it is possible to naïvely estimate six separate 2SLS regressions and attempt to draw conclusions about the effects of each category of duty:

$$
\begin{aligned}
Turnover_{i,t+1} = {} & \alpha_{INDEX} + \beta_{INDEX} INDEX_{i,t} + \delta_{INDEX} INDEX_{i,t} * R_{i,t} + \varphi_{INDEX} R_{i,t} \\
& + \gamma'_{INDEX} X_{i,t} + \lambda_{INDEX,i} + \lambda_{INDEX,t} + \nu_{INDEX,i,t}
\end{aligned}
\qquad (5)
$$

where $INDEX \in \{INFO, MEET, SHHD, MGMT, BOARD, RETAIN\}$. The advantage of studying each index separately is that we can sidestep multicollinearity problems. The disadvantage, of course,

is that excluding some indices and their interactions from the regressions creates an omitted variables problem, leading to biased and inconsistent estimates of the true causal effects.

To proceed with the naïve approach of estimating either (4) or (5) via 2SLS, we require instrumental variables for the 12 endogenous variables (six indices plus their interactions with stock performance). We construct instruments by interacting a post-shock indicator with "exposure" indicators that capture whether a firm had no duties in certain categories at the time of the shock. (This approach is analogous to the one used in Section 4.2.2 to instrument for the presence of a lead director role.) Specifically, for each major duty category $D \in \{INFO, MEET, SHHD, MGMT, BOARD, RETAIN\}$, we generate a "zero duties" indicator, $ZERO_D$, that equals 1 if and only if a firm has no duties within category *D* at the time of the shock. Then, we define instruments $A_D \equiv ZERO_D * Post$, $B_D \equiv ZERO_D * Post * R$. This yields a total of 12 instruments for the 12 variables of interest.

Table 10 shows the results of the naïve regressions. In these regressions, the control group consists of firms with a separate CEO and Chair in the latest pre-shock year, while the treated group is defined as firms with a combined CEO/Chair in the latest pre-shock year.[18] Each regression includes firm fixed effects. In addition, each regression includes group-specific year effects, i.e., a full set of year dummies for the treated group as well as the control group. Errors are clustered at the firm level. Also, each regression includes the control variables used in Table 6: *Log(Assets)*, *Log(CEO age)*, *Log(CEO tenure)*, *Independent board*, *Log(Board size)*, and *Combined CEO/Chair*.

[18] Note that this definition of treated firms differs from the definition used earlier in Tables 2 through 6. Here, we do not need to require that a treated firm lacks all lead director duties at the time of a shock. Indeed, identification of the model comes from the fact that many firms have nonzero duties in some categories while at the same time are completely lacking in other categories.

Columns (1) through (6) report 2SLS estimates from the simplified regressions given by (5). Panel A is based on the ISS policy change (2000-2008), while Panel B is based on the SEC rule change (2005-2014). For the ISS policy change, five of the six duty categories have a significant, negative coefficient estimate for the index-performance interaction (the exception is $RETAIN*R$ which has a negative, insignificant estimate). In Panel B, $INFO*R$, $MEET*R$, $BOARD*R$, and $RETAIN*R$ have negative and significant estimates; the other two interactions have insignificant estimates.

Column (7) of each panel in Table 10 reports the results of the naïve 2SLS regression of the model in (4). As expected, for both the ISS shock and the SEC shock, the coefficient estimates for the index levels and interactions are all insignificant. Evidently, the multicollinearity severely limits the power of this regression to detect forced turnover effects of individual duties or their interactions. This shows that multicollinearity and omitted variables inconsistency create a two-pronged dilemma that is difficult to resolve. On the one hand, a full model that includes all explanatory variables as in Column (7) yields weak and unreliable estimates. On the other hand, focusing on indices one-at-a-time as in Columns (1)-(6) could lead to estimates that overstate or understate the effects of individual duty categories.

5.2 Addressing Multicollinearity and the Omitted Variables Problem

To overcome the twofold problem of multicollinearity and omitted variables inconsistency, we use a new method of estimation in which we modify the initial instrumental variables to make them suitable as instruments for much simpler regressions that consider one individual duty type (alongside its interaction with performance) at a time. These simplified regressions enable us to

examine each index's impact on turnover-performance sensitivity in isolation from the effects of all other indices.

We illustrate our method with the *INFO* index (a similar approach applies to each of the other five indices). Suppose we would like to estimate the following short-form regression over the time period corresponding to one of the exogenous reforms:

$$Turnover_{i,t+1} = \alpha + \beta_{INFO} INFO_{i,t} + \delta_{INFO} INFO_{i,t} * R_{i,t} + \varphi R_{i,t} + \gamma' X_{i,t} + \lambda_i + \lambda_t + \eta_{i,t}. \quad (6)$$

The problem with the naïve 2SLS approach used in Column (1) of Table 10 is that the error term $\eta_{i,t}$ in (6) consists of more than just $\varepsilon_{i,t}$: it also includes omitted variables (i.e., other indices and their interactions) that are correlated with the initial instruments A_{INFO} and B_{INFO}. In particular, the two reform shocks that constitute the basis for constructing A_{INFO} and B_{INFO} likely drive a common increase in *MEET*, *SHHD*, *MGMT*, etc., not just $INFO$. Thus, there is an omitted variables problem that is not solved by the initial instruments. In other words, a naïve approach of applying 2SLS to (6) with A_{INFO} and B_{INFO} as "instruments" for $INFO$ and $INFO * R$ would give inconsistent estimates of β_{INFO} and δ_{INFO}.

Nevertheless, it is possible to overcome this problem of omitted variables if we have valid instruments for $INFO$ and $INFO * R$ that are uncorrelated with $\eta_{i,t}$. We proceed to construct "refined" instruments that are indeed uncorrelated with $\eta_{i,t}$ but still correlated with $INFO$ and $INFO * R$. The construction involves a two-step process:

Step 1. Regress each of *INFO* and $INFO * R$ on the 10 initial "non-*INFO*" instruments defined in Section 5.1 ($A_{MEET}, B_{MEET}, \ldots, A_{RETAIN}, B_{RETAIN}$) and calculate the fitted values:

$$\widehat{INFO} = \alpha_{MEET}A_{MEET_{i,t}} + \alpha_{SHHD}A_{SHHD_{i,t}} + \alpha_{MGMT}A_{MGMT_{i,t}} + \alpha_{BOARD}A_{BOARD_{i,t}} + \alpha_{RETAIN}A_{RETAIN_{i,t}} + \gamma_{MEET}B_{MEET_{i,t}} + \gamma_{SHHD}B_{SHHD_{i,t}} + \gamma_{MGMT}B_{MGMT_{i,t}} + \gamma_{BOARD}B_{BOARD_{i,t}} + \gamma_{RETAIN}B_{RETAIN_{i,t}} \quad (7a)$$

$$\widehat{(INFO * R)} = \mu_{MEET}A_{MEET_{i,t}} + \mu_{SHHD}A_{SHHD_{i,t}} + \mu_{MGMT}A_{MGMT_{i,t}} + \mu_{BOARD}A_{BOARD_{i,t}} + \mu A_{RETAIN_{i,t}} + \lambda_{MEET}B_{MEET_{i,t}} + \lambda_{SHHD}B_{SHHD_{i,t}} + \lambda_{MGMT}B_{MGMT_{i,t}} + \lambda_{BOARD}B_{BOARD_{i,t}} + \lambda_{RETAIN}B_{RETAIN_{i,t}} \quad (7b)$$

Step 2. Regress A_{INFO} on the fitted value $\widehat{INFO}$ and compute the resulting residual, $\tilde{A}_{INFO}$. Similarly, regress B_{INFO} on the fitted value $\widehat{INFO * R}$ and compute the residual, $\tilde{B}_{INFO}$.

In Appendix C, we give a detailed argument justifying why $\tilde{A}_{INFO}$, $\tilde{B}_{INFO}$ constructed above are indeed uncorrelated with $\eta_{i,t}$ and are, therefore, suitable IVs for consistently estimating β_{INFO} and δ_{INFO} in equation (6). The basic idea behind our procedure is that it serves to purge the initial instruments A_{INFO}, B_{INFO} of the effects of unwanted correlations among duties arising from a common reform shock. By "residualizing" A_{INFO} and B_{INFO} in a certain way, we ensure that the resulting instruments $\tilde{A}_{INFO}$ and $\tilde{B}_{INFO}$ are uncorrelated with each of the non-*INFO* duties contained in $\eta_{i,t}$.

