Death by Committee? An Analysis of Corporate Board (Sub-) Committees*

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Abstract

Theoretical models of groups suggest that sub-group usage can affect communication among members and group decision-making. To examine the trade-offs from forming sub-groups, we assemble a detailed dataset on corporate boards (groups) and committees (sub-groups). Boards have increasingly used committees formally staffed entirely by outside directors. Twenty-five percent of all director meetings occurred in such committees in 1996; this increased to forty-five percent by 2010. We find evidence that granting formal authority to such committees can impair communication and decision-making. Sub-groups are relatively understudied, but our results suggest that they play an important role in group functioning and corporate governance.

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1. Introduction

Committees exist in nearly every organization. Both chambers of Congress maintain a variety of committees, some of which have their own sub-committees. University committees help with recruitment, promotion, and tenure decisions. Central bank committees oversee internal operations and generate policy recommendations.

Because models of group decision-making quickly become intractable when heterogeneous agents are added, few theories touch on the benefits and costs of committees, which we define as sub-groups that are carved out of a group of decision-makers. While committees may be useful to divide labor, it is not clear how they affect aggregate group information production and decision-making.

We analyze the potential trade-offs of forming sub-groups using corporate boards.[1] U.S. firms maintain committees to serve a large number of functions; our data contains nearly two-thousand unique committee names. Boards and committees also exhibit a high degree of variation in their responsibilities and in the number of meetings they hold. This activity is relevant; a committee that never meets exists in name only.

Corporate boards also generate observable outcomes relevant to group information production and decision-making. Insider trading data helps measure how informed directors are. The market's response to mergers and acquisitions can inform our understanding of important board decisions, while firm values allow us to assess the board's overall performance.

By dividing group members into sub-groups, committees may allow a group to achieve consensus more easily and overcome groupthink. However, the results in Li, Rosen, and Suen (2001) suggest that sub-groups can also impair communication. Decision-makers may receive different information when they form sub-groups, which may undermine the pooling-of-information rationale for group formation. Aghion and Tirole (1997) propose that the allocation of formal authority across a

[1]The term "committee" has different meanings in the academic literature. Corporate governance research generally follows the terminology used by corporations; a committee is a sub-group of the board of directors tasked with specific responsibilities. Other branches of academic research refer to any small group of people as a committee. To avoid confusion, we will use "group" to refer to studies analyzing decision-making and interactions among a small number of people. The term "committee" will be used to refer to any subset of individuals in such a group.

group and its sub-groups affects communication and decision-making; members who lack formal decision-making authority withhold and strategically manipulate information to gain influence.

Yet, their mere existence is not sufficient for committees to affect communication and decision-making. The economics literature suggests that committee structure and behavior dictate their impact. For example, by collecting similar group members, a committee may experience less strategic manipulation of information than a larger group (e.g. Baccara and Yariv 2013; Crawford and Sobel 1982; Li and Suen 2004). On the other hand, homogeneous sub-groups of people, who may be predisposed to agree with one another, may not always have strong incentives to gather costly information (Beniers and Swank 2004; Malenko 2014; Schulz-Hardt, Jochims, and Frey 2002). Evidence from corporate boards suggests that committees may allow the group to monitor more intensely (Bronson, Carcello, Hollingsworth, and Neal 2009; Faleye, Hoitash, and Hoitash 2011; Klein 2002) at the potential cost of reducing members' incentives to share private information (Adams and Ferreira 2007).

Our research studies how the allocation of formal authority from the group to relatively homogeneous committees (sub-groups) affects the overall group. Theoretical models suggest that committees, and the transfer of formal authority to them, change group members' incentives to share information. These informational incentives affect communication not only at the committee level, but also at the group level. Members may manipulate or withhold information when meeting as a group if they believe doing so can later influence decisions made by a committee. As members strategically manipulate information, the quality of decision-making by both the group and its committees can change.

To investigate the net effects of committees, we assemble the most detailed data set on corporate boards of which we are aware. This data supplements commonly used board characteristics, such as board size, with complete structural details on committees and novel proxies for how boards and committees operate. We quantify board and committee formal operations along two

dimensions: meeting frequency and stated responsibilities with respect to information gathering and decision-making.

The structural data is based on all firm-years found in either the BoardEx or Institutional Shareholder Services Governance (ISS) databases, corrected, as necessary, with hand collected information on committees and their director membership. The meeting data is gathered using a natural language processing technique. Our algorithm uses key grammatical relations among words in proxy statements to extract information on the number of board and committee meetings each fiscal year. We also use Latent Dirichlet Allocation (LDA), a text-based topic model, to infer stated information gathering and decision-making responsibilities of boards and committees. Using LDA, we identify nine such topics that commonly appear in proxy statements: the awarding of stock and option grants, the review of independent auditor reports, the determination of stock option awards terms, the identification of director candidates, the pre-approval of independent auditor services, strategies to maximize firm value, the development and review of corporate governance practices, the appointment of independent auditors, and the recommendation of independent auditor reports. Our final sample contains complete data on board structure, directors, committee type and membership, meetings, and stated responsibilities for over 30,000 firm-year observations of unregulated companies from 1996 to 2010.[2]

The data reveals the importance of committees to boards. For every board meeting, there are approximately 2.3 committee meetings, on average. Similarly, for every stated board responsibility, there are approximately 3.8 stated committee responsibilities. Moreover, committee meetings are a key dimension along which board governance varies. For example, while boards at the 5^{th} percentile have only 5 committee meetings a year, those at the 95^{th} have 31. In contrast to committee meetings, committee structure and membership are relatively invariant across firms. The median firm has three committees, and 86% of board-year observations have between two and four committees.

[2]Board and committee LDA-based responsibility and meeting frequency data is available from the authors. At the time of this publication, data may be downloaded from www.tumarkin.net.

Over 90% of committees do not have a formal member who is a corporate insider.

Because of the multi-dimensionality of our data, we draw on Li, Rosen, and Suen (2001) and Aghion and Tirole (1997) to construct a concise measure of sub-group usage. The theoretical models in these papers show that both structural hierarchy and the allocation of authority are important factors in communication and group effectiveness. Li, Rosen, and Suen (2001) demonstrate that information considered by sub-groups differs from that used by larger groups, even if participant information sets are fixed. As a result, decision-making is a function of structural hierarchy. In Li, Rosen, and Suen's 2001 model, authority is tied to structure. Sub-groups are self-contained, receiving no outside information, and have complete decision-making authority.

Aghion and Tirole (1997) provide insights when sub-groups can receive information from non-members and authority is not directly tied to structure. They distinguish between formal authority ("the right to decide") and real authority ("the effective control over decisions") within organizations, demonstrating that the allocation of formal authority affects information flow and communication. According to their theory, a sub-group member, serving as a principal with both formal and real authority, will be inclined to disclose information. Yet, if that same person is invited to participate as an unofficial sub-group member (an agent with only real authority), their incentives to share information will change. Strategically withholding or manipulating information becomes a method by which the unofficial member asserts real authority and leads the sub-group to their preferred decision. Such problems become more acute as the dissonance in objectives between the formal sub-group members and the unofficial members increases.

Li, Rosen, and Suen's 2001 two-agent, heterogeneous preferences model broadly reflects the two categories of corporate directors, insiders and outsiders, whose incentives and information are more similar within category than across. Thus, to map our data to the theory, we focus on outsider-only committees, committees composed entirely of outside directors with exclusive formal authority. While insiders may assert real authority in outsider-only committees when they participate by

invitation, Aghion and Tirole's 1997 model suggests that their contribution would be different if they were official members with formal authority. We define the outsider-only fraction (OOF) as the average fraction of total operations that directors carry out in committees that are formally composed entirely of outside directors. OOF accounts for hierarchical structures by distinguishing between boards and their committees, and it accounts for group composition and the role of formal authority by differentiating between outsider-only and other committees.[3]

We create two outsider-only fractions that use different underlying measures for board and committee operations. The first measures the scope of directors' authority using descriptions of board and committee responsibilities in corporate proxy statements. The LDA-based outsider-only fraction (LDA-based OOF) is the average fraction of total information gathering and decision-making responsibilities a director has in committees that are officially composed entirely of outside directors. This fraction is first computed at the director-level using the results of LDA analysis and is then averaged over all directors to determine the board-level fraction.

Because firms often repeat descriptions of board and committee responsibilities verbatim from one year to the next, disclosed responsibilities may be a noisy and lagging indicator of actual operations. Meetings of the board are the best available proxy for the time directors spend communicating. We rely on annual quantitative meeting data to capture the scale of director authority. The meeting-based outsider-only fraction (meeting-based OOF) is the average fraction of total annual meetings a director has in committees composed entirely of outside directors. This is computed for each director and then averaged over all directors to determine the board-level characteristic.

These two measures of committee operations are intended to reflect formal information gathering and decision-making operations. LDA-based OOF uses disclosed responsibilities to measure the scope of the director authority. Since directors must meet to execute their responsibilities; meeting-based OOF is the "revealed" scale of director authority. We find strong relationships between the

[3]OOF encapsulates structural, compositional, and operational characteristics of the board and its committees. Adams and Ferreira (2007), Aghion and Tirole (1997), Baker, Gibbons, and Murphy (1999), Beniers and Swank (2004), Gerardi and Yariv (2008), and Laux and Laux (2009) each provide different rationales as to why these factors determine group effectiveness.

two variables in both contemporaneous and predictive regression settings. These results suggest that LDA- and meeting-based OOF are both driven by the allocation of authority within the board.

While corporate governance critics may suggest that board and committee meetings are perfunctory, our results suggest they are directly tied to meaningful responsibilities. Meeting-based OOF appears to be more timely and informative, providing stronger statistical significance and greater economic relevance than LDA-based OOF. Hence, we focus on meeting-based OOF throughout our analysis and use LDA-based OOF to support the interpretation of our results.

Disclosed outsider-only information gathering and decision-making responsibilities increased from about 25% of board operations in 1996 to around 35% in 2010. Outsider-only meetings shows a more dramatic shift, increasing from 25% of board operations in 1996 to around 45% in 2010. This change is caused by an increase in the total number of committee meetings per year, which nearly doubled over the sample period from approximately 11 to about 20. The increased workload of committees disproportionately affected outside directors. Outside directors spent approximately 40% of annual operations (responsibilities and meetings) in committee at the start of our sample and about 60% at the end. An opposite result holds for inside directors, whose percent of operations in committees decreased from around 35% to about 23% over the sample period.

The Sarbanes-Oxley Act and revised stock exchange listing standards (collectively SOX) appear to have changed the corporate governance equilibrium. Commonly studied board characteristics, such as board size, number of committees, and board meetings, seem to be unaffected by SOX, exhibiting little variation over the sample period. Meeting-based OOF is also reasonably stable from 1996 through 2001 and from 2004 through 2010, but increases considerably over the period from 2001 to 2004 when SOX was effected.

To investigate whether, as hypothesized, the fraction of formal outsider-only operations affects directors' information sets, we examine the market reaction to director trades and buy-and-hold abnormal returns (BHARs) following share purchases. For outside directors, a one standard

deviation increase in meeting-based OOF leads to a 0.23% lower cumulative abnormal return (CAR) over the 2-day window beginning with the net purchase reporting date. Six-month BHARs following net purchases by outside directors are also lower when meeting-based OOF is higher. These results are consistent with the idea that outsider directors have less market-price relevant information when they spend relatively more time in outsider-only committees.

As board decisions and value creation should depend on directors' knowledge, we analyze the market reaction to acquisition announcements and firm values. When meeting-based OOF is higher, the market reacts less positively to acquisitions. Tobin's q is negatively related to OOF in models that include time-series instruments to address potential endogeneity when firm performance and board operations are determined simultaneously. These results are consistent with the idea that the market believes that formally outsider-only committees lead to less effective decision-making.[4]

An emerging literature suggests that committee structures are relevant to firms. Klein (1998) shows that inside directors' membership on finance and investment committees can add value. Similarly, Faleye, Hoitash, and Hoitash (2011) find that independent director majorities on committees are costly to firms. Reeb and Upadhyay (2010) suggest that committees are helpful for large boards but may not have the same effect on small or insider-oriented boards.

What is not yet clear from this literature is why committees matter. By putting committees in a group decision-making framework, our results support Aghion and Tirole's (1997) theoretical prediction. We consider nominally outsider-only committees — committees whose formal structure does not contain insiders. While insiders may assert real authority in such committees when they participate by invitation,[5] our results suggest that information usage in nominally outsider-only committees differs from committees in which insiders are formal members. Information gathering

[4]If one argues that the compliance related activities that SOX requires to be executed in outsider only committees are "busywork", then our results could potentially be explained by a "busyness" effect (Fich and Shivdasani 2006). According to this argument, outsider-only meetings may distract directors from understanding the key strategic issues facing the firm, with a deleterious effect on firm outcomes. Our data on the formal allocation of information-gathering and decision-making responsibilities allows us to address this alternative explanation for our results. LDA-based OOF examines topics from the pre- and post-SOX periods, identifying core responsibilities of the board and its committees. The topics we use in the analysis are those that have been reported in proxy statements over the full sample period, not SOX-mandated compliance tasks. Thus, the fact that LDA-based OOF is negatively associated with firm value suggests our results are not driven by "busyness."

[5]Our sample of proxy statements contains examples of committees whose charters explicitly mention the inclusion of people by invitation. We do not formally analyze this data as regulations do not require that firms disclose invitees.

and decision-making processes are not simply functions of who attends a meeting; formal structure matters. This finding has important policy implications because investor and regulators can, in general, only operate on formal, observable board characteristics.

Our results provide insights into the nature of formal authority within boards. Cohen, Hayes, Krishnamoorthy, Monroe, and Wright (2013) document that experienced corporate directors believe that SOX greatly reduced the amount and quality of board-level discussions on firm strategy by assigning responsibilities to outsider-only committees. Consistent with this evidence, we find a negative relation between firm value and LDA-based OOF. Thus, our results suggest that formal authority is not restricted to committee structure and membership; the allocation of responsibilities matters.

We highlight economic links between two disparate measures of director effort used in the literature. Vafeas (1999); Brick and Chidambaran (2010); and Linck, Netter, and Yang (2009), among others, posit that meetings may be a proxy for the scale of director effort. However, meetings need not change corporate outcomes if, for example, additional meetings are simply the result of increased compliance responsibilities. Using meeting minutes within a sample of Israeli firms with substantial public ownership, Schwartz-Ziv and Weisbach (2013) analyze the scope of director effort, as measured by the number of issues they discuss. But, scope need not change corporate outcomes if increases come at the expense of depth (e.g. each topic is discussed superficially). In our data, the scale (meeting-based OOF) and the scope (LDA-based OOF) of director's responsibilities are correlated, suggesting that both measures of effort are important to understanding directors' workload.[6]

Our results highlight how complex groups are. Information-sharing and decision-making are linked through group and sub-group structure, composition, and operations (e.g. Adams and

[6]We note that our measures do not consider attendance. Firms are only required to divulge if a director has attended less than 75 percent of meetings. RiskMetrics data shows that less than 2% of directors have such attendance problems over our sample period. Since committee meetings often precede or follow board meetings, it is very unlikely that attendance patterns at committee meetings is significantly different than that at board meetings. Further, the data suggest that attendance problems have become exceedingly rare over time while OOF has increased over time. This is inconsistent with the idea that attendance problems drive the negative relationship between OOF and firm value that we document.

Ferreira 2007; Aghion and Tirole 1997; Baker, Gibbons, and Murphy 1999; Beniers and Swank 2004; Gerardi and Yariv 2008; and Laux and Laux 2009). Policies targeting one aspect of groups (e.g. structure) can create unanticipated responses in other dimensions (e.g. operations). Examining how corporations implemented SOX's sub-group mandates illustrates this point. The SOX listing standards contained significant structural elements, requiring that firms maintain standing audit, corporate governance/director nomination, and compensation committees. Instead of altering their board structure by setting up new committees, our data show that many firms simply expanded the operational scope of existing ones. Multi-function committees increase from 12% of all committees in 1996 to 28% in 2010.

The complexity of groups becomes more apparent when we compare outcomes between firms whose governance structures were explicitly targeted by SOX and those that were not. While the outsider-only fractions increased on average in all types of firms, regardless of whether they needed to change corporate governance structures to comply with SOX, firms that had the required board and committee structures in place before SOX increased committee meetings more than those that did not. This suggests that firms that appeared to be structurally untreated by SOX may not form a valid control group for causal attribution in difference-in-differences analyses, as is common in the literature. To understand how groups work and adapt to circumstances, comprehensive, multi-faceted data — of the type presented in this paper — is needed.

While there is a large literature contrasting individual and group decision-making, we are unaware of papers discussing the comprehensive role of committees as sub-groups within boards. This is surprising given the prevalence of committees in corporate and academic decision-making. Our novel measures of board structure and operations, which simultaneously account for multiple aspects of boards and committees, and our grammar-based algorithmic data extraction approach should prove useful in the further testing and development of theories of sub-groups in corporate decision-making.

2. Group information gathering and decision-making with sub-groups

A unifying theory of group optimality that considers sub-group structure, composition, and formal operations does not currently exist. However, Li, Rosen, and Suen (2001) analyze a stylized model that provides reasonable intuition on the trade-offs in sub-group formation. The model considers information production and strategic manipulation in the decision-making problem of a two agent group. Each agent has private information and a desired decision. A truth-telling equilibrium does not exist if the agents' preferences are not identical. Instead of disclosing their precise private signal, the agents manipulate and obfuscate their information.

The model shows that transferring decision-making authority from the group to a single agent is not optimal whenever the group decision rule (e.g. unanimous vote) can be set endogenously. The decision maker would prefer to know something about the other agent's private signal, however distorted it may be presented; the agent not making the decision would like her information to be used, however marginally, by the decision maker.

Thus, the model implies that groups pool information efficiently, consistent with arguments in the wisdom of crowd literature (e.g. Bainbridge 2002; Da and Huang 2015; Economies 2005; Hall, Mouton, and Blake 1963; Vollrath, Sheppard, Hinsz, and Davis 1989). Intuitively, the benefit of information pooling is lessened when decisions are made in sub-groups.

However, we propose that sub-group formation may help a group achieve better outcomes in the presence of groupthink and herding, two phenomena absent from the Li, Rosen, and Suen (2001) model. According to groupthink theory, an individual's desire to preserve harmony within a group can override her incentives to share critical information (Bénabou 2013; Esser 1998; Gershoni 2019; Janis 1982; Levine and Moreland 1990; Lorsch and MacIver 1989; Schwartz-Ziv and Weisbach 2013; Visser and Swank 2007). When herding occurs, group members overweight observable information known to the group relative to their own private signal (Fahr and Irlenbusch 2011; Hirshleifer and Teoh 2003; Weizsäcker 2010). Thus, groups may not necessarily fully exploit

relevant information known to members. Sub-groups may be a way to break group cohesiveness and encourage differing opinions.

Sub-group membership is not random. Sub-groups may also allow a group to approximate desired levels of heterogeneity through member selection (Beniers and Swank 2004; Duchin, Matsusaka, and Ozbas 2010; Gillette, Noe, and Rebello 2007; Harris and Raviv 2008). Heterogeneity in preferences may be beneficial if it encourages sub-group members to gather costly information (Beniers and Swank 2004; Malenko 2014), which can reduce the possibility of confirmation bias in decision-making (Schulz-Hardt, Jochims, and Frey 2002). Conversely, homophilic sub-groups may be more stable and achieve consensus quicker (Baccara and Yariv 2013; Li and Suen 2004).

These arguments suggest that sub-group formation and composition jointly affect information pooling and decision-making. Sub-groups may achieve efficiencies through division of labor, prevention of groupthink and herding, and optimal heterogeneity. However, they may impair overall group performance if the formal structure affects information flow and slows decision-making. Thus, the net effect of sub-group formation is theoretically unclear and must be determined empirically. Our outsider-only fractions allow us to do this because they concisely aggregate committee structure, composition, and operations, while simultaneously recognizing that directors serve as both part of the group (board) and sub-groups (committees). Importantly, these fractions reflect the underlying hierarchy of decision-making in Li, Rosen, and Suen (2001) and the importance of formal authority to group outcomes (Aghion and Tirole 1997).

3. Data

The core of our data consists of unique information on the composition, information-gathering and decision-making responsibilities, and meetings of boards of directors and committees. For each firm-year in the sample, we collect: the names and classification (inside or outside) of all directors; the names of all committees of the board and their membership; stated information gathering and decision-making responsibilities; and the number of meetings held by the board and

each committee over a fiscal year. To examine the relations between outsider-only fractions and (i) the market reaction to, and the performance of, director stock purchases, (ii) the market reaction to acquisition announcements, and (iii) firm values, we supplement this board- and committee-level data with information on firm financial performance from S&P Global Market Intelligence Compustat (Compustat), stock prices from The Center for Research in Security Prices (CRSP), acquisition activity from SDC Platinum (SDC), director stock purchases from Thomson Reuters Insiders (Thomson Reuters), and equity analyst forecasts from Thomson Reuters Institutional Brokers' Estimate System (I/B/E/S). The sample begins in fiscal year 1996, the earliest year for which we have data on corporate directors for a large number of firms, and ends in 2010.

3.1. Sample construction

Our sample consists of all unregulated firms in BoardEx or ISS (formerly RiskMetrics). ISS data begins with proxy statements filed in calendar year 1996; BoardEx data starts with proxy statements filed in 2000. While ISS covers a longer time period than BoardEx, it has a narrower cross-section, emphasizing S&P 1500 firms. We take the union of the two databases to minimize the time-series limitations of BoardEx and the cross-sectional limitations of ISS. As detailed in the following sections, BoardEx data is more detailed and accurate at the committee-level. Hence, we use BoardEx whenever a firm is in both databases for a single year. When a firm-year appears only in ISS, we use the director information in ISS, but correct the committee data as described later. Appendix A.1 details the process by which we ensure a firm-year appears only once in the combined data set.

3.2. Directors

We obtain annual director-firm-year observations from BoardEx or ISS. We follow BoardEx in categorizing directors as either inside (executive) or outside (non-executive). ISS groups directors into three categories (insider, affiliated, and independent). We treat ISS insider directors as corporate

insiders and those designated as either affiliated or independent as outside directors.[7]

Several of our tests require comprehensive histories of each director's experience across firms and over time. Because we source information from different databases, we create our own director identifier system. See Appendix A.2 for details.

3.3. Committees and their composition

We collect detailed information on all committees supporting the board of directors of each firm in order to build a complete picture of board structure. Since BoardEx includes information on all committees for each firm, we use committee data as is for sample firm-years sourced from BoardEx. As detailed in Appendix A.3, ISS committee data is incomplete and may be misleading. ISS only provides information on audit, compensation, governance, and nominating committee functions. Committees not fitting within one of these functional categories are ignored. Moreover, in ISS, a committee with several functions may be coded as separate committees with unique functions. It is also not clear how ISS chooses which committee to report when several overlap functionally. Given these limitations of ISS, we ignore all committee information for ISS sourced firm-year observations. Instead, we manually collect committee names and memberships from proxy statements for firm-years without BoardEx coverage.[8]

3.4. Meeting frequency and information gathering and decision-making responsibilities

The SEC's disclosure instructions under the Securities Exchange Act of 1934 require that, for each board committee, firms truthfully disclose the name, membership, purpose, and number of meetings held during the preceding fiscal year (17 CFR §240.14a-101 item 22(b)(14) and §240.14a-9 item (a)). Although standard databases contain some of this information (e.g. BoardEx contains the name of the committee), no database contains comprehensive committee meeting data for our

[7] Affiliated directors are not a significant portion of the ISS sample. All results are economically and statistically similar when we use three director classifications: insider, affiliated, and independent. To do so, non-executive BoardEx directors are split into affiliated and independent directors using a best-guess keyword search on BoardEx director role descriptions. We note, however, that the keyword search is limited by the low detail in director descriptions. The best-guess search does not achieve consistent affiliated director classifications between data sets even for those director-firm-year observations appearing in both. Further, it is not possible to apply ISS classifications to BoardEx given differences in cross-sectional coverage.

[8] Manually collected committee data accounts for 6,195 firm-year observations. These are concentrated in the pre-SOX period.

sample period. In addition, no database contains information on the stated responsibilities of the Board or its committees.