Table 11 reports our 2SLS estimates of the effects of lead director duties on CEO turnover-performance sensitivity. Once again, the control group is defined as firms with a separate CEO and Chair in the latest pre-shock year, and the treated group is defined as firms with a combined CEO/Chair in the latest pre-shock year. In Panel A, we present the effect of each duty using the 2004 ISS policy change to form our initial instruments. The results show that all six duties have a negative and statistically significant effect on sensitivity of CEO turnover to performance. These results are consistent with the view that, in the earlier part of the sample period, all major aspects of a lead director's role can affect monitoring. For example, the negative coefficients on *INFO* and *MEET* suggest that, by reviewing materials sent to the board, previewing CEO and board decisions, and controlling meeting agendas and schedules, the lead director can constrain a combined CEO/Chair's ability to withhold critical information or shape meeting agendas in self-serving ways. At the same time, by calling board meetings and wielding the sole right to call executive sessions, a lead director helps promote communications among outside directors, ensuring that the board can act quickly and decisively to address poor performance.

The negative coefficient for *SHHD* indicates that making the lead director the sole shareholder contact for the board or for the independent directors enhances the performance-sensitivity of forced CEO turnover. Our interpretation of this result is that, if communications are funneled to the board through an independent, non-management director, shareholders will be more willing to convey their frank opinions about management. Also, a requirement that shareholder opinions must be communicated directly to the lead director makes it harder for top management to distort or suppress opinions from shareholders.

In addition to assessing statistical significance of the individual causal effects, we are interested in their economic magnitudes as revealed by the estimated coefficients. Results in table

10 indicate that the latter three duties, *MGMT*, *BOARD*, and *RETAIN*, have more economically significant effects on turnover sensitivity than the first three duties. These findings are consistent with the effects hypothesized in Section 2. Assigning a single outside director the duty to oversee management appears to strengthen monitoring by the board, perhaps by improving coordination and cohesion among board members. Tasking the lead director with the recruitment and evaluation of other board members also seems to improve monitoring. Finally, out of all of the duties, the authority to retain outside experts and consultants appears to play the most important role. This indicates that the ability to hire outside consultants has a sizable effect on turnover sensitivity, perhaps because outside consultants can help lower the costs of finding and recruiting suitable replacement CEOs.

Next, Panel B shows the effect of each duty category using the SEC rule change for identification. For *INFO*, *MEET*, and *RETAIN*, the results are qualitatively the same. However, *SHHD*, *MGMT*, and *BOARD* no longer have statistically significant coefficient estimates on their interaction terms. One possible explanation for why *SHHD* no longer seems to affect CEO turnover sensitivity is that, in the more recent time period, shareholders have more alternative channels by which they can voice their concerns and agitate for change (e.g., through activist campaigns, proxy fights, traditional news media, or social media). A possible explanation for the lack of causal effect of *MGMT* and *BOARD* duties is that nominating committees might be participating more in the oversight of management and the board in recent years, and thus lead directors' oversight duties might have only a limited incremental effect.

Finally, we note that effects of the various the duties are economically significant when viewed in terms of turnover probabilities. For example, given a hypothetical stock performance drop in the earlier period from the 75th to the 25th percentile, the probability of forced CEO

turnover increases by 3.1 percentage points for a one standard deviation rise in related to meeting and agenda control. For the same hypothetical performance drop, the probability of forced CEO turnover increases by 3.4 percentage points if information flow duties increase by one standard deviation, and the probability increase is 3.2 percentage points if shareholder contact duties increase by one standard deviation. For the latter time period, our estimates imply that, for a hypothetical 75^{th} to 25^{th} percentile drop in stock performance, a one-standard-deviation increase duties related to information flow, meeting/agenda control, or retention of outside experts causes a 1.6, 1.5, and 4.9 percentage-point increase, respectively, in the probability of forced CEO turnover.

6. Conclusion

Recent years have seen a dramatic shift in board leadership structures of U.S. public firms whereby many of the duties traditionally held by board chairs have been ceded to one designated outside director, a so-called lead director. Most observers and market participants have welcomed the rise of lead directors, citing their potential ability to provide a check on the power of CEO/Chairs. Yet, surprisingly little is known about whether lead directors actually do enhance board independence and, if so, how.

In this paper, we use a unique, hand-collected dataset covering S&P 1500 firms over 2000-2015 to provide empirical evidence on the impact of lead directors on board independence. We focus on one important proxy for board independence: the sensitivity of forced CEO turnover to stock performance. To overcome endogeneity problems, we use a propensity score matched sample to estimate panel regressions that control for firm, board, and CEO characteristics as well as time effects and firm fixed effects. We also estimate the causal effect of lead directors by

exploiting two quasi-natural experiments that led to sharp increases in the use of lead directors and their duties. Our results show that the presence of a lead director has a strong effect on the performance-sensitivity of forced CEO turnover, leading to more effective monitoring.

With our data on the specific duties and responsibilities assigned to lead directors, we are also able to explore the channels through which forced CEO turnover is affected. We use a new econometric approach to address multicollinearity and omitted variable problems. Under this approach, an initial set of instrumental variables is adjusted to account for between-duty correlations induced by a common reform shock. This gives rise to a set of "refined" instruments that are purged of unwanted correlation with any duties omitted from a regression. When we employ this approach to estimate causal effects, we find that three categories of duties emerge as being particularly important: (1) control over information flow; (2) control over meetings and agendas; and (3) authority to retain outside experts. Overall, our findings suggest that a lead director who is empowered by these types of duties can serve as an effective counterweight to CEO/Chair power.