We collect meetings and stated responsibilities using a variety of natural language processing and machine learning techniques. To do this, we first prepare all proxy statements by eliminating HTML code, page breaks, and other items not related to content. We then segment the cleaned proxy statements into sentences, keeping only those that contain the word board or committee(s). This yields a collection (corpus) of 5.9 million sentences for further analysis.

3.4.1. Meeting frequency

Firms use different words, different tenses, and different voices (active or passive) when describing meeting frequencies of boards and committees. Committee meeting sentences are often interrupted by intervening clauses that detail membership. While some firms provide a distinct meeting frequency sentence for each committee, others group the meetings of the board and all committees into one long sentence. These issues make standard keyword-search approaches to meeting data collection unreliable and error prone.

We collect meeting data by exploiting common grammatical structures. Stanford CoreNLP (Manning, Surdeanu, Bauer, Finkel, Bethard, and McClosky 2014) contains a machine learning algorithm that has been trained to parse and grammatically analyze sentences. For each pair of words forming a grammatical relationship in a sentence, the "dependencies" output of the CoreNLP yields (i) the governing word, (ii) the dependent word, and (iii) the type of grammatical relationship between the governing and dependent words.[9]

— *Insert Figure 1 about here.* —

Panel A of Figure 1 displays the grammatical structure produced by CoreNLP's dependency output for the simple sentence "The audit committee met 4 times over the last fiscal year." The

[9]CoreNLP may be downloaded from the Stanford Natural Language Process Group website. Toutanova and Manning (2000) and Toutanova, Klein, Manning, and Singer (2003) review part-of-speech tagging; Chen and Manning (2014) describes the dependency parser's neural network technology.

verb "met" is the root of the sentence. There is a relationship through the verb between the nominal subject (*nsubj*) "committee" and the direct object (*dobj*) "times." A noun compound modifier (*nn*) relationship links the subject with its "audit" committee type. The numeric modifier (*num*) provides the actual number of meetings.

Panel B of Figure 1 shows similar grammatical structures underlying the passive voice sentence "Five meetings were held by the compensation committee last year." In this sentence, a committee (*agent*) held meetings (passive nominal subject (*nsubjpass*)). As in the active voice case, the committee type appears as a noun compound modifier and the number of meetings is a numeric modifier.

To implement our approach, we identify four distinct grammatical patterns characterizing sentences containing board and committee meetings. We represent these patterns as labelled directed graph data structures. A graph's nodes represent words, with labelled arrows indicating the grammatical relationship from the governing to the dependent words. Each target grammatical pattern pinpoints the location of the entity (board or committee type) and the number of meetings (typically a numeric modifier). After passing all sentences from the corpus to the Stanford Core NLP for grammatical dependency coding, we execute an exhaustive sub-graph search in which each sentence's labelled directed graph is matched against our four target grammatical patterns. We then extract the entity and number of meetings from matched sentences.

This grammatical data extraction approach is highly accurate. A comparison of this data to a hand-collected sample of 1,000 board and committee meetings spanning 200 proxy statements shows the grammatical approach produced half as many errors as hand-collecting. Errors with the grammatical method were largely due to proxy statements containing multiple data points, such as listing both the scheduled and actual number of board meetings. Errors like these were straightforward to identify and manually correct in our final dataset. Our error rate with hand collected data was more than twice that of the algorithmically collected data, with most errors due

to data entry. A more detailed discussion of our grammatical analysis technique, algorithm design, and the comparison with hand collected data is found in Section 1 of the Online Appendix.

3.4.2. Information gathering and decision-making responsibilities

To measure the information gathering and decision-making operations of the board of directors and committees, we require a methodology that can identify specific responsibilities within proxy statements. Latent Dirichlet Allocation (LDA) (Blei, Ng, and Jordan 2003), a topic-modeling algorithm, is well-suited for identifying common themes in heterogeneous text. LDA is an unsupervised machine learning algorithm; we do not need to supply expected topics. Instead, the algorithm infers the topics that firms detail in their proxy statements using distributional assumptions and Bayesian methods.[10]

We clean the data before applying LDA. We first remove committee names from sentences. Committee names are descriptive. An audit committee is clearly responsible for audit, but not all sentences that discuss the "Audit Committee" detail operations relevant to our research. Removing committee names reduces the risk that LDA topics relate to names and not operations. We then eliminate sentences unlikely to describe information gathering and decision-making operations (e.g sentences describing board or committee membership, meeting frequency, or other administrative details) from our corpus. To do so, we manually categorize a sample of 10,000 randomly selected sentences as either related to the responsibilities of interest or not. We then use *doc2vec* (Le and Mikolov 2014) to convert all sentences in the corpus into vectors in $\mathbb{R}^n$.[11] For each unclassified sentence, we calculate the Euclidean distance between its vector and those in the training sample and identify the group of k-Nearest neighbors. If 75% of sentences in the k-Nearest neighbor group are classified as unrelated, we remove the unclassified sentence from the LDA corpus. The

[10] Rule-based algorithms, an alternative approach commonly used in Finance research, are not well-suited for identifying information gathering and decision-making activities in our environment. The corpus is reasonably unstructured, with 5.9 million sentences that mention either a Board of Directors or a committee. This makes it difficult to specify a sufficiently rich set of text-based rules ex ante.

[11] *doc2vec* uses a neural network to convert sentences into real-valued vectors in moderately sized vector spaces. Sentences with similar meanings are located close to one another in the vector space. This alleviates high dimensionality problems with "bag-of-words" approaches in which each distinct word (or word-root) is a unique basis vector.

Online Appendix provides details on our methodology, the configuration of each algorithm's domain-specific hyperparameters, and results from cross-validation tests used in calibration.

The cleaned corpus is then analyzed with LDA. Bayesian estimation yields (i) the topics that are present in the corpus of sentences and (ii) the probabilities that each of these topics applies to each sentence. We assess the quality of the topics produced with LDA using the concept of coherence, which is known to correspond with human understanding of topics (Mimno, Wallach, Talley, Leenders, and McCallum 2011; Newman, Lau, Grieser, and Baldwin 2010). Coherence identifies topics whose words may be grouped together into a "single coherent concept" (Mimno, Wallach, Talley, Leenders, and McCallum 2011) by scoring topics on the frequency with which constituent words appear together in sentences (co-occurrence of words). In Table 2 of the Online Appendix, we find that coherence is maximized using the 10 highest scoring topics from a 30 topic model. Table 3 of the Online Appendix provides indicative words and representative sentences for these 10 most coherent topics. Nine of these topics relate to information gathering and decision-making responsibilities. In order of decreasing coherence, these topics are: the awarding of stock and option grants, the review of independent auditor reports, the determination of stock option awards terms, the identification of director candidates, the pre-approval of independent auditor services, strategies to maximize firm value, the development and review of corporate governance practices, the appointment of independent auditors, and the recommendation of independent auditor reports. We ignore all other topics in the subsequent analysis.

3.4.3. Outsider-only fractions

Outsider-only fractions (OOF) are the average fraction of total operations that directors carry out in committees composed entirely of outside directors. For meeting-based OOF, we first calculate a director-level measure, using each director's unique committee membership. This is the number of annual meetings that a director has in outsider-only committees divided by the director's total number of board and committee meetings. We average the director-level fractions over all board

members to determine a board-level characteristic.

LDA-based OOF also begins at the director level. For each director, we form a set of sentences containing all sentences related to the board and all sentences pertaining to committees on which the director is a member. Each sentence receives a weight equal to the sum of that sentence's information gathering and decision-making topic probabilities. Director-level LDA-based OOF is the fraction of total information gathering and decision-making sentence topic weights that apply to outsider-only committees. As with meeting-based OOF, we average the director-level LDA-based OOF over all board members to compute the board-level characteristic.

3.5. Sample description

— *Insert Table 1 about here.* —

Table 1 reports the number of firms in the sample on an annual basis and in aggregate. Annual counts are based on the calendar year in which a firm's fiscal year-ends. The sample begins in 1996 with observations from ISS. We incorporate BoardEx data beginning in 2000. BoardEx's share of our sample grows from 65% in 2000 to approximately 95% of the sample in 2003. Starting in 2004, BoardEx is the source for nearly all the firm-year observations.

— *Insert Table 2 about here.* —

Table 2 reports summary statistics. Panel A presents information on board characteristics. Director characteristics are summarized in Panel B. Descriptive statistics on sample firm characteristics and financial performance are in Panel C. Panels D and E provide data on director stock trades and firm acquisitions, respectively. Given the large number of variables used in our tests, we defer discussion of dependent variables and some controls until the sections in which we use them.

Panel A of Table 2 shows that the average firm has 7.2 board meetings and 15.5 committee meetings each fiscal year. In the average firm, 35.9% of director-meetings occur in outsider-only committees. There is substantial variation in meetings and the meeting-based outsider-only fraction;

median levels are generally two to three times those found at the (smallest) 5th percentile and half those at the (biggest) 95th percentile. Section 4 of the Online Appendix provides detailed definitions of all variables.

4. Data-driven perspectives on board operations

Our data give us an exceptional perspective on the evolution of corporate boards over a 15-year period that contained corporate scandals, policy attempts to address those scandals through SOX and revised exchange listing standards, and a global financial crisis. Using both univariate trend analysis and multivariate regressions, we highlight how multi-faceted data on board operations provide new insights into the inner workings of the board. We examine how information gathering and decision-making operations relate to changing circumstances, and how meeting- and LDA-based OOF relate to each other. The results provide a foundation for our later analysis by illuminating sources of variation that drives our director information and corporate outcome tests.

4.1. Visual history

In Figures 2 through 4, we present a visual history of our 15-year sample period that illustrates major trends in the data. To minimize the effect of firm entry as the cross-section expands from the large-cap firms of ISS to the broad universe of BoardEx, we require that any firm included in this univariate analysis be present in the sample for at least 10 years. As a result, the sample for this visual history primarily consists of S&P 1500 firms (results using the full sample are similar). Analyses in Section 4.2 examine the full panel in multivariate regression settings. In the figures, a non-SOX targeted firm is a firm that had a majority of outside directors on its board and formally fully-outsider-composed committees responsible for audit, corporate governance/director nomination, and executive compensation as of 2001 fiscal year end. SOX-targeting is a time-invariant characteristic specific to each firm.

4.1.1. Structure

— *Insert Figure 2 about here.* —

In Figure 2, Panels A and B show that average board size is very stable over time, but the percent of outside directors increases around SOX (as documented in the existing literature). Hence, firms comply with independent director majority requirements by replacing inside directors with outsiders. Panels C and D show that the committee characteristics parallel those of boards. The average committee size does not change materially over the sample period, but the percent of committee members that are outside directors increases from 82% to 97%.

Boards could have created new committees to comply with the SOX-era listing standard requirements to maintain standing audit, corporate governance/director nomination, and compensation committees. Rather than do so, panels E and F suggest that firms expanded committee duties. Multi-function committees, defined as committees whose name encompasses multiple formal roles necessitated by SOX (e.g. a Compensation and Nominating Committee), increase from 12% of all committees in 1996 to 28% in 2010, on average.

4.1.2. Meetings

— *Insert Figure 3 about here.* —

SOX governance regulations appear to have precipitated a major change in committee meetings, but not board meetings. Panel B of Figure 3 suggests that the number of committee meetings nearly doubles post-SOX to approximately 20 committee meetings annually from a pre-SOX average of about 11. Brick and Chidambaran (2010) document audit committee activity increases by 4.7 meetings around SOX. Our data suggest that they capture approximately half of the increased role of board committees after SOX, and that this increase was not limited to audit.

Panels C and D highlight that insiders, who were not particularly active in committees pre-SOX, participate in even fewer committee meetings afterwards. Outside directors have around 5

committee meetings per year from 1996 through 2001, on average. This increases to approximately 10 (SOX-targeted) and 11 (non-SOX targeted) committee meetings per year annually from 2004 through 2010.

We do not show trends in the levels of LDA-based information gathering and decision-making responsibilities in Figure 3. Corporate disclosure verbosity increased significantly over the sample period. Loughran and McDonald (2014) document an increase in 10-K file size and the number of words over our sample period. We find a similar pattern for proxy statements. Thus, it is difficult to disentangle trends in disclosure style from trends in information gathering and decision-making responsibilities. In the next section, we focus on the outsider-only fraction measures, which, by design, should be less sensitive to disclosure regimes.