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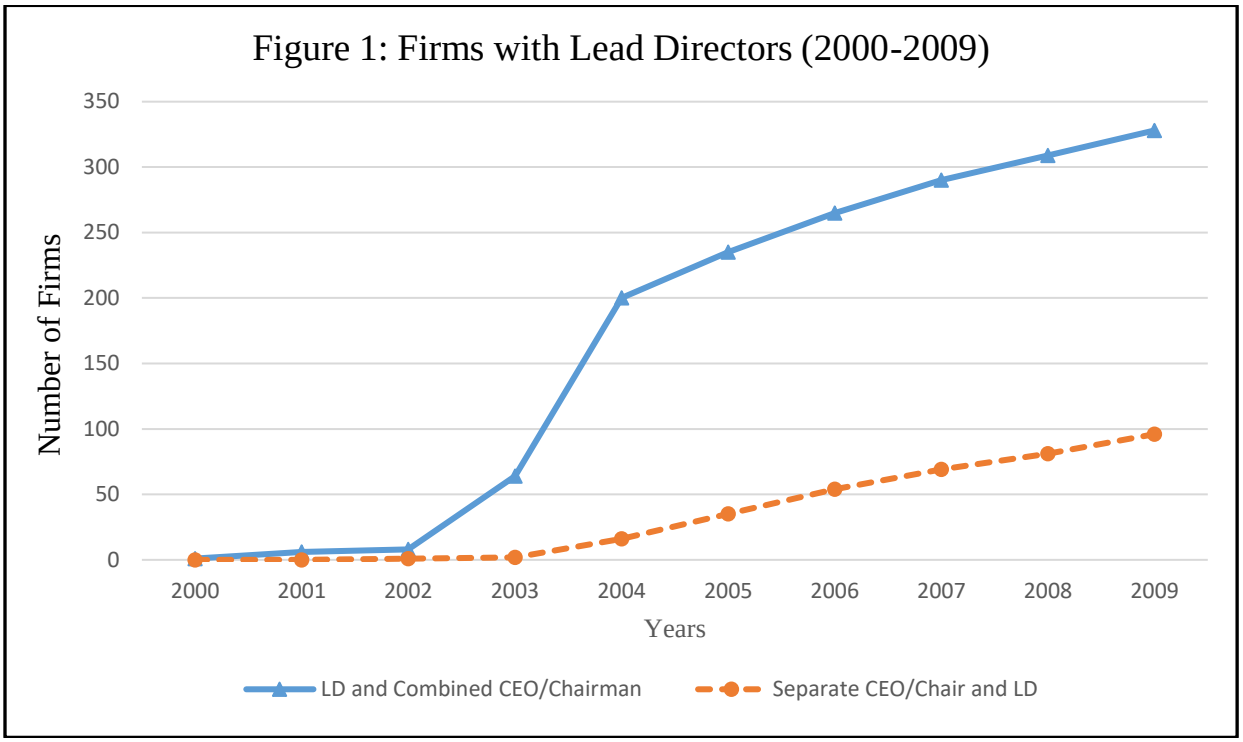
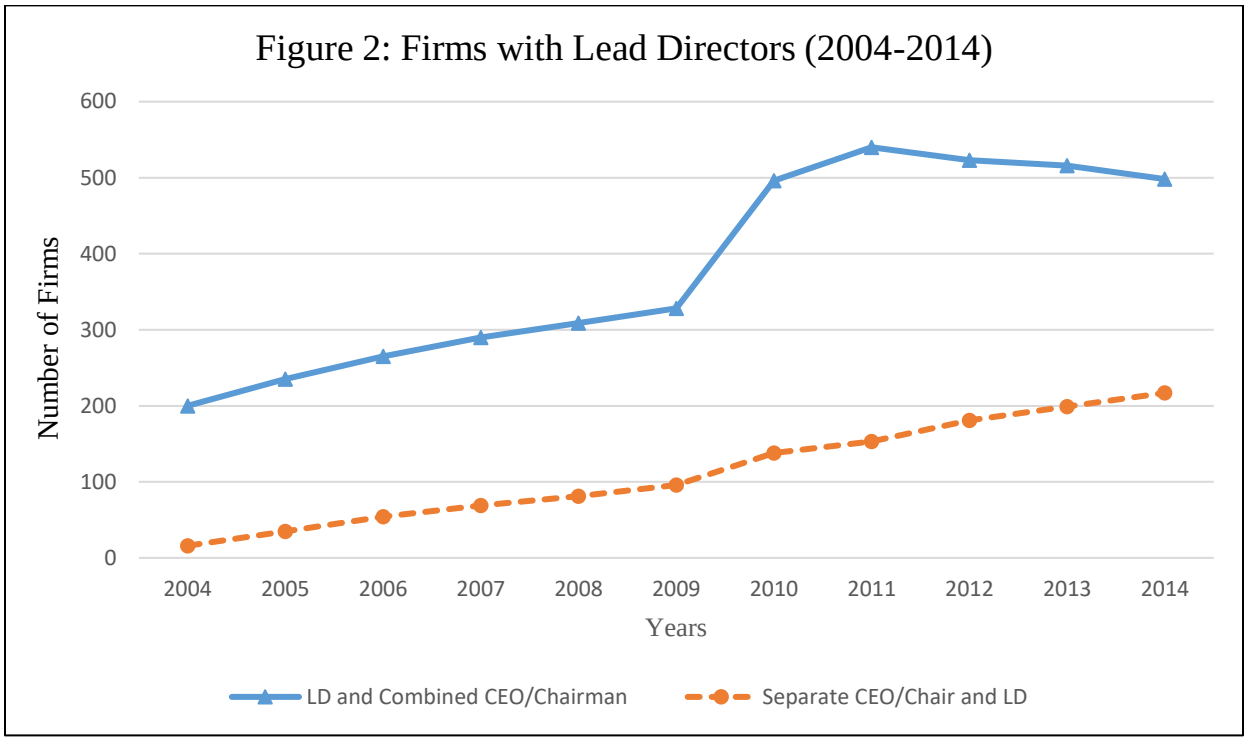


Figure 1: This figure shows the use of lead directorships during 2000-2009 by S&P 1500 firms with different types of CEO/Chair leadership structure. The solid line represents the number of firms with a combined CEO/Chair and a lead director. The dashed line represents the number of firms with a separate CEO/Chair and a lead director.



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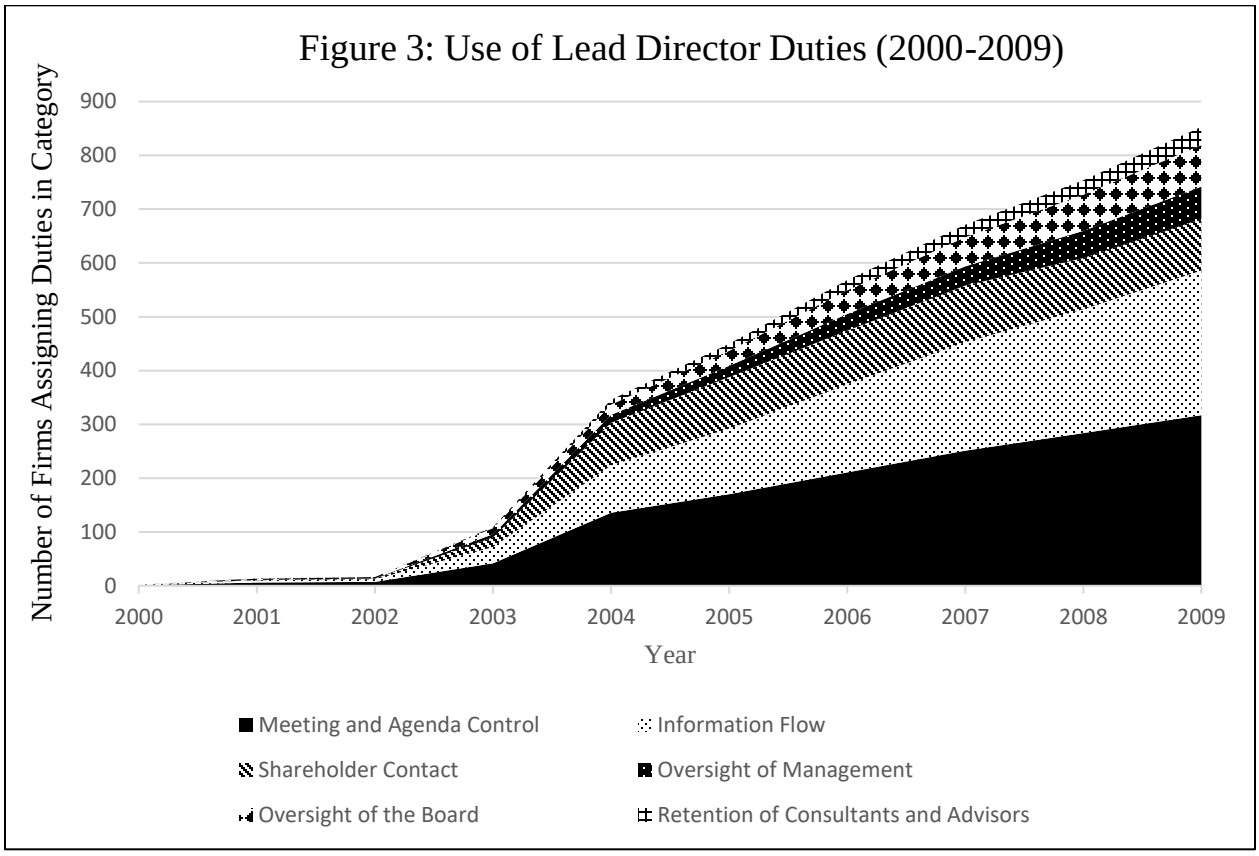

Figure 3: This figure shows the incidence of lead director duties at S&P 1500 firms during 2000-2009. Data on assigned duties are from SEC proxy and 10-K filings. Duties are categorized into six broad functional areas as detailed in Table A1. The vertical distances between graphs represent the numbers of firms assigning at least one duty in a specific category during the year.

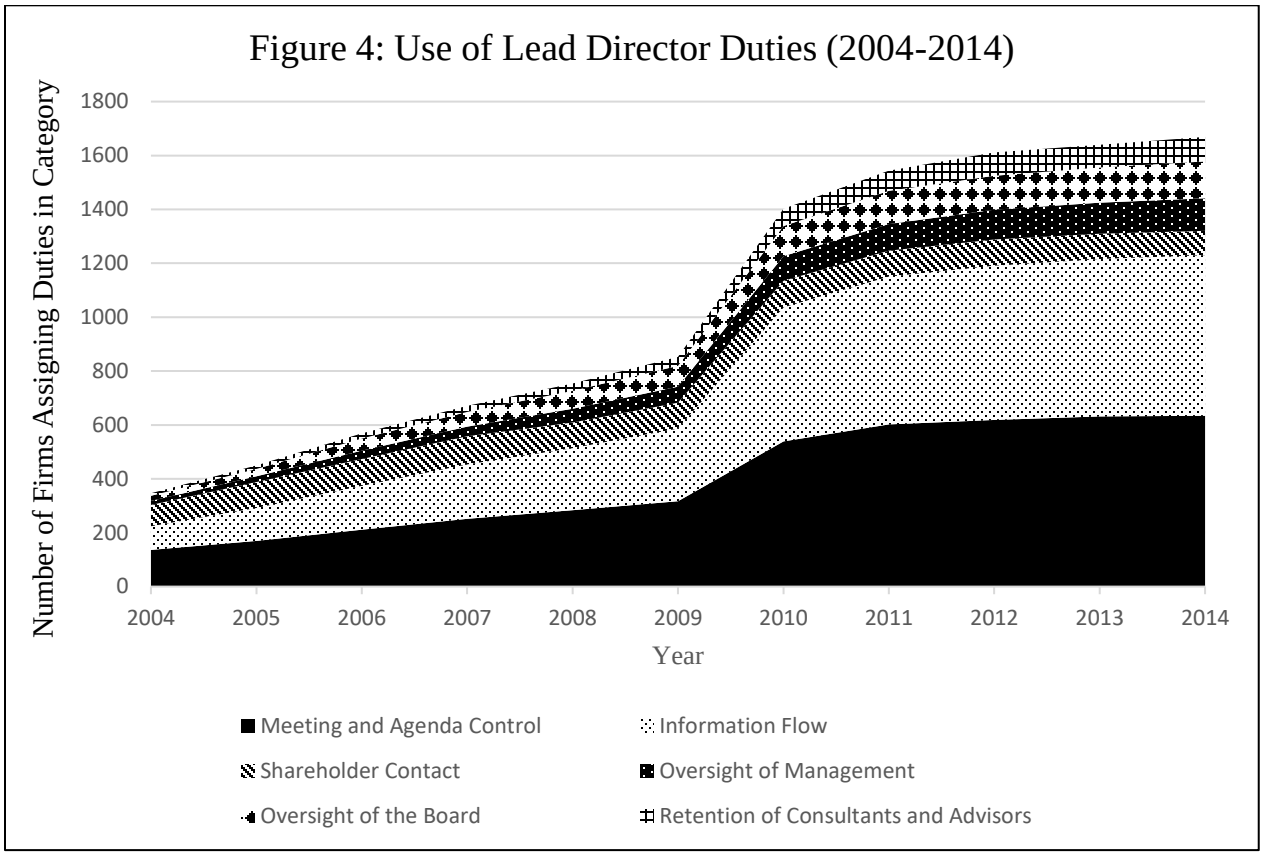

Figure 4: This figure shows the incidence of lead director duties by sample firms during 2004-2014. Data on assigned duties are from SEC proxy and 10-K filings. Duties are categorized into six broad functional areas as detailed in Table A1. The vertical distances between graphs represent the numbers of firms assigning at least one duty in a specific category during the year.

Table 1: Summary Statistics

This table reports summary statistics for the sample. Panel A shows statistics for 20,950 firm-year observations during the sample period, which covers fiscal years 2000 through 2014. Stock returns are 12-month total returns, net of the median 2-digit SIC return, as described in the text. The existence of a lead director is measured on the basis of whether one or more lead director duties is present. Forced CEO turnover is measured from *Execucomp* based on whether the CEO departs the firm and is less than 56 years of age. In Panel B, statistics are reported for directors on the boards of sample firms. Data on individual directors are drawn from *BoardEx*. Panel C reports statistics on the characteristics of lead directors (from *BoardEx* data) and on the duties assigned to lead directors. Data are from CRSP, Compustat, SEC filings, and *BoardEx*.

Panel A: Firm Characteristics				
	Obs.	Mean	Median	S.D.
Total assets ($M)	20,945	7,372.6	1,402.7	29,510.9
Market capitalization ($M)	20,871	8,261.2	1,480.2	28,140.5
Lead director	20,950	0.32	0	0.47
Combined CEO/Chair	20,950	0.66	1	0.47
Lead director and combined CEO/chair	20,950	0.24	0	0.43
Industry-adjusted stock return	20,634	0.12	0.037	0.68
Board size	20,950	8.99	9	2.31
Independent directors (%)	20,950	74.58	77.78	15.70
Forced CEO turnover	20,950	0.033	0	0.18
Panel B: Director Characteristics				
	Obs.	Mean	Median	S.D.
Age	188,518	60.42	61	8.91
Tenure	188,677	8.59	6.4	7.98
Lead director role	188,841	0.034	0	0.18
Number of outside seats	188,841	0.71	0	1.08
Outside CEO role	188,841	0.052	0	0.23
Outside board chair role	188,841	0.082	0	0.30

Table 1, continued

Panel C: Lead Director Characteristics and Duties				
	Obs.	Mean	Median	S.D.
Age	4,495	65.15	66	7.57
Tenure	4,500	11.56	10.4	6.91
Number of outside seats	4,500	0.99	1	1.17
Outside CEO role	4,500	0.057	0	0.24
Outside board chair role	4,500	0.144	0	0.39
Number of duties:				
Agenda and meeting control	6,705	0.821	1	0.384
Information flow	6,705	0.733	1	0.443
Shareholder contact	6,705	0.181	0	0.385
Oversight of management	6,705	0.146	0	0.353
Oversight of the boards	6,705	0.177	0	0.381
Retaining advisors and consultants	6,705	0.103	0	0.303

Table 2: Lead Directors and Differences in Firm and CEO Characteristics

This table reports summary statistics for the subsamples by whether a firm has a functional director from fiscal years 2000 through 2014. The existence of a lead director is measured on the basis of whether one or more lead director duties is present. Column 1-3 show summary statistics for firms without lead directors and Column 4-6 show summary statistics for firms with lead directors. Column 7 reports differences in means, and Column 8 reports t-statistics for differences in means. Stock returns are 12-month total returns, net of the median 2-digit SIC return, as described in the text. Forced CEO turnover is measured from *Execucomp* based on whether the CEO departs the firm and is less than 56 years of age. Data are from CRSP, Compustat, SEC filings, and *BoardEx*.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Lead Director = 0			Lead Director = 1			Diff. in	
Variables	Mean	Median	SD	Mean	Median	SD	Means	T-Stat
Total asset ($M)	4,691	4,691	18,845	13,071	13,071	43,808	-8380.1***	-19.34
Market capitalization ($M)	5,779	5,779	23,052	13,509	13,509	36,087	-7730.0***	-18.68
Board size	8.736	8.736	2.329	9.558	9.558	2.156	-0.822***	-24.40
Combined CEO/Chair	0.614	0.614	0.487	0.755	0.755	0.43	-0.141***	-20.28
CEO age	55.09	55.09	7.623	56.34	56.34	7.024	-1.250***	-11.25
CEO tenure	10.12	10.12	9.272	9.432	9.432	8.729	0.687***	5.05
Independent director (%)	71.63	71.63	16.8	80.85	80.85	10.6	-9.222***	-41.25
Industry-adjusted stock return	0.143	0.143	0.717	0.0843	0.0843	0.596	0.0583***	5.77
Forced CEO turnover	0.0342	0.0342	0.182	0.0318	0.0318	0.175	0.00242	0.91

Table 3: Lead Directors and Forced CEO Turnover

This table reports the results of panel regressions that relate forced CEO turnover to the presence of a lead director on the board. The sample is a propensity score matched sample of firms that switched to a lead director structure and firms that did not. Treated firms are those that, during the sample period, switched to a lead director structure and maintained that structure for at least four subsequent years. For each treated firm, control firms are drawn from the set of firms that had no lead director role for five years after the switch year. Propensity-score matching is performed by estimating logit regressions to predict treatment status in the pre-switch year; in these regressions, covariates include all the variables in Table 2 (log transformations are applied to CEO age, CEO tenure, total assets, and board size). Nearest-neighbor matching with replacement is used to match each treated firm with the 10 control firms having the closest predicted log odds. Then, for each treated firm as well as each control firm, event-years ranging from five years before the relevant switch to five years after the switch are kept. In the regressions, *Adjusted stock return* is the total stock return over the prior fiscal year, net of the median 2-digit SIC contemporaneous return. Control variables include log(total assets), log(ceo age), log(board size), an indicator for a combined CEO-chair, and *Independent board* (an indicator for whether the board consists of at least 75% independent directors). All regressions include year fixed effects. The OLS regressions in Columns (1) and (2) include year dummies but no firm fixed effects; the regressions in Columns (3) and (4) include both year dummies and firm fixed effects. T-statistics based on robust standard errors clustered at the firm level are reported in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