4.1.3. Outsider-only fractions

— *Insert Figure 4 about here.* —

Figure 4 displays trends in the average LDA- (panel A) and meeting-based (panel B) outsider-only fractions. LDA-based OOF increases from about 25% in 1996 to approximately 35% in 2010 (panel A). Meeting-based OOF increases from 25% to nearly 45% over this period (panel B). Despite deriving from different types of corporate reporting, the levels and overall trends for LDA-based and meeting-based OOF are similar, although meeting-based OOF shows a more pronounced increase around SOX than LDA-based OOF.

It is possible that the increases in committee meetings and the outsider-only fractions we document in Figures 3 and 4 are responses to aggregate policy uncertainty. The fact that these increases are concentrated around SOX, but exhibit no changes, on average, in the financial crisis and the 2008 election of a Democratic president with a Democratic-controlled congress suggests that this is not the case.[12]

[12] We thank the referee for asking us to consider this possibility.

4.2. Multivariate analysis

Figures 3 and 4 illustrate that there are significant differences between the pre- and post-SOX periods, but minimal differences between SOX targeted and non-targeted firms. To address the possibility that these univariate patterns reflect omitted characteristics rather than the evolving regulatory environment, we mirror the trend analysis in regression settings. Our specifications include *Post-SOX* (an indicator variable equal to 1 for observations with fiscal year ends in and after 2002) and its interaction with *Non-SOX Targeted* (a firm-constant indicator that equals 1 for firms that were not explicitly targeted by SOX as of the 2001 fiscal year end).

Our control variables include the number of directors, which a large body of research suggests is associated with board effectiveness and firm performance (e.g. Adams and Ferreira 2007; Beniers and Swank 2004; Coles, Daniel, and Naveen 2008; Malenko 2014; Yermack 1996). We also include firm characteristics related to (i) the composition and size of the board of directors, (ii) the allocation of information gathering and decision-making responsibilities, (iii) board and committee meetings, and/or (iv) firm performance. Firm leverage is known to vary with the composition of the board of directors (Güner, Malmendier, and Tate 2008; Klein 1998). Vafeas (1999) shows that larger firms and older firms have more active boards. CEOs of diversified firms benefit from advice provided by large boards (Hermalin and Weisbach 1988). Finally, boards need to address business uncertainty (Demsetz and Lehn 1985). Hence, we control for book leverage, firm size (measured by assets and number of employees), firm age, growth opportunities (measured by R&D expenditures), diversification (measured by the number of business segments), and business uncertainty (measured by stock return volatility). All regression specifications include firm fixed effects, and, as a result, the time-constant *Non-SOX Targeted* indicator is not tabulated.

4.2.1. Meetings

— *Insert Table 3 about here.* —

Table 3 presents results of OLS regressions examining variation in the number of annual board meetings (columns 1 through 6) and total annual committee meetings (columns 7 through 12).[13] Columns (1) and (2) examine board-meetings at the firm-year level with standard errors clustered by firm. Column (1) shows that the number of annual board meetings increased after SOX. While statistically significant, the economic effect is only about 0.3 meetings per year. Consistent with the plots, there is no statistical difference in this effect between SOX targeted and non-targeted firms. The results also suggest that boards meet more often when firms perform poorly. However, this negative correlation may arise due to time trends as any regression that includes *post-SOX* must omit year fixed effects. Column (2) includes year fixed effects and shows that the statistically significant negative correlation continues to hold. But, the economic effect is small; a one standard deviation decrease in stock returns is associated with approximately 0.1 additional meetings annually.

The firm-level patterns may be due to changes in board composition over the sample period if, for example, outside directors prefer to hold more meetings than inside directors. In columns (3) through (6), we analyze board-meetings using director-firm-year observations. A director who sits on multiple boards in a given year will have separate director-firm-year observations. We add director fixed effects in the regressions. Standard errors are clustered by firm and by director.

Point estimates in director-firm-year panels are similar to those in firm-year panels. Controlling for director fixed effects, the average director had approximately 0.3 more board meetings after SOX (column 3). Inside and outside directors both bear this increase (columns 5 and 6).

The average director has approximately 1.8 more committee meetings after SOX (column 7).[14] Columns (9) through (12) examine director-level regressions. In these specifications, all directors who sit on a given board will only be assigned the meetings for the committees of which they are members. Outside directors experience an increase in committee meeting workloads, with approximately 2.1 more meetings annually (column 12) post-SOX. Inside directors, on the other

[13] We compute the number of committee meetings for each director and then average over all the directors of the board. An alternate measure computed as the total number of committee-director meetings for all board members divided by the number of directors yields similar results.

[14] The results in column (7) of Table 3 and Panel B of Figure 4 cannot be directly compared. The regression examines the number of committee meetings for the average director, while the plot displays the total number of meetings for all committees.

hand, have 0.4 fewer annual committee meetings after SOX (column 11). Specifications with year fixed effects in columns (7) and (9) suggest that committee meetings are negatively related to stock returns, which is consistent with the result for board meetings.

Although it is intuitive to assume that SOX should affect targeted firms more than non-targeted firms, our results reject this assumption. In fact, the opposite seems to hold: committee meetings increased more for firms that were *not* targeted by SOX's structural requirements than for firms that were. Columns (7) and (9) show that a director in a non-SOX targeted firm has about 0.6 more committee meetings post-SOX than a similar director in a SOX targeted firm. While an increase in committee meetings may have been expected given SOX's stipulated compliance responsibilities for committees, it is not obvious why non-targeted firm committees should have more meetings post-SOX than targeted ones. These results highlight the difficulties inherent in using regulatory interventions as "natural" experiments in difference-in-differences settings. Because the consequences of regulations may differ from stated objectives, it is sometimes unclear which part of the population is untreated.

4.2.2. Outsider-only fractions

— *Insert Table 4 about here.* —

Table 4 replicates the analysis in the previous section with meeting-based (columns 1 through 4) and LDA-based (columns 5 through 8) OOF as dependent variables. Columns (1), (2), (5) and (6) show results for firm-year panel models. OOF is a board-level measure, but we also examine its director-level components in columns (3), (4), (7), and (8) so that we can include director fixed effects. Inside directors are excluded because OOF is 0 for them by definition.

The meeting-based outsider-only fraction increased after SOX. Economically, the average outside director spends about 7.8% more of her total annual meetings in groups without an inside director as a formal member after SOX (column 3). This result is statistically significant even after including director, firm, and year fixed effects and double-clustering standard errors by director and firm.

Unlike board and committee meetings, the meeting-based outsider-only fraction does not appear to be associated with stock returns in specifications with year fixed effects (columns 2 and 4). Thus, board and committee meetings appear to vary in tandem such that the proportion of director meetings on outsider-only committees is uncorrelated with firm performance.

The LDA-based outsider-only fraction increased after SOX at both the firm- and director-level in the specifications without year fixed effects (columns 5 and 7). In this period, the average outside director has 2.5% more of her stated information gathering and decision-making responsibilities allocated to outsider-only committees (column 7). Unlike meeting-based OOF, LDA-based OOF is negatively related to stock returns in specifications with year fixed effects (column 6 and 8). While statistically significant, the economic effect is quite small. A one standard deviation increase in returns is associated with a 0.0025 decrease in LDA-based OOF.[15]

4.2.3. A comparison of LDA- and meeting-based OOF

The LDA- and the meeting-based outsider-only fractions are designed to capture three aspects that theory predicts influence group effectiveness: structure, composition, and formal operations. The two measures differ in the way the operational component is measured. LDA-based OOF captures stated information gathering and decision-making responsibilities. However, there may be a lag in reporting how board and committee responsibilities change. In practice, proxy statement texts evolve slowly. Sometimes firms repeat descriptions of committee responsibilities verbatim from one year to the next despite dramatic changes in meeting frequency (which are presumably due to increased workload). While potentially less intuitive, the benefit of meeting-based OOF is that it is based on data that firms are required to update on a timely basis.

— *Insert Table 5 about here.* —

[15] OOF is determined by three primary components: the fraction of outside directors on the board, the number and formal composition of committees, and the relative allocation of responsibilities or meetings across the board and its committees. Only SOX-targeted firms needed to increase the fraction of outside directors, create necessary committees, or alter the membership of existing committees. Thus, one might expect OOF to increase more for SOX targeted firms. Yet, the coefficient on the interaction of the post-SOX and non-SOX targeted firm indicators in Table 4 is never statistically negative.

The two OOF measures should be related if they proxy for the same underlying economic phenomenon. In Table 5, we show that this is indeed the case. In the first two columns, we regress LDA-based OOF on meeting-based OOF and the control variables from Table 4 with year and firm fixed effects. Column (1) is a contemporaneous model, in which all variables are measured in the same fiscal year. Column (2) is a predictive model, in which the explanatory right-hand-side variables are lagged by one year to the dependent variable. In columns (3) and (4), we show the results of swapping the dependent and explanatory variables, regressing meeting-based OOF on LDA-based OOF. We cluster the standard errors by firms.

We find statistically strong relationships in the contemporaneous and predictive settings. The *t*-statistics in contemporaneous regressions in columns (1) and (3) are 23.8 and 19.2, respectively. Predictive regression *t*-statistics in columns (2) and (4) are 6.3 and 4.7, respectively. Meeting-based OOF explains more variation in LDA-based OOF than vice versa. After normalizing coefficients by variable standard deviations, meeting-based OOF is approximately three times more economically meaningful than LDA-based OOF in predictive settings.

5. Outsider-only fractions and the flow of information

An extensive literature measures the quality of unpriced information known to corporate insiders by examining the market reaction to, and performance of, their stock transactions (e.g. Aboody and Lev 2000; Fidrmuc, Goergen, and Renneboog 2006; Lakonishok and Lee 2001; Ravina and Sapienza 2010). As commonly argued, there is information asymmetry between outside and inside directors of corporate boards (e.g. Adams and Ferreira 2007; Harris and Raviv 2008; Raheja 2005; Ravina and Sapienza 2010).

Our hypothesis suggests that the information corporate directors have is related to OOF. We evaluate this by analyzing the relations among director type (outsider and insider), the market reaction to trades, trade performance, and the outsider-only fractions. We emphasize meeting-based OOF, which our results in the previous section suggest is more timely than its LDA-based

counterpart. As a result, it is likely to be more meaningful to market participants when evaluating director transactions. We focus on share purchases and not sales, for which liquidity motives and litigation risk may obscure information content.[16]

5.1. Market reaction to reported director purchases

At the start of our sample, corporate directors needed to report SEC Form 4 relevant transactions within ten days of the calendar month end. For example, a corporate director trading on March 1 could wait until April 10 to report the trade. Beginning on August 29, 2002, revised SEC rules required directors (and other insiders) to report trades within two days. To ensure our findings are not affected by non-timely disclosure, we analyze the market reaction to director trades from August 29, 2002 through December 31, 2010.[17]

Our tests use Thomson Reuters's director-level transaction data that we link to our sample of directors on a firm-by-firm basis using manually reviewed, fuzzy text matching algorithms. We exclude flawed transactions, option related sales, and "routine" sales pursuant to Rule 10b5-1 of the Securities Exchange Act per Cohen, Malloy, and Pomorski (2012). See Appendix A.4 for details.

Our unit of observation is a director-firm-transaction day because a single day may have one director executing a net purchase and another director executing a net sale. We classify a reporting date for a director as a "net purchase" if the number of company shares purchased exceeds that sold. We define the market reaction to be the cumulative abnormal return (CAR) over the 2-trading day window beginning on the day the trade is reported to the SEC. For both days in this trading window, we compute the daily abnormal return as the return of the stock less that of a size and book-to-market matched Fama and French (1993) 2 x 3 benchmark portfolio.[18]

Our regressions of CARs on OOF include the firm-level control variables we use in the previous

[16] Lakonishok and Lee (2001), for example, argue that "insiders have many reasons to sell shares but the main reason to buy shares is to make money." Litigation risk may also obscure the information content of stock sales (Johnson, Nelson, and Pritchard 2007; Meulbroek 1992). Our evidence for sales is consistent with this idea that they are less informative than share purchases; we do not report these results for the sake of brevity.

[17] Brochet (2010) and Wu and Zhu (2011) find that trades of corporate insiders are more informative under the timely reporting regime implemented post-SOX than pre-SOX.