Dependent Variable: Forced CEO Turnover				
	OLS		Firm Fixed Effects	
	(1)	(2)	(3)	(4)
Lead director	0.011***	0.009**	0.005	0.003
	(2.66)	(2.17)	(1.21)	(0.77)
Lead director × Adj. stock return	-0.040***	-0.038***	-0.032***	-0.032***
	(-4.97)	(-4.63)	(-3.92)	(-3.84)
Adj. stock return	-0.011***	-0.013***	-0.013***	-0.013***
	(-3.70)	(-3.97)	(-3.66)	(-3.59)
Log(Assets)	-0.002*	0.001	0.006	0.007
	(-1.95)	(0.49)	(1.05)	(1.08)
Log(CEO age)		-0.144***		-0.277***
		(-8.39)		(-6.43)
Log(CEO tenure)		-0.007**		0.027***
		(-2.24)		(4.54)
Independent board		-0.003		-0.010*
		(-0.68)		(-1.75)
Log(Board size)		-0.018*		-0.009
		(-1.84)		(-0.47)
Combined CEO-Chair		-0.001		0.028***
		(-0.25)		(3.32)
Clustered standard errors	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	117,290	115,602	117,290	115,602
R^2 or within R^2	0.004	0.024	0.006	0.021

Table 4: Effect of the ISS Policy Change (2004) and the SEC Rule Change (2010) on Performance-Sensitivity of Forced CEO Turnover

This table reports DID estimates of the effects of the ISS policy change and the SEC rule change on the performance-sensitivity of forced CEO turnover. For each reform, the treated group is the set of firms in the year prior to the reform that had a combined CEO/chair but no lead director; the control group is the set of firms in the year prior to the reform that had a separate CEO and chair. In Columns (1) and (2), *Post* is a binary variable indicating proxy filings after the ISS policy change (February 2004). In Columns (3) and (4), *Post* is a binary variable indicating proxy filings after the SEC rule change (February 2010). *Adjusted stock return* is the total stock return over the prior fiscal year, net of the median 2-digit SIC contemporaneous return. Control variables include log(total assets), log(ceo age), log(board size), an indicator for a combined CEO-chair, and *Independent board* (an indicator for whether the board consists of at least 75% independent directors). Each regression includes firm fixed effects and year fixed effects. T-statistics based on robust standard errors clustered at the firm level are reported in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

Dependent Variable: Forced CEO Turnover				
	ISS Policy Change		SEC Rule Change	
	(1)	(2)	(3)	(4)
Treated × Post	0.028**	0.034***	0.024***	0.027***
	(2.33)	(2.61)	(2.90)	(3.06)
Treated × Post × Adj. stock return	-0.025**	-0.025**	-0.030***	-0.033***
	(-2.24)	(-2.15)	(-2.86)	(-3.14)
Post × Adj. stock return	-0.009	-0.011	0.008	0.011
	(-1.17)	(-1.27)	(1.21)	(1.63)
Adj. stock return	-0.005	-0.004	-0.015***	-0.016***
	(-1.17)	(-1.07)	(-4.85)	(-4.90)
Log(Assets)	0.009	0.002	0.004	0.001
	(1.21)	(0.29)	(0.78)	(0.08)
Log(CEO age)		-0.315***		-0.402***
		(-5.84)		(-9.17)
Log(CEO tenure)		0.050***		0.045***
		(5.45)		(7.04)
Independent board		-0.014		-0.003
		(-2.06)		(-0.49)
Log(Board size)		0.035		0.019
		(1.62)		(0.97)
Combined CEO-Chair		0.021*		0.019**
		(1.87)		(2.08)
Clustered standard errors	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	7.919	7,789	10,828	10,547
Groups	1,160	1,158	1,328	1,317
Within R^2	0.008	0.026	0.006	0.029

Table 5: First-Stage Regressions: Effect of the ISS Policy Change and the SEC Rule Change on Use of Lead Directors

This table presents estimates of the effects of the two reforms (ISS policy change (2004) and SEC rule change (2010)) on the main explanatory variables in the 2SLS model specified by Equations (2) and (3) in the text. In Columns (1), (3), and (5) of the table, the dependent variable is the presence of a lead director; in Columns (2), (4), and (6), the dependent variable is the interaction of stock performance with the presence of a lead director. Each regression is estimated over treated firms (firms that had a combined CEO/chair but no lead director in the year prior to the relevant reform) and control firms (firms in the year prior to the relevant reform that had a separate CEO and chair). *Treatment_ISS* is a binary variable equal to 1 for post-reform years of treated firms under the ISS reform experiment. *Treatment_SEC* is a binary variable equal to 1 for post-reform years of treated firms under the SEC reform experiment. *Adjusted stock return* is the total stock return over the prior fiscal year, net of the median 2-digit SIC contemporaneous return. Control variables include log(total assets), log(ceo age), log(board size), an indicator for a combined CEO-chair, and *Independent board* (an indicator for whether the board consists of at least 75% independent directors). Each regression includes firm fixed effects and year fixed effects. T-statistics based on robust standard errors clustered at the firm level are reported in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

	ISS Policy Change		SEC Rule Change		Combined	
	Lead Director	Lead Director × Adj. Stock Return	Lead Director	Lead Director × Adj. Stock Return	Lead Director	Lead Director × Adj. Stock Return
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment_ISS	0.124***	-0.007			0.140***	0.008
	(5.19)	(-1.02)			(5.51)	(1.29)
Treatment_ISS × Adj. stock return	-0.005	0.217***			-0.015*	0.060
	(-0.36)	(5.40)			(-1.83)	(1.13)
Treatment_SEC			0.312***	-0.012	0.267***	-0.010
			(11.68)	(-1.54)	(10.07)	(-1.36)
Treatment_SEC × Adj. stock return			0.005	0.419***	0.005	0.403***
			(0.30)	(6.85)	(0.31)	(6.24)
Adj. stock return	0.002	0.011*	-0.002	0.053***	0.007	0.035**
	(0.43)	(1.68)	(-0.34)	(3.03)	(1.43)	(2.51)
Log(Assets)	-0.001	0.006	0.010	0.007	0.015	0.011***
	(-0.04)	(1.34)	(0.68)	(1.09)	(1.22)	(2.88)
Log(CEO age)	0.080	0.040*	-0.007	-0.019	0.069	-0.002
	(1.11)	(1.72)	(-0.09)	(-0.73)	(1.05)	(-0.11)

(continued)

Table 5, Continued

Log(CEO tenure)	-0.033** (-2.48)	-0.003 (-0.84)	-0.040*** (-3.26)	-0.002 (-0.46)	-0.043*** (-3.87)	0.0002 (0.04)
Independent board	0.028** (2.11)	0.008** (2.01)	0.018 (1.34)	0.009 (1.45)	0.038*** (3.16)	0.008* (1.86)
Log(Board size)	-0.011 (-0.27)	0.025* (1.74)	0.077* (1.92)	0.007 (0.37)	0.039 (1.11)	0.010 (0.78)
Combined CEO-Chair	0.095*** (5.79)	0.009 (1.47)	0.139*** (7.36)	0.007 (0.98)	0.152*** (9.45)	0.012** (2.15)
Clustered standard errors	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,789	7,789	10,547	10,547	13,803	13,803
Groups	1,158	1,158	1,317	1,317	1,586	1,586
Within R^2	0.230	0.202	0.414	0.254	0.395	0.244

Table 6: Effect of Lead Directors on Performance-Sensitivity of Forced CEO Turnover

This table reports estimates of the effect of a lead director on the performance-sensitivity of forced CEO turnover. Column (1) shows the results of estimating an OLS regression over the entire sample period (2000-2015). In Columns (2) through (4), 2SLS regressions are estimated over time periods corresponding to the ISS policy change (2000-2008), the SEC rule change (2009-2015), and the combined period, respectively. Each 2SLS regression includes treated firms (firms with a combined CEO/chair but no lead director in the year(s) prior to reform) and control firms (firms with a separate CEO and chair in the year(s) prior to reform). The instruments for the 2SLS regressions are interactions of *POST* or *POST***RET* with binary variables for treated-firm status. Each regression includes firm fixed effects and year fixed effects. T-statistics based on robust standard errors clustered at the firm level are reported in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