[18] Each stock from July of year *t* through June of year *t+1* is matched to the corresponding portfolios based on the cutoffs reported by Fama and French (1993) as of the end of June in year *t*. Size is the market value of equity as of June in year *t*. Book-to-Market is the ratio of the book-value of equity in fiscal year *t-1* to the market value of equity as of year-end *t-1*.

section and additional control variables. We include the book-to-market ratio and stock market capitalization (Fama and French 1993). As optimal trading strategies may be correlated with the outsider-only fraction and CARs, we add controls to measure the strength of the purchase signal. These include the dollar value of shares purchased (*trade size*), the number of directors purchasing shares (*strong buy*), and the number of purchases executed over the past year by the director (*filing frequency*). We also control for several director characteristics: director age, education, sex, board tenure, and membership on other public and private boards. Finally, OOF and trade CARs may both depend on the degree of firm-level informational asymmetries, which we control for by including the number of stock analysts providing estimates of annual earnings per shares. Control variables are measured as of the fiscal year-end preceding the trade to reflect information known to market participants on the reported trade date. All specifications include unique Fama and French 48 industry fixed effects for every year-month.[19] Standard errors are clustered by year-month to allow for cross-sectional correlation and overlapping 2-trading day cumulative abnormal return windows.

— *Insert Table 6 about here.* —

The relation between the meeting-based outsider-only fraction and CARs differ for outside and inside directors. In director-type split sample specifications in columns (1) and (2), the meeting-based outsider-only fraction is associated with an increase in the market response to reported net purchases of inside directors, but is unrelated to the market response to purchases of outside directors.

Column (4) confirms these results in a specification that includes all directors. Meeting-based OOF is associated with higher CARs for inside directors (as reflected in the non-interacted coefficient); a one standard deviation increase in meeting-based OOF corresponds to a 0.30% increase in the CAR for their reported net purchases. Critically, the meeting-based outsider-only fraction is associated with lower CARs for outside directors relative to insiders. The coefficient on the

[19] Our fixed effect specification captures industry-specific time effects. As not all directors in a firm trade in a given month, we cannot use firm-specific time effects.

interaction of meeting-based OOF and the outside director indicator is negative and statistically significant. It suggests that a one standard deviation increase in meeting-based OOF leads to a 0.23% lower market reaction to outside director purchases.

These results are consistent with the idea that information flow and communication are a function of formal group structure (Aghion and Tirole 1997). Cohen, Hayes, Krishnamoorthy, Monroe, and Wright (2013) provide anecdotal evidence that the use of formally outsider-only committees reduces the overall board-level discussion on strategy. Our results provide quantitative, large-sample support for this finding. As OOF increases, it appears that unpriced information about the firm is not transferred from inside to outside directors. Because the OOF coefficient in column (4) is positive and significant, the results suggest instead that information known to corporate insiders becomes more relevant to the market. It is important to note that the results do not suggest that the total information known by the board changes with OOF. The cumulative effect of OOF on outside directors (the sum of the coefficients on *meeting-based OOF* and its interaction with *outside director*) in column (4) is not statistically different from zero.[20]

The results also provide a more nuanced picture of the established result that the trades of outside directors underperform those of insiders (Ravina and Sapienza 2010; Seyhun 1986). Column (3) confirms that this finding holds in our data when the specifications include an outside director indicator, but not the meeting-based outsider-only fraction. However, column (4) demonstrates that the negative returns for outside directors are no longer statistically significant once an interaction term between outside directors and meeting-based OOF is included. This suggests that the market does not view outsiders as intrinsically less informed or worse traders than insiders. Instead, markets perceive that OOF alters communication between insiders and outsiders.

The signs on the coefficients are the same when LDA-based OOF is used as the explanatory measure in column (5). However, the LDA-based OOF coefficients have lower economic signif-

[20]For example, it is possible that outside directors have "more" information with increased OOF. This may occur as outside directors gather information during committee sessions. But, the decrease in CARs with greater OOF suggests that such information may have a minimal price impact or already be known to the market (e.g. outsiders may invest in knowledge of audit which is largely observable to the market).

icance than the meeting-based coefficients and are not statistically significant. This is consistent with the idea that firms update stated responsibilities slowly and, consequently, LDA-based OOF is less informative to market participants.[21]

The coefficients on several control variables in Table 6 suggest that market participants consider board meetings and trading strategies to reflect information known to directors. Board meetings exhibit a positive relationship with CARs, implying that the market believes information is transferred among directors at board meetings. The three variables that serve as proxies for the strength of the director purchase signal are also positive and statistically significant.

5.2. Performance of director purchases

While potential reporting delays would confound the interpretation of short-term CARs in the untested period before August 29, 2002, they are unlikely to systematically affect long-term Buy and Hold Abnormal Returns (BHARs). Thus, we analyze BHARs using the full sample of insider trading data beginning in 1996. We compute 6-month BHARs, because corporate directors are subject to short swing profit rules that prevent them from trading in opposite directions within a six-month period.

BHARs are measured per firm-director type-month. We classify months as purchase months if the aggregate share purchases by all directors of a given type (inside or outside) exceeds the aggregate sales. We compute BHARs beginning with the first trade date following each aggregated month in excess of the return of size and book-to-market matched Fama and French (1993) 2 x 3 benchmark portfolios.

Our BHAR specifications mirror our CAR specifications, except that trade-level controls (*trade size*, *strong buy,* and *filing frequency*) are summed over all directors within a given type and director characteristics (e.g. age) are averaged across directors within a given type.[22] Results are in

[21] Directors may copy the trades of other members of the board. Such trades may obscure the effect of information if, for example, outside directors simply copy the transactions of insider directors. In untabulated results, we eliminate trades that appear to mimic trades of other directors. We consider mimicking trades to be trades that occur within two days of a director's transaction report date. The results remain economically and statistically significant without mimicking trades.

[22] BoardEx provides all the director characteristics we use. ISS contains data on director age, gender, tenure, and number of public boards beginning

columns (6) and (7) of Table 6. Standard errors are double clustered by year-month (to account for potential cross-sectional correlation) and by firm (to address overlapping 6-month BHAR calculation windows).

The buy and hold performance of stock purchases of outside directors decreases as the meeting-based outsider-only fraction increases. Economically, a one standard deviation increase in meeting-based OOF lowers outside director BHAR by 0.89% (column 6). As with the CARs, the BHAR results do not provide insight on the total information known to the board. The cumulative effect of OOF on outside director BHARs in column (6) is statistically significant and negative. However, the effect of OOF on inside director BHARs is positive, but not statistically significant. We also find in column (7) that a model using LDA-based OOF as the explanatory variable yields coefficients with the same signs as meeting-based OOF, but with lower statistical significance. Thus, the results are consistent with reduced sharing of market-price relevant information between inside and outside directors.[23]

6. Outsider-only fractions and decision-making

Our tests suggest that the quality of outside director information is related to OOF. If corporate decisions reflect the collective wisdom of board members, we expect to find a relationship between OOF and outcomes. Inside directors may withhold information to increase their real authority as their formal authority declines (Aghion and Tirole 1997), forcing outside directors to defer, in part, to the judgement of insiders. This suggests that an increase in formal authority represented in OOF may lead to increased agency costs and poorer decision-making. To test this hypothesis, that an increase in the outsider-only fraction can affect the decision-making capacity of the board, we examine (i) how the market reaction to acquisition announcements varies with OOF and (ii) the relation between Tobin's q and OOF in a panel setting.

in 1998. We set missing director characteristics to 0 and include a set of dummies flagging missing characteristics in the specifications.

[23] In contrast to our results, Jeng, Metrick, and Zeckhauser (2003) find statistical significance on insider share purchase BHARs. However, their standard errors do not appear to account for serial correlation.

We examine these settings because acquisitions are key corporate decisions that generally fall under the purview of the board of directors, with board approval required for material acquisitions, and Tobin's q reflects the cumulative effect of board decisions. While important strategic discussions generally occur at the board-level with both inside and outside directors present, the overall committee structure and the allocation of formal authority remains relevant. Inside directors may continue to strategically withhold or manipulate information as a way to assert real authority and influence decisions. For example, an inside director may not reveal information relevant to a board-level discussion if such information can later lead a committee away from a preferred decision.

Moreover, the existing literature links the three principal factors in OOF (structure, composition, and operations) to both acquisition and investment outcomes. For example, Masulis, Wang, and Xie (2007) demonstrate that boards with separate CEO and chairperson positions (structure) experience higher abnormal returns for acquisitions. Levi, Li, and Zhang (2014) relate acquisition premia to director gender (composition). Caskey and Laux (2016) develop a theoretical model relating accounting policy (operations) to investment efficiency.

6.1. Acquisitions

We obtain data on mergers and acquisitions from SDC. We follow Masulis, Wang, and Xie (2007) in restricting our data to economically significant transactions.[24] Our sample consists of 1,688 deals completed by 941 unique firms.

We regress the market reaction to acquisition announcements on OOF. These specifications reflect the fact that the full board has final approval on acquisitions. We do not examine the role of acquisition committees separately since firms can execute acquisitions without one. In fact, 97% of acquisitions in our sample are executed by a firm without a standing acquisition or merger committee. We define the market reaction to an acquisition announcement as the cumulative

[24]Prior to the deal announcement, the acquirer must control less than 50% of the target company's shares, and the acquirer must control 100% of the target's shares after the transaction is completed. The deal value must also be greater than $1 million.

abnormal return (CAR) over the 5-day window beginning 2 days prior to and ending 2 days following the announcement (Masulis, Wang, and Xie 2007; Moeller, Schlingemann, and Stulz 2004). As acquirer control variables, we include the board- and firm-level characteristics used earlier, measured as of the fiscal year-end preceding the deal announcement. We also follow Cai and Sevilir (2012), Custódio and Metzger (2013), Masulis, Wang, and Xie (2007), Moeller, Schlingemann, and Stulz (2004), and Schmidt (2015) and include a number of deal-level control variables,[25] as well as controls for the bidder's Tobin's q, cash flow, and the cumulative stock return from 210 days prior through 11 days prior to the event. All specifications include year and industry fixed effects.[26]

— *Insert Table 7 about here.* —

Table 7 presents the results of regressions analyzing the market reaction to the acquisition announcements by sample firms. In columns (1) and (2), model adjusted CAR is based on daily abnormal returns over a single-factor market model, which is estimated from 210 days to 11 days before the announcement using the CRSP value-weighted return as the market index. The CAR in columns (3) and (4) is the total daily market adjusted return, defined as the difference between the stock return and the CRSP value-weighted return (Brown and Warner 1985).

The results demonstrate an economically and statistically meaningful negative relationship between meeting-based OOF and acquisition CARs. Columns (1) and (3) show that firms have lower market reactions as meeting-based OOF increases. There is a negative relation between LDA-based OOF and announcement CAR in columns (2) and (4); this effect is not statistically significant, consistent with an interpretation that LDA-based OOF may not be updated in a timely fashion and, as a result, is either noisier or has lower information content. These results suggest that the market associates an increase in the outsider-only fraction with lower-quality board decision-making. Economically, a one-standard deviation increase in meeting-based OOF is associated with

[25] The deal-level controls include indicator variables for public and private targets, all cash deals, whether the deal included stock, high-tech deals, hostile offers, tender offers, and diversifying deals. Continuous deal-level control variables are the relative deal size and the transaction value. As in the existing literature, we also include relevant interactions of these deal-level control variables.

[26] As many firms only execute a single acquisition, we do not include firm fixed effects.

a decrease in the market reaction to acquirers' acquisition announcements of approximately 0.72%.

6.2. Firm value

Our hypothesis suggests a more general link between OOF and the cumulative effect of board decisions. To test this, we examine the relation between firm value, defined as the natural log of Tobin's q, and the outsider-only fractions. We recognize potential endogeneity in this relation, which may arise as firms alter their board composition, committee structure, and operations in response to performance (e.g. Cremers, Litov, and Sepe 2017; Hermalin and Weisbach 2003; Hoechle, Schmid, Walter, and Yermack 2012; Roberts and Whited 2013; Wintoki, Linck, and Netter 2012).

To allow for dynamic endogeneity, simultaneity, and unobservable firm-level effects, we follow Wintoki, Linck, and Netter (2012), Hoechle, Schmid, Walter, and Yermack (2012), and Cremers, Litov, and Sepe (2017), among others, in applying dynamic panel GMM estimators (e.g. Arellano and Bond 1991; Arellano and Bover 1995) to a corporate governance setting. We model current firm value as a linear function of (i) lagged firm values and (ii) the outsider-only fraction, board meetings, and the firm-level characteristics used in Section 4.2. First differencing the model eliminates all unobserved time-constant firm-level effects, and the resulting model can be estimated within a GMM instrumental variables approach.