Dependent Variable: Forced CEO Turnover				
	OLS	IV (ISS Policy Change)	IV (SEC Rule Change)	IV (Combined)
	(1)	(2)	(3)	(4)
Lead director	0.002	0.277**	0.081***	0.080***
	(0.33)	(2.38)	(2.88)	(2.82)
Lead director × Adj. stock return	-0.005	-0.153***	-0.063***	-0.061***
	(-0.84)	(-3.04)	(-2.76)	(-2.87)
Adj. stock return	-0.011***	-0.005	-0.010**	-0.009***
	(-3.47)	(-1.19)	(-2.57)	(-2.88)
Log(Assets)	0.001	0.003	0.001	0.0005
	(0.32)	(0.35)	(0.12)	(0.09)
Log(CEO age)	-0.308***	-0.331***	-0.403***	-0.340***
	(-10.64)	(-5.73)	(-9.14)	(-9.65)
Log(CEO tenure)	0.032***	0.059***	0.048***	0.045***
	(6.93)	(5.53)	(7.21)	(7.65)
Independent board	-0.015***	-0.020**	-0.004	-0.014**
	(-3.26)	(-2.41)	(-0.60)	(-2.51)
Log(Board size)	0.023*	0.042*	0.013	0.021
	(1.85)	(1.67)	(0.64)	(1.31)
Combined CEO-Chair	0.010*	-0.004	0.008	0.0004
	(1.65)	(-0.26)	(0.84)	(0.04)
Clustered standard errors	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	18,709	7,782	10,506	13,784

Table 7: Comparability of Treated and Control Firms

This table compares characteristics of treated and control firms in the year prior to the ISS policy change or prior to the SEC rule change. Treated firms are those firms with a combined CEO/chair but no lead director. Control firms are those firms with a separate CEO and chair. Propensity-score matching is performed by estimating a logit regression in the last pre-shock year to predict treatment status. Each treatment firm is then matched (with replacement) to the control firm with the closest predicted log odds. Panel A (Panel B) reports statistics for the unmatched (propensity score matched) samples. Standard deviations are reported in parentheses below means. *, **, and *** indicate significant differences in means at 10%, 5%, and 1%, respectively.

Panel A: Unmatched Samples

	ISS Policy Change		SEC Rule Change	
	Treated (obs = 885)	Control (obs = 248)	Treated (obs = 673)	Control (obs = 597)
	(1)	(2)	(3)	(4)
Log(Assets)	7.29	6.78***	7.25	6.80***
	(1.54)	(1.35)	(1.50)	(1.45)
Adjusted stock return	0.11	0.10	0.07	0.14
	(0.58)	(0.66)	(0.34)	(1.11)
Log(CEO age)	4.02	3.96***	4.04	3.99***
	(0.14)	(0.13)	(0.14)	(0.12)
Log(CEO tenure)	2.21	1.69***	2.31	1.59
	(0.79)	(0.84)	(0.80)	(0.78)
Log(Board size)	2.17	2.13**	2.15	2.12
	(0.27)	(0.25)	(0.26)	(0.26)
Independent board	0.36	0.32	0.62	0.75
	(0.48)	(0.47)	(0.49)	(0.43)

Panel B: Propensity Score Matched Samples

	ISS Policy Change		SEC Rule Change	
	Treated (obs = 885)	Control (obs = 885)	Treated (obs = 673)	Control (obs = 673)
	(1)	(2)	(3)	(4)
Log(Assets)	7.29	7.19	7.25	7.16
	(1.54)	(1.52)	(1.50)	(1.46)
Adjusted stock return	0.11	0.13	0.07	0.07
	(0.58)	(0.90)	(0.34)	(0.42)
Log(CEO age)	4.02	4.01	4.04	4.03
	(0.14)	(0.13)	(0.14)	(0.12)
Log(CEO tenure)	2.21	2.23	2.31	2.32
	(0.79)	(0.84)	(0.80)	(0.75)
Log(Board size)	2.17	2.16	2.15	2.13
	(0.27)	(0.26)	(0.26)	(0.24)
Independent board	0.36	0.39	0.62	0.62
	(0.48)	(0.49)	(0.49)	(0.49)

Table 8: Lead Directors and Forced CEO Turnover: Propensity Score Matched Samples

This table reports 2SLS estimates of the effect of a lead director on the performance-sensitivity of forced CEO turnover using propensity score matched samples. For each of the two reforms considered (ISS policy change and SEC rule change), the treatment group consists of firms with a combined CEO/chair but no lead director in the year prior to the reform. Control firms are those firms with a separate CEO and chair in the year prior to the year of the reform. Propensity-score matching is performed by estimating a logit regression to predict treatment status in the pre-shock year in terms of the covariates listed in Table 7. Each treatment firm is matched to the control firm with the closest predicted log odds. Each regression includes firm fixed effects and year fixed effects. T-statistics based on robust standard errors clustered at the firm level are reported in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

Dependent Variable: Forced CEO Turnover		
	IV (ISS Policy Change)	IV (SEC Rule Change)
	(1)	(2)
Lead director	0.150*	0.020
	(1.82)	(0.55)
Lead director × Adj. stock return	-0.160***	-0.079***
	(-3.09)	(-2.93)
Adj. stock return	-0.004	-0.003
	(-1.08)	(-0.61)
Log(Assets)	0.008	0.0003
	(0.76)	(0.04)
Log(CEO age)	-0.250***	-0.345***
	(-4.72)	(-5.90)
Log(CEO tenure)	0.034***	0.041***
	(3.20)	(4.74)
Independent board	-0.023**	-0.011
	(-2.24)	(-1.37)
Log(Board size)	0.037*	0.027
	(1.68)	(0.98)
Combined CEO-Chair	0.026*	0.023
	(1.87)	(1.37)
Clustered standard errors	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	12,208	11,360

Table 9: Duties of Lead Directors

This table shows descriptive statistics for 27,789 assigned lead director duties present among S&P 1500 firms during the period 2000 to 2015. Duties are classified into six major categories (see Appendix A and the text for details of the classification). Data on lead director duties are obtained from SEC proxy filings and 10-K filings. Statistics in Panels A and B are based on 6,705 firm-years in which a lead director is present. Panel A reports statistics for raw indices obtained by summing up the number of duties present within each category or the total number of duties present across all categories. In Panel B, correlations are reported for *INFO*, *MEET*, *SHHD*, *MGMT*, *BOARD*, *RETAIN*, and *TOTAL*, which are standardized indices corresponding to the seven raw indices in Panel A. Standardization is performed by subtracting the mean level of an index over the sample period and dividing by the standard deviation of the index over the sample period.

Panel A: Summary Statistics

Index	Number of Components in Index	Number of Obs.	Raw Index Level (as % of Total Possible)			
			Mean	Median	S.D.	Max
Information flow	4	6,705	27.27	25.00	20.56	75.00
Agenda/meeting control	9	6,705	25.01	22.22	19.44	77.78
Shareholder contact	3	6,705	10.02	0.00	22.36	66.67
Oversight of management	7	6,705	2.37	0.00	6.08	42.86
Oversight of the board	7	6,705	3.31	0.00	7.93	57.14
Retention of advisors or consultants	3	6,705	3.49	0.00	10.43	66.67
Total	33	6,705	12.56	12.12	7.92	42.42

Panel B: Correlations

	INFO	*MEET*	*SHHD*	*MGMT*	*BOARD*	*RETAIN*	*TOTAL*
INFO	1.000						
MEET	0.587	1.000					
SHHD	-0.233	-0.259	1.000				
MGMT	0.109	0.099	-0.051	1.000			
BOARD	0.182	0.166	-0.078	0.414	1.000		
RETAIN	0.230	0.225	-0.092	0.111	0.221	1.000	
TOTAL	0.730	0.865	-0.027	0.352	0.455	0.385	1.000

Table 10: Naïve 2SLS Models of Lead Director Duties and Forced CEO Turnover

This table reports 2SLS regression estimates of the effects of different categories of lead director duties on performance-sensitivity of forced CEO turnover. The regressions are "naïve" in the sense that either they do not account for omitted variables inconsistency (Columns (1) through (6)), or they do not address multicollinearity (Column (7)). The sample includes 27,789 individual duty assignments present at S&P 1500 firms from 2000 through 2015. Data on duties are gathered from proxy statements and 10-K filings. Panel A considers the ISS policy reform (2004), while Panel B considers the SEC rule reform (2010). Explanatory variables are based on six standardized indices that capture the extent to which lead director duties within a certain category are present for Firm *i* in year *t*. The six indices include *INFO*, *MEET*, *SHHD*, *MGMT*, *BOARD*, and *RETAIN*. To construct the indices, we sum the number of duties within six mutually exclusive categories and then use sample moments to standardize the sum to have zero mean and unit variance. Columns (1) to (6) are based on Model (5) in the text, while Column (7) is based on Model (4) in the text. Instruments for the endogenous variables are interactions between *POST* or *POST***RET* and a binary variable indicating that no category-specific duties were present in the year prior to reform (see text for details). Treatment firms include firms with a combined CEO/chair in the year prior to reform; control firms include firms with a separate CEO and chair in the year prior to reform. Each regression includes firm fixed effects, treated-sample year fixed effects, and control-sample year fixed effects. T-statistics based on robust standard errors clustered at the firm level are reported in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