As an instrumental variables estimation technique, this dynamic GMM model is valid, provided the instruments are relevant and satisfy the exclusion restriction. Our instruments are lags of firm value, the outsider-only fraction, board meetings, and all control variables. Wintoki, Linck, and Netter (2012) argue that relevance follows from the dynamic endogeneity of corporate governance. In our data, for example, Table 4 suggests firm performance is relevant for OOF. Since, in principle, relevance can be tested, we examine relevance in detail later. Instrument exogeneity requires (weak) rational expectations (Muth 1961) among corporate directors and market participants. We believe this is reasonable in our setting as we examine a market-based measure of firm value and its relation to publicly available corporate data. Market efficiency implies that this corporate data is impounded

into prices. Thus, in a dynamically complete specification, lags of firm value, the outsider-only fraction, board meetings, and firm characteristics should be exogenous to current firm value and satisfy the exclusion condition (Hoechle, Schmid, Walter, and Yermack 2012; Wintoki, Linck, and Netter 2012).

In our data, as in Cremers, Litov, and Sepe (2017), two lags of firm value appear sufficient to capture the dynamics of firm value. In untabulated results, we find that the coefficient on the third lag of firm value, while significant on its own, is not significant when the first and second lags are included. Thus, any information in the third lag of firm value appears to be subsumed by the first two.

— *Insert Table 8 about here.* —

Table 8 presents the estimation results. As a benchmark, columns (1) and (2) provide standard fixed effects panel models. Columns (3) and (4) present results from estimating dynamic panel models. Meeting-based OOF is used as the key explanatory variable in columns (1) and (3), while LDA-based OOF is used in columns (2) and (4). Control variables, except for the lagged dependent variable, are measured contemporaneously with Tobin's q. All specifications control for firm and year fixed effects, and standard errors are clustered by firm.

Differencing the dynamic panel models in columns (3) and (4) for estimation induces a mechanical first-order serial correlation in the resulting first-differenced errors. However, the second-order autoregressive test (AR(2)) cannot reject the null hypothesis of no second-order serial correlation in the differenced errors with p-values of 0.762 and 0.462 in columns (3) and (4), respectively. This suggests that we have included enough lags of firm value to control for dynamic relations and that third lags of regressors and later are potentially valid instruments. The Hansen J-Tests fail to reject the null that the lagged instruments are exogenous with p-values of 0.160 and 0.173.[27] We

[27] We do not use the additional moment conditions in levels proposed by Blundell and Bond (1998) to improve efficiency. These conditions require that initial observations are drawn from a steady state distribution. This assumption is unlikely to hold for our unbalanced panel. As a result, we do not perform the Hansen J test for the level equation moment conditions as in Cremers, Litov, and Sepe (2017); Hoechle, Schmid, Walter, and Yermack (2012); and Wintoki, Linck, and Netter (2012).

also replicate the Stock and Yogo (2002) style weak instrument tests recommended by Wintoki, Linck, and Netter (2012) and assess each control variable individually. In untabulated results, we find F-statistics of 173.85 and 24.18 when differences in meeting-based OOF and board meetings are instrumented by lagged levels, respectively. These exceed the critical value of 21.42 reported by Stock and Yogo (2002) for a 5% maximal bias relative to OLS (i.e. the instrumented estimator will yield a coefficient whose bias is less than 5% of the OLS bias). Instrumenting differences in LDA-based OOF with lagged levels yields an F-statistic of 19.60, below the 5% critical value, but well above the critical value of 11.32 for a 10% maximal bias relative to OLS.[28]

The results suggest that a higher outsider-only fraction impairs the collective decision-making capacity of the board, thereby reducing firm value. The coefficient on meeting-based OOF is negative and statistically significant in both fixed effect and dynamic panel specifications (columns 1 and 3). The coefficient on LDA-based OOF is also negative in both specifications and statistically significant at the 5% level in the dynamic panel. Economically, the increases in the meeting- and LDA-based outsider-only fractions after SOX are associated with 2.49% and 0.45% lower Tobin's q, respectively.[29]

7. Conclusion

Board committees have been relatively understudied, perhaps because they are not the focus of standard financial datasets. Since committee information is generally embedded in text, it is difficult to accurately extract committee characteristics using the sentiment and word pattern techniques common to the literature. Our use of advanced natural language processing techniques enables us to collect comprehensive data on committees that leads to new insights on groups and sub-groups. We

[28] We also find that F-statistics for year-to-year changes in log assets, log firm age, log number of employees, log number of segments, and stock volatility greatly exceed the critical value for a 5% maximal bias with a minimum F-statistic of 98.63 (log number of employees). However, book leverage, log board size, and R&D fall below the critical value, suggesting these coefficients may be biased due to weak instruments. We find similar relations, both economically and statistically, between Tobin's q and OOF measures when book leverage, log board size, and R&D are dropped from the dynamic panel specifications.

[29] The coefficients on *Post-SOX* in Table 4 are 0.075 and 0.027 for meeting- and LDA-based OOF, respectively. The elasticity of Tobin's q with respect to meeting- and LDA-based OOF is -0.332 and -0.165, respectively (columns (3) and (4) of Table 8). Multiplying the change in OOF around SOX with the elasticity gives the reported estimated change in Tobin's q.

believe the use of grammar-based algorithms like ours can broaden the scope of corporate finance research.

Our results suggest that the formal assignment of responsibilities to committees of nominally outsider-only directors can be inconsistent with the board's firm value maximization objective. This may seem incongruous with the reality that the firms in our sample increased the use of such committees over time. However, formal authority through committee structure and usage are not decided exclusively by a firm's shareholders. A long history of regulatory requirements and recommendations for committees predates SOX. The Securities and Exchange Commission (SEC) and New York Stock Exchange (NYSE) first advocated for separate audit committees following the McKesson & Robbins scandal of 1938 (Birkett 1986). In the 1970s, in response to widespread bribery by U.S. corporations in foreign countries, the SEC recommended that firms maintain a majority of independent directors on audit and nominating committees and the NYSE updated its listing standards to require that firms maintain audit committees (Dundas and George 1980). Several high profile corporate failures in the early 1980s brought about the Treadway Commission, whose report was a factor when the major national exchanges recommended audit committee independence (Reeb and Upadhyay 2010). Our results are consistent with the spirit of Aghion and Tirole (1997). As the formal authority of inside directors declines, they may strategically withhold information to increase their real authority. Thus, even in equilibrium, boards may not be able to take steps to improve communication when formal authority is constrained by regulation.

The apparent resilience of corporate scandals to this long history of preventative mechanisms implemented via board committees suggests it may not be possible to eliminate corporate scandals altogether. While several researchers find that reforms can improve internal monitoring (for example, Bronson, Carcello, Hollingsworth, and Neal 2009; Cohen, Krishnamoorthy, and Wright 2010; Faleye, Hoitash, and Hoitash 2011), existing regulatory mandates do not appear to consider how altering formal authority can impact group decision-making. Reform-induced codification of

responsibilities instead emphasizes regulatory compliance and performance reporting. The results in this paper suggest that regulators may need to trade-off reductions in corporate failures with potential reductions in firm values when operating on formal, observable board characteristics.

However, the optimal trade-off is not clear. We note that committees are used less intensively in some jurisdictions outside the United States. In 2002, Japan allowed firms to switch corporate governance models from a statutory auditor structure to a U.S.-style structure with required audit, nomination, and compensation committees. Yet, as of 2012, only 2.2% of firms listed on the Tokyo Stock Exchange had moved to the U.S.-style system (Goto 2013). To satisfy SEC governance standards, Köhler (2017) notes that the "Supervisory Board as a whole" can act as the audit committee in cross-listed German firms. In Denmark, only an audit committee is required under accounting laws. All other committees are formed voluntarily – perhaps because the 2001 Nørby report (Copenhagen Stock Exchange) explicitly questioned the need for board committees: "Most company boards are not so large that they require the establishment of board committees in order to be able to manage their tasks, and therefore appointments of board committees cannot be recommended in general."

Our results, therefore, suggest that sub-groups should be examined in greater detail by both theoretical and empirical researchers. As groups become more complex due to heterogeneity in sub-group structure and member preferences, information aggregation problems may become more acute. Determining who should sit on sub-groups and how sub-groups should report back to the group are interesting topics for further research.

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Appendix

A. Details of data set construction

A.1. Firm-Year observations

The sample contains firm-year observations from BoardEx and ISS. BoardEx data provides accurate information on director names and classifications, committees of the board, and committee memberships. When BoardEx data is not available, ISS is used for the director names and classifications only; committee names and committee composition are collected manually.

Since some firms are contained in both BoardEx and ISS, we harmonize identifiers using Compustat firm identifier (*gvkey*) and fiscal year. This requires merging both BoardEx and ISS with Compustat. We are able to match all ISS firm-year source observations with Compustat by CUSIP codes. While we can match most BoardEx firms to Compustat using CUSIPs (CUSIPs are embedded within BoardEx's ISIN codes), some BoardEx firm CUSIPs do not have a match in Compustat. For such firms, we attempt to match across the databases using firm names. Fortunately, BoardEx provides a full history of the firm's name, which we use to identify potential matches in Compustat. Whenever a match on name is unsuccessful, we use Internet searches to identify the Compustat observation that corresponds to the BoardEx firm. Compustat matches are not available for slightly more than one hundred firms in BoardEx, all of which are either privately held or headquartered outside the United States.

A.2. Director data set construction

We track each director's experience on all the sample boards on which she has served. Doing so requires unique identifiers for each director, as a director may appear in both BoardEx and ISS firm-year observations. The BoardEx director data is of high quality, with each person having an identifier that is common across all the corporate boards on which he or she serves. ISS director

data, on the other hand, is less reliable. A director with multiple appointments may have different identifiers depending on the firm. Director identifiers are also shared across people with different names.

We use BoardEx as a base data set. To harmonize identifiers between databases and over time, we match directors from ISS-sourced firm-years to BoardEx directors. For each director-observation in both databases, we build a list of companies with which the director was associated. Director observations are considered matches when the BoardEx and ISS names match exactly and the observations share a company association. The company association need not occur in the same year, which allows us to bridge the time between the start of ISS data and that of BoardEx. If a match is not found using this approach, we perform a fuzzy match on director names using both edit distance (Damerau-Levenshtein) and sound-based (Metaphone) algorithms, while maintaining the requirement that directors share a firm history. The remaining unmatched ISS directors are matched to BoardEx by name only and validated with proxy statements. Any directors left in ISS are assumed to be unique and are added to the sample. We check such directors for changes in ISS identifiers (using an ISS self-match) to ensure we capture the director's experience across firms and over time.

A.3. Issues with ISS committee data

ISS committee data is both restrictive and potentially misleading. ISS provides committee memberships for four types of committee functions: Audit, Compensation, Governance, and Nominating. Committees that fall outside of these designated functions are not recorded in the data. For example, most of United Airlines's ten committee are not recorded in 1998 fiscal year.[30] In addition, when multiple committees have similar functions, ISS selects one as a representative committee. United Airlines had an Independent Director Nomination Committee and an Outside Public Director Nomination Committee in 1998. The committee membership presented in BoardEx

[30]These were the Executive, Audit, Compensation, Compensation Administration, Competitive Action Plan, Labor, Independent Director Nomination, Outside Public Director Nomination, Pension and Welfare Plans Oversight, and Transaction Committees.

is for the Outside Public Director Nomination Committee, committee members unique to the Independent Director Nomination Committee do not have a nomination role in the database.

ISS also disaggregates committees with multiple functions into multiple observations. For example, the proxy statement filed by Briggs and Stratton for the 1998 fiscal year indicates that the firm had two committees, an Audit Committee and a Nominating, Compensation and Governance Committee. Members of the single Nominating, Compensation and Governance Committee are recorded as having these three distinct committee functions in ISS. Therefore, ISS data overstates the number of committees in some cases and understates them in others.

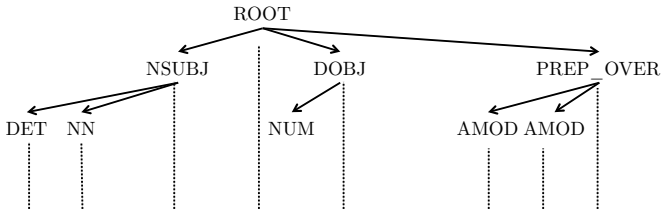
A.4. Thomson Reuters director trade sample selection

We obtain director trades from Thomson Reuters. Trades are attributed to directors using a two-way match on director name (using fuzzy matching) and firm CUSIP (using each firm's full CUSIP history). We exclude director trades from Thomson Reuters that are coded as flawed (marked with cleanse code "A" or "S") and option related sales (option sell indicator "A" or "P"), which are likely to be motivated by diversification needs and less likely to be informative. We also remove transactions that we consider to be non-informative and/or pre-planned (Cohen, Malloy, and Pomorski 2012). Any calendar month during which a director makes trades in the same net direction for three consecutive years is considered a non-informative, pre-planned trade.

Figure 1
Grammatical Structures

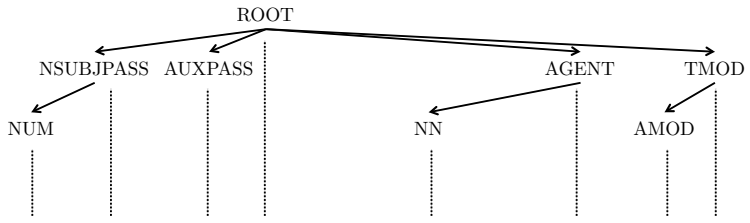
The panels show grammatical dependency trees for simple sentences describing board committee meetings. Similar patterns exist for the board of directors. Panel A displays a tree for an active voice sentence; panel B shows a tree for a passive voice sentence. Grammatical structures are generated using the Stanford Natural Language Processing Group's CoreNLP software. Stanford CoreNLP implements a machine learning algorithm that has been trained to parse sentences, providing the grammatical interrelationships between words. For each pair of words forming a grammatical relationship in a sentence, the "dependencies" output of CoreNLP yields the (i) governing word, (ii) the dependent word, and (iii) the type of grammatical relationship between the two. In both panels, the grammatical structure is represented by the tree diagram above the sentence. The relationships between words are displayed using arrows from the governing word to the dependent word. The type of grammatical relationship between the governing and dependent word is displayed at the end of the arrow. Dashed vertical lines link these grammatical dependencies to the words in the sentence. *ROOT* is the root word of the sentence, which is the source from which grammatical dependencies originate. The other grammatical relationships appearing in these sentences include an agent (*AGENT*), an adjectival modifier (*AMOD*), a passive auxiliary (*AUXPASS*), a determiner (*DET*), a direct object (*DOBJ*), a noun compound modifier (*NN*), a nominal subject (*NSUBJ*), a passive nominal subject (*NSUBJPASS*), a numeric modifier (*NUM*), the preposition "over" (*PREP_OVER*), and a temporal modifier (*TMOD*).

Panel A: Active Voice



The audit committee met 4 times over the last fiscal year.

Panel B: Passive Voice



Five meetings were held by the compensation committee last year.

Figure 2
Board and Committee Structure

The plots show average board and committee characteristics for firms that were in the sample for at least 10 years. Observations are averaged based on the calendar year in which a firm's fiscal year ends. In each panel, the black and gray lines represent those firms targeted and not targeted by the Sarbanes-Oxley (SOX) era regulations, respectively. A non-SOX targeted firm is one that had a majority of outside directors on its board and had fully outside committees responsible for audit, corporate governance, director nomination, and executive compensation as of the 2001 fiscal year end. All other firms are considered SOX targeted. Panel A displays the *Number of Directors* on the board. In Panel B, *Percent outside directors* is the percent of those directors classified as outsiders; a director who is not a corporate insider is classified as an outside director. *Number of directors (committee)* in Panel C is the average number of committee members. Panel D shows the average *Percent outside directors* on a firm committee. *Number of Committees* in Panel E is the number of standing committees of the Board of Directors; committees are not required to have met during a fiscal year to count toward this statistic. Panel F displays *Percent multi-function committees* as the ratio of the number of standing committees that are responsible for more than one functional area specified by SOX (i.e. audit, corporate governance, director nominations, and executive compensation) to the total number of standing committees. Variables in Panels C through F are first computed for each firm-year observation, and then averaged each year for SOX-targeted and non-SOX targeted firms separately. Tick marks on the horizontal axis indicate December 31 of each year. Vertical lines mark two key dates related to SOX: July 30, 2002, the day the bill was signed into law, and June 15, 2004, the fiscal year end date after which public companies with a market capitalization greater than $75 million were required to be compliant with the legislation.

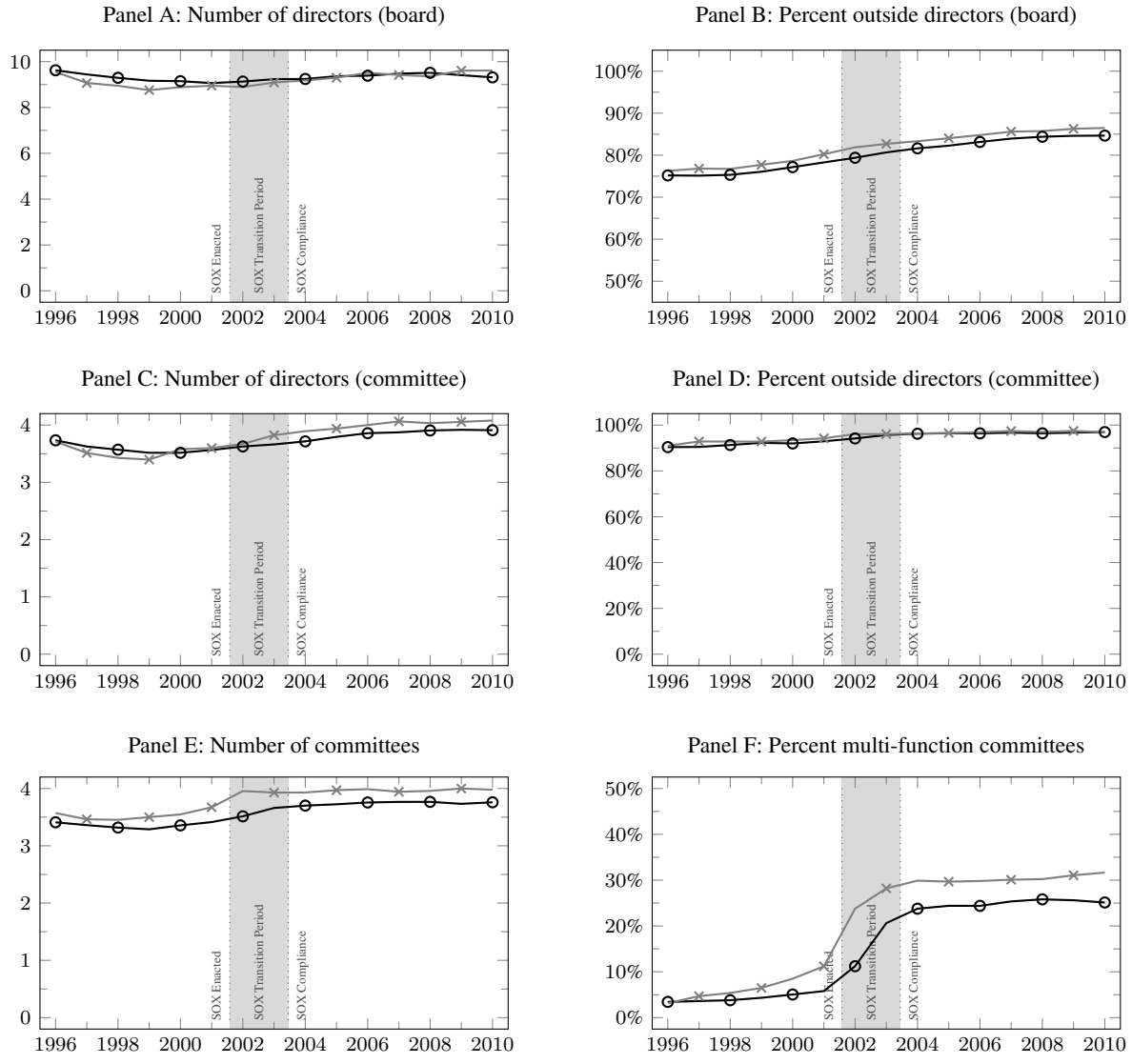


Figure 3
Board and Director Activity

The plots show average board and committee meetings by year and director-type-year based on underlying firms that were in the sample for at least 10 years. Observations are averaged based on the calendar year in which a firm's fiscal year ends. In each panel, black and gray lines represent those firms targeted and not targeted by the Sarbanes-Oxley (SOX) era regulations, respectively. Figure 2 defines SOX targeted and non-SOX targeted firms. Panel A displays the *Total Annual Board Meetings*; this statistic considers only in-person meetings of the board. *Total annual committee meetings* in Panel B represents the total meetings of all firm committees. For example, a firm that had Audit, Nomination, and Governance committees that met 7, 6, and 5 times, respectively, would count 18 total committee meetings. Panels C and D show the average number of annual committee meetings for inside directors and outside directors, respectively. Variables in these two panels are first computed for each director-firm-year observation. They are then averaged over inside and outside directors for each firm-year. These firm-year measures are then averaged each year for SOX-targeted and non-SOX targeted firms separately. Tick marks on the horizontal axis indicate December 31 of each year. Vertical lines mark two key dates related to SOX as described in Figure 2.

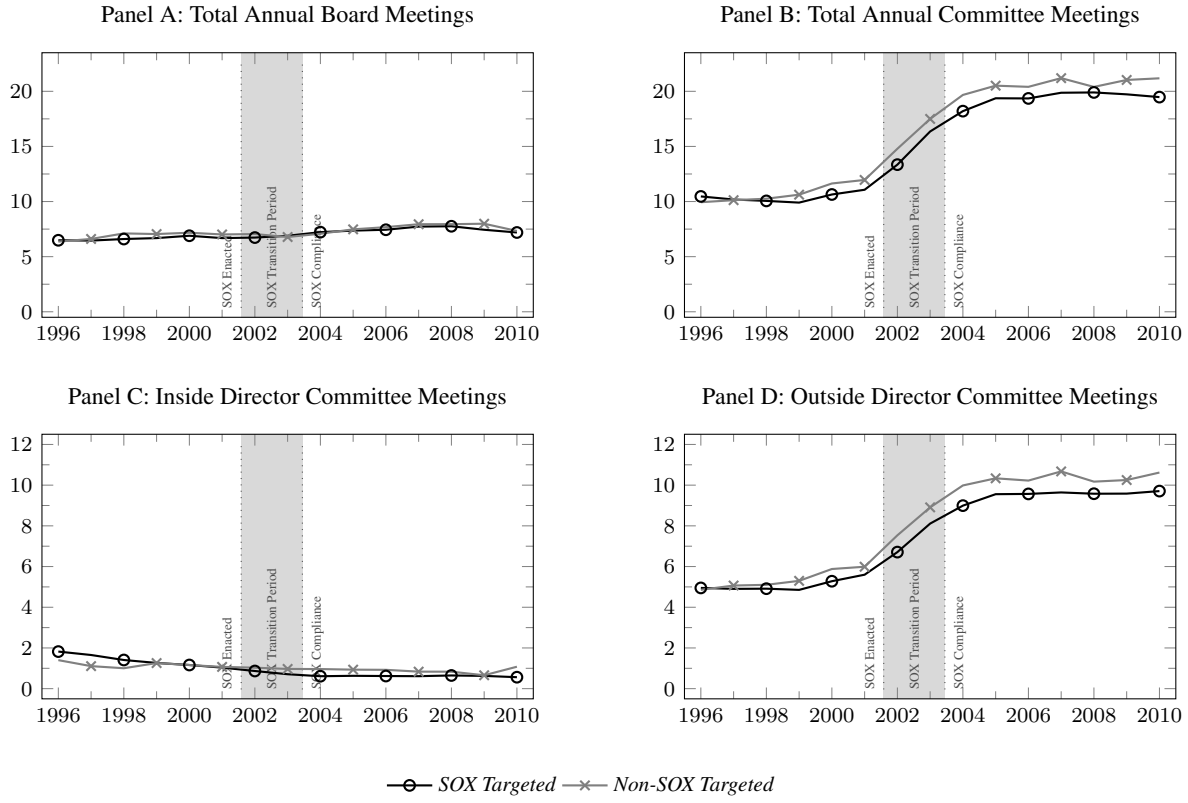
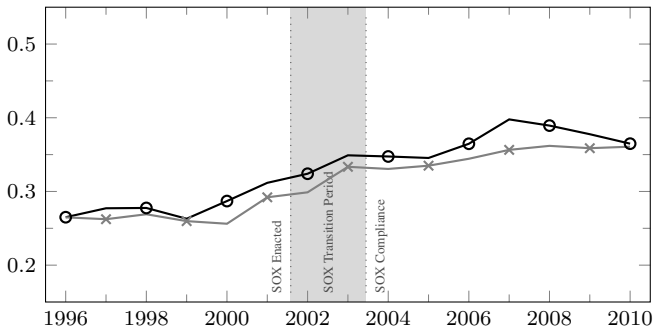