Table 10, continued

Panel A: ISS Policy Change							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
INFO	-0.021 (-0.73)						0.137 (0.25)
INFO × Return	-0.111** (-2.46)						0.047 (0.08)
MEET		0.013 (0.36)					0.059 (0.38)
MEET × Return		-0.150** (-2.55)					0.269 (0.22)
SHHD			-0.020 (-0.75)				-0.050 (-0.62)
SHHD × Return			-0.153** (-2.45)				-0.938 (-0.31)
MGMT				-0.032 (-1.37)			-0.138 (-0.40)
MGMT × Return				-0.177* (-1.76)			0.544 (0.31)
BOARD					0.017 (0.75)		-0.070 (-0.22)
BOARD × Return					-0.125* (-1.69)		0.437 (0.28)
RETAIN						0.057 (1.51)	-0.158 (-0.33)
RETAIN × Return						-0.259 (-1.51)	0.399 (0.33)
Return	-0.063*** (-2.78)	-0.081*** (-2.83)	-0.037*** (-3.09)	-0.046** (-2.14)	-0.034** (-2.10)	-0.054* (-1.72)	0.231 (0.24)
All other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustered std. errors	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Treated-year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control-year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,609	6,609	6,609	6,609	6,609	6,609	6,609

Table 10, continued

Panel B: SEC Rule Change							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
INFO	-0.037 (-1.20)						0.740 (0.28)
INFO × Return	-0.039*** (-2.65)						-0.140 (-0.16)
MEET		-0.057 (-1.49)					-0.509 (-0.26)
MEET × Return		-0.037** (-2.41)					0.274 (0.19)
SHHD			-0.019 (-0.34)				-0.810 (-0.24)
SHHD × Return			0.143 (1.58)				-0.147 (-0.29)
MGMT				0.006 (0.40)			-0.135 (-0.18)
MGMT × Return				-0.071 (-1.39)			0.042 (0.14)
BOARD					0.014 (1.00)		-0.163 (-0.23)
BOARD × Return					-0.137* (-1.76)		-0.314 (-0.25)
RETAIN						-0.003 (-0.21)	-0.373 (-0.23)
RETAIN × Return						-0.144** (-2.53)	-0.458 (-0.27)
Return	-0.027*** (-5.08)	-0.027*** (-4.68)	-0.003 (-0.21)	-0.023*** (-3.44)	-0.037*** (-2.86)	-0.033*** (-4.34)	-0.087 (-0.36)
All other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustered std. errors	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Treated-year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control-year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,088	13,088	13,088	13,088	13,088	13,088	13,088

Table 11: Lead Director Duties and Forced CEO Turnover: 2SLS Models Free of Omitted Variables Inconsistency

This table reports 2SLS regression estimates of how different categories of lead director duties affect the performance-sensitivity of forced CEO turnover. The sample includes 27,789 individual duty assignments present at S&P 1500 firms from 2000 through 2015. Data on duties are gathered from proxy statements and 10-K filings. The regression model is

$$y_{it} = \alpha + \beta_1 INDEX_{it} + \beta_2 INDEX_{it} RET_{it} + \Gamma X_{it} + \lambda_{it} + \lambda_i + \varepsilon_{it}$$

where X_{it} is a set of (possibly time-varying) firm-level characteristics, λ_i captures firm fixed effects, λ_t captures group-specific time fixed effects, RET_{it} is the 12-month industry-adjusted stock return, and $INDEX_{it}$ is a standardized index that captures the extent to which lead director duties within one of six categories are present for Firm *i* in year *t*. The six indices include *INFO*, *MEET*, *SHHD*, *MGMT*, *BOARD*, and *RETAIN*. To construct the six indices, we sum the number of duties within six mutually exclusive categories and then standardize the sums to have zero mean and unit variance (see Table A1 for details of the classification). Panel A considers the ISS policy reform (2004), while Panel B considers the SEC rule reform (2010). In each column, *INDEX* is one of *INFO*, *MEET*, *SHHD*, *MGMT*, *BOARD*, or *RETAIN*; instruments are residualized versions of interactions between *POST* or *POST*RET* and a binary variable indicating that no duties in *INDEX* were present at the time of the reform (see text and Appendix C for details). Treated firms are firms with a combined CEO/chair in the year prior to reform; control firms are firms with a separate CEO and chair in the year prior to reform. Each regression includes firm fixed effects, treated-sample year fixed effects, and control-sample year fixed effects. T-statistics based on robust standard errors clustered at the firm level are reported in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

Table 11, continued

Panel A: ISS Policy Change						
	(1)	(2)	(3)	(4)	(5)	(6)
INFO	0.005 (0.16)					
INFO × Return	-0.087** (-2.19)					
MEET		0.023 (0.68)				
MEET × Return		-0.079* (-1.71)				
SHHD			-0.005 (-0.21)			
SHHD × Return			-0.081*** (-3.01)			
MGMT				0.016 (0.38)		
MGMT × Return				-0.150* (-1.78)		
BOARD					0.109 (1.21)	
BOARD × Return					-0.157** (-2.07)	
RETAIN						0.257 (1.21)
RETAIN × Return						-0.252* (-1.87)
Return	-0.052*** (-2.63)	-0.048** (-2.15)	-0.043*** (-3.71)	-0.040** (-2.21)	-0.040** (-2.46)	-0.054** (-2.19)
All other controls	Yes	Yes	Yes	Yes	Yes	Yes
Clustered std. errors	Yes	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Treated-year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Control-year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,609	6,609	6,609	6,609	6,609	6,609

Table 11, continued

Panel B: SEC Rule Change						
	(1)	(2)	(3)	(4)	(5)	(6)
INFO	-0.044 (-1.41)					
INFO × Return	-0.041** (-2.54)					
MEET		-0.065* (-1.75)				
MEET × Return		-0.039** (-2.31)				
SHHD			-0.134 (-0.56)			
SHHD × Return			0.305 (0.71)			
MGMT				0.006 (0.30)		
MGMT × Return				-0.074 (-1.28)		
BOARD					-0.029 (-0.57)	
BOARD × Return					-0.152 (-1.60)	
RETAIN						-0.001 (-0.06)
RETAIN × Return						-0.122** (-2.47)
Return	-0.027*** (-4.84)	-0.028*** (-4.43)	0.065 (0.51)	-0.023*** (-3.23)	-0.039** (-2.53)	-0.031*** (-4.53)
All other controls	Yes	Yes	Yes	Yes	Yes	Yes
Clustered std. errors	Yes	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Treated-year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Control-year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,088	13,088	13,088	13,088	13,088	13,088

Appendix A: Classification of Lead Director Duties

Table A1

This table reports the six-way classification used to analyze 33 different types of lead director duties present in the sample. The total sample includes 27,789 assigned lead director duties present among S&P 1500 firms between 2000 and 2015. Data on lead director duties are obtained from SEC proxy filings and 10-K filings.

Category	Lead Director Duty
Meeting/Agenda Control	• Schedule timing of board meetings • Schedule timing of executive sessions • Review schedule of committee meetings • Sole right to call executive sessions • Call board meetings • Call special meetings • Set/approve board meeting agendas • Set/approve executive session agendas • Chair board meetings absent chairman
Information Flow	• Liaise with Chair or CEO • Preview significant decisions with Chair or CEO • Review/ approve of materials sent to the board • Review/approve of information sent to the board
Shareholder Contact	• Serve as sole shareholder contact for the board • Serve as sole shareholder contact for the independent directors • Serve as spokesperson of the board
Oversight of Management	• Oversee CEO evaluation • Oversee CEO hiring or dismissal • Oversee succession planning • Monitor and coordinate management • Crisis management • Provide leadership when chairman conflicts • Clear insider transactions of management

Table A1, continued

Oversight of the Board	• Oversee evaluation of directors or the board • Oversee compliance with corporate governance policies • Oversee director nomination or committee composition • Recommend committee or committee chair composition • Oversee review of board leadership structure • Recruit or interview new director candidates • Advise committee chair
Retention of Outside Experts	• Recommend retention of board consultants or advisers • Retain board consultants or advisors • Liaise with board consultants or advisors

Appendix B: Descriptions of Lead Director Duties at Three Sample Companies

From Applied Materials Inc. DEF 14A Proxy Filing, 1/22/2013:

Mr. Roelandts, an independent director, serves as Applied's Lead Independent Director. The Lead Independent Director helps ensure a strong, independent and active Board. He presides at all meetings of the Board at which the Chairman is not present, including executive sessions of the independent directors; has the authority to call meetings of the independent directors; serves as liaison between the Chairman and the independent directors; approves information sent to the Board; provides input on and approves meeting agendas for the Board; approves meeting schedules to assure that there is sufficient time for discussion of all agenda items; has the authority to retain outside advisors and consultants who report directly to the Board on board-wide issues; serves as a liaison for consultation and direct communication with stockholders; and performs such other duties as deemed necessary by the Board from time to time. The Lead Independent Director regularly communicates with other directors between scheduled Board meetings.

From AT&T Inc. DEF 14A Proxy Filing, 3/10/2015:

Board Leadership Structure

The non-management members of the Board of Directors meet in executive session (without management Directors or management personnel present) at least four times per year. The Lead Director, who is appointed for a two-year term, presides over these sessions. Joyce M. Roché currently serves as Lead Director; her term is scheduled to expire January 31, 2017.

Responsibilities of the Lead Director include:

- presiding at meetings of the Board at which the chairman is not present;
- presiding at executive sessions of the non-management Directors;
- preparing the agenda for the executive sessions of the non-management Directors;
- acting as the principal liaison between the non-management Directors and the Chairman and Chief Executive Officer;
- coordinating the activities of the non-management Directors when acting as a group;
- approving the agenda for each Board meeting;
- approving meeting schedules to ensure there is sufficient time for discussion of all agenda items;
- advising the Chairman and Chief Executive Officer as to the quality, quantity and timeliness of the flow of information from management, including the materials provided to Directors at Board meetings;
- if requested by major stockholders, ensuring that he or she is available for consultation and direct communication and acting as a contact for other interested persons;
- sharing with other Directors as he or she deems appropriate letters and other contacts that he or she receives; and
- contacting management to obtain such additional information relating to contacts by interested persons as he or she may require from time to time.

In addition, the Lead Director may:

- call meetings of the non-management Directors in addition to the quarterly meetings, and
- require information relating to any matter be distributed to the Board.

Appendix B: Examples of Lead Director Duties (continued)

From Home Depot Inc. DEF 14A Proxy Filing, 4/7/2014:

BOARD LEADERSHIP

We believe that having a combined Chair and CEO, an independent Lead Director, and Board committees composed entirely of independent directors currently provides the best Board leadership structure for The Home Depot. This structure, together with our other strong corporate governance practices, provides robust independent oversight of management while ensuring clear strategic alignment throughout the Company. Specifically, Mr. Blake proposes strategic priorities to the Board (with input from the Lead Director), communicates the Board's guidance to management, and is ultimately responsible for implementing the Company's key strategic initiatives.

Our Lead Director is an independent director who is elected annually by the independent members of the Board. Bonnie G. Hill, a director since 1999, currently serves as our Lead Director. As noted above, Ms. Hill is not standing for re-election to the Board, and Gregory D. Brenneman, a director since 2000, has been elected by the independent members of the Board to be our Lead Director effective immediately following the Meeting. Our Lead Director:

- Chairs Board meetings when the Chair is not present, including presiding at executive sessions of the Board (without management present) at every regularly scheduled Board meeting;
- Works with management to determine the information and materials provided to Board members;
- Approves Board meeting agendas, schedules and other information provided to the Board;
- Consults with the Chair on other matters that are pertinent to the Board and the Company;
- Has the authority to call meetings of the independent directors;
- Is available for communication and consultation with major shareholders upon request; and
- Serves as liaison between the Chair and the independent directors.

Appendix C: Demonstration that $\tilde{A}_{INFO}$ and $\tilde{B}_{INFO}$ are uncorrelated with the error term in Equation (6) of Section 4.3.2.

We show the desired result for $\tilde{A}_{INFO}$ (similar reasoning can be used to establish the result for $\tilde{B}_{INFO}$). First, note that regressing *INFO* onto A_{INFO} yields the following orthogonal decomposition: $INFO = \alpha A_{INFO} + INFO_0$, where $\alpha > 0$ and where $INFO_0$ is uncorrelated with A_{INFO}. Likewise, we can write every other index as an orthogonal decomposition, yielding residual terms $MEET_0$, $SHHD_0$, etc. Our mild identifying assumption is that each of these residual terms is uncorrelated with each of $A_{INFO}, B_{INFO}, A_{MEET}, B_{MEET}, \ldots, A_{RETAIN}, B_{RETAIN}$. Now, since $A_{INFO} = (1/\alpha)INFO - (1/\alpha)INFO_0$, regressing A_{INFO} onto $\widehat{INFO}$ in Step 2 yields a linear prediction $(1/\alpha)\widehat{INFO}$.

Now, observe that the residual from Step 2 in the text, $\tilde{A}_{INFO}$, is in fact equal to the following: $\tilde{A}_{INFO} = (1/\alpha)INFO - (1/\alpha)INFO_0 - (1/\alpha)\widehat{INFO}$. In other words, $\alpha \tilde{A}_{INFO}$ equals the residual from the Step 1 regression minus another term, $INFO_0$. Note that the residual from the Step 1 regression and $INFO_0$ are both orthogonal to $A_{INFO}, B_{INFO}, A_{MEET}, B_{MEET}, \ldots, A_{RETAIN}, B_{RETAIN}$. It follows from this that $\tilde{A}_{INFO}$ itself is orthogonal to $A_{INFO}, B_{INFO}, A_{MEET}, B_{MEET}, \ldots, A_{RETAIN}, B_{RETAIN}$.

Next, we verify that $\tilde{A}_{INFO}$ is orthogonal to $\eta_{i,t}$, the error term in Equation (6). Note from Equations (4) and (6) that $\eta_{i,t}$ will consist of several different "hidden" components representing omitted variables and the true disturbance term. In particular,

$$\eta_{i,t} = \sum_{INDEX \neq INFO} \mu_{INDEX} A_{INDEX} + \sum_{INDEX \neq INFO} \beta_{INDEX} INDEX_0 + \sum_{INDEX \neq INFO} \theta_{INDEX} B_{INDEX} + \sum_{INDEX \neq INFO} \delta_{INDEX} (INDEX * R_{i,j})_0 + \delta' Y_{i,t} + \varepsilon_{i,t} \quad \text{(A1)}$$

where $\varepsilon_{i,t}$ is the disturbance term in the overall regression model (Equation (4)) and $\delta' Y_{i,t}$ is a collection of other unobserved, confounding variables that are orthogonal to the shock-based IVs. We proceed to argue that $\tilde{A}_{INFO}$ and $\tilde{B}_{INFO}$ are uncorrelated with each of the components of $\eta_{i,t}$. First, as already shown, $\tilde{A}_{INFO}$ and $\tilde{B}_{INFO}$ are orthogonal to all 10 of the initial "non-*INFO*" IVs: $A_{MEET}, B_{MEET}, \ldots, A_{RETAIN}, B_{RETAIN}$. Second, $\tilde{A}_{INFO}$ and $\tilde{B}_{INFO}$ are orthogonal to $MEET_0$, $(MEET*R_{i,j})_0$, $SHHD_0$, $(SHHD*R_{i,j})_0$ etc. Third, since $\tilde{A}_{INFO}$ and $\tilde{B}_{INFO}$ are linear combinations of the 12 initial instruments, they are each uncorrelated with $\varepsilon_{i,t}$. Fourth, since $\tilde{A}_{INFO}$ and $\tilde{B}_{INFO}$ are linear combinations of the 12 initial instruments, they are each uncorrelated with the potential confounding variables $\delta' Y_{i,t}$. We have thus shown that $\tilde{A}_{INFO}$ and $\tilde{B}_{INFO}$ are each orthogonal to $\eta_{i,t}$, the error term in Equation (6).