Figure 4
LDA- and Meeting-based Outsider-Only Fraction

The plots show annual averages of the LDA- and the meeting-based outsider-only fractions (OOF) for firms that were in the sample for at least 10 years. Observations are averaged based on the calendar year in which a firm's fiscal year ends. In each panel, black and gray lines represent those firms targeted and not targeted by the Sarbanes-Oxley (SOX) era regulations, respectively. Figure 2 defines SOX targeted and non-SOX targeted firms. LDA-based OOF (Panel A) is the average fraction of total (board and committees) information gathering and decision-making responsibilities directors have attributed to committees composed entirely of outsider directors (responsibility weights are determined using Latent Dirichlet Allocation (LDA)). Meeting-based OOF (Panel B) is the average fraction of total annual meetings (board and committees) directors have in committees composed entirely of outside directors. Both OOF measures are first calculated at the director-firm-year level and then averaged over all directors to compute the firm-year value. Tick marks on the horizontal axis indicate December 31 of each year. Vertical lines mark two key dates related to SOX as described in Figure 2.

Panel A: LDA-based Outsider-Only Fraction



Panel B: Meeting-based Outsider-Only Fraction

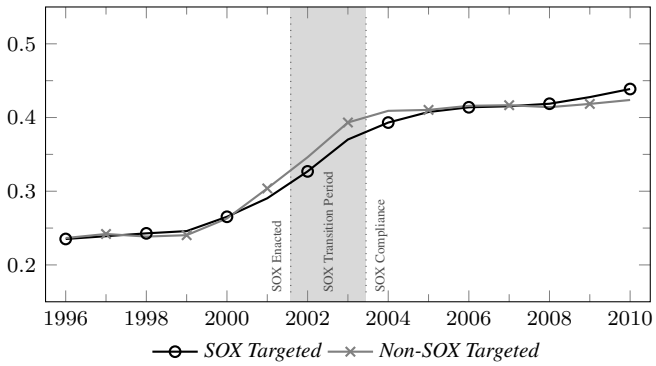


Table 1
Source Observations by Database

The table reports the number of firm-year observations in the sample per year and in aggregate. The sample contains data from BoardEx and Institutional Shareholder Services Governance (ISS). Annual counts are based on the calendar year in which a firm's fiscal year ends. As described in the text, BoardEx data is used in preference to ISS. The BoardEx and ISS column indicates the number of firm observations that were sourced from each database. The parenthesized numbers in the ISS column indicate the total number of firm-year observations covered by the database. The differences between the non-parenthesized and parenthesized ISS observations represent firm-years covered by both BoardEx and ISS and, consequently, sourced from BoardEx.

	Number of Observations			
Year	Total	BoardEx	ISS	
1996	1,066	0	1,066	(1,066)
1997	1,254	0	1,254	(1,254)
1998	1,276	0	1,276	(1,276)
1999	1,281	52	1,229	(1,279)
2000	1,612	1,055	557	(1,344)
2001	1,622	1,317	305	(1,143)
2002	1,623	1,372	251	(1,111)
2003	2,559	2,425	134	(1,108)
2004	3,009	2,949	60	(1,104)
2005	3,101	3,070	31	(1,082)
2006	3,027	3,023	4	(1,025)
2007	2,959	2,954	5	(1,042)
2008	2,702	2,692	10	(1,033)
2009	2,596	2,584	12	(1,085)
2010	2,134	2,133	1	(941)
Total	31,821	25,626	6,195	16,893

Table 2
Summary statistics

The table presents summary statistics on boards, directors, firms, director trades, and acquisitions. *Mean*, *SD*, and *Median* reports the means, standard deviations, and medians, respectively. *p5*, *p25*, *p75*, and *p95* show the 5st, 25th, 75th, and 95th percentile values, respectively. Panel A summarizes board characteristics, meeting frequency, and the outsider-only fractions for 31,821 firm-year observations. *Board Meetings* is the number of regular (non-telephonic) meetings held by the board in a fiscal year; *Board Size* is the number of directors on the Board; *Committee Meetings (Average)* is the number of regular (non-telephonic) meetings the Board's average committee holds each year; *Committee Meetings (Total)* is the total number of regular (non-telephonic) meetings held by all the Board's committees; *LDA-based Outsider-Only Fraction* is the average fraction of total (board and committee) information gathering and decision-making responsibilities directors have attributed to committees composed entirely of outsider directors (responsibility weights are determined using Latent Dirichlet Allocation (LDA)); *Meeting-based Outsider-Only Fraction* is the average fraction of total annual meetings (board and committee) directors have in committees composed entirely of outside directors; and *Non-SOX Targeted* is an indicator variable that takes the value of 1 if the firm did not have a majority of outside directors or fully-outsider committees for audit, corporate governance/director nominating, and executive compensation as of the fiscal year end immediately preceding SOX (i.e. 2001 fiscal year ends). *LDA-based Outsider-Only Fraction*, *Meeting-based Outsider-Only Fraction* and *Committee Meetings* are first computed for each director and then averaged over all directors to derive the firm-year average. Panel B presents information on director characteristics for 264,532 director-firm-year observations. *Age* is the director's age in years; *Education* is the maximum educational qualification a director has earned (3 = Ph.D., 2 = Masters, 1 = Bachelors, 0 otherwise); *Female* is an indicator variable that takes the value of 1 if the director is female, and 0 otherwise; *Number of Private Boards* counts the private company boards on which the firm's director serves; *Number of Public Boards* counts the publicly listed company boards (excluding the current firm) on which the firm's director serves; and *Tenure* is the number of years between the fiscal year-end and the date the director was appointed to the Board. Panel C shows firm characteristic data on 31,821 firm-year observations. *Assets* is the book value of total assets in billions of dollars; *Book Leverage* is the total book value of long-term and current debt normalized by the book value of total assets; *Firm Age* is the number of years between the firm's current fiscal year-end date and the first fiscal year-end date available in Compustat; *Number of Analysts* counts analysts in I/B/E/S who provide active annual Earnings per Share (EPS) forecasts (active forecasts are those released no more than 300 days before the company's actual fiscal-year-end EPS announcement); *Number of Employees* provides employees (in thousands) as reported to shareholders; *Number of Segments* counts business segments reported in the Compustat segments database; *Research and Development* is the total costs incurred over the fiscal year in the research and development of new products, normalized by the book value of total assets at the start of the fiscal year; *Stock Return* is the total compound stock return (including dividends) over the fiscal year; *Stock Volatility* is the annualized standard deviation of daily stock return over the fiscal year; and *Tobin's q* is the is the market-to-book ratio of asset. Panel D summarizes trade characteristics on 23,677 director-firm-stock net-purchase days. *Book to Market* is the ratio of the company's book value of common equity to its market value of common equity, measured as of the fiscal year-end before the trade; *Buy and Hold Return* is the abnormal return measured over the six-month period beginning the month after relevant insider or outside directors cumulatively executed a net purchase of shares; *Cumulative Abnormal Return* is measured over the two-day period covering the day the trade was received by the SEC and the following day; *Filing Frequency* is the number of days over the preceding July through June year in which the director had a net purchase of shares; *Market Capitalization* is the market value of common equity in billions of dollars, measured as of the fiscal year-end before the trade; *Strong Buy* is the number of directors that purchased more shares than they sold on the trading day; and *Trade Size* is the cumulative net purchase of shares by a company's director on the trading day as a fraction of the firm's number of shares outstanding. Both *Buy and Hold Return* and *Cumulative Abnormal Return* are measured relative to six matched Fama-French portfolios formed as the intersection of two size (small and big) and three book-equity-to-market-equity (value, neutral, and growth) portfolios. Panel E presents summary statistics for 1,688 acquisitions executed by sample firms. *All Cash Deal* is an indicator variable that takes the value of 1 if the deal is entirely in cash, and 0 otherwise; *Announcement CAR (Market Adjusted)* is the cumulative five-day excess stock return over the CRSP equally-weighted return (the five-day window begins two trading days before and ends two trading days after the deal's announcement date); *Announcement CAR (Model Adjusted)* is the cumulative five-day adjusted stock return over the market model, where the market model is estimated from 230 days to 11 days before the announcements using the CRSP equally-weighted return as the market index; *Cash Flow* is total income before extraordinary items, depreciation, and amortization, normalized by the book value of total assets at the start of the fiscal year; *Diversifying Acquisition* is an indicator variable that takes the value of 0 if the bidder and target are in the same 48 industry groups as defined by Fama and French (1997), and 1 otherwise; *High-Tech Deal* is an indicator variable that takes the value of 1 if the acquirer and target are both in high-tech industries defined by Loughran and Ritter (2004), and 0 otherwise; *Hostile Deal* is an indicator variable that takes the value of 1 if the bid is classified as hostile, and 0 otherwise; *Private Target* is an indicator variable that takes the value of 1 if the target company is privately held, and 0 otherwise; *Public Target* is an indicator variable that takes the value of 1 if the target company is publicly listed, and 0 otherwise; *Relative Deal Size* is the ratio of the deal value to the acquirer's market capitalization of equity (measured as of the close of the 11th trading day before the deal announcement); *Stock Deal* is an indicator variable that takes the value of 1 if the deal includes any stock, and 0 otherwise; *Stock Runup* is the acquirer's buy-and-hold abnormal return relative to the CRSP equally-weighted index beginning 210 trading days before and ending 11 trading days before the deal's announcement; *Tender Offer* is an indicator variable that takes the value of 1 if the acquisition is a tender offer, and 0 otherwise; and *Transaction Value* is the value of the deal in billions of dollars. Data sources are provided in Section 4 of the Online Appendix.

(*Continued*)

Table 2
Continued

			Distribution				
	Mean	SD	p5	p25	Median	p75	p95
Panel A: Board Characteristics (N=31,821)							
Board Meetings	7.226	3.112	4.000	5.000	7.000	9.000	13.000
Board Size	9.108	2.419	6.000	7.000	9.000	11.000	13.000
Board Size *(as log(x))*	2.174	0.266	1.792	1.946	2.197	2.398	2.565
Committee Meetings (Average)	6.397	3.528	1.636	3.750	5.889	8.500	12.923
Committee Meetings (Total)	15.481	8.103	4.000	9.000	15.000	20.000	30.000
LDA-based Outsider-Only Fraction	0.334	0.157	0.108	0.231	0.323	0.421	0.575
Meeting-based Outsider-Only Fraction	0.359	0.120	0.164	0.278	0.360	0.444	0.553
Non-SOX Targeted	0.171	0.377	0.000	0.000	0.000	0.000	1.000
Panel B: Director Characteristics (N=264,532)							
Age (years)	58.911	9.230	43.000	53.000	59.000	65.000	73.000
Education	1.809	0.653	1.000	1.000	2.000	2.000	3.000
Female	0.094	0.292	0.000	0.000	0.000	0.000	1.000
Number of Private Boards	1.307	2.159	0.000	0.000	1.000	2.000	5.000
Number of Private Boards *(as log(1+x))*	0.588	0.647	0.000	0.000	0.693	1.099	1.792
Number of Public Boards	1.088	1.478	0.000	0.000	1.000	2.000	4.000
Number of Public Boards *(as log(1+x))*	0.555	0.577	0.000	0.000	0.693	1.099	1.609
Tenure (years)	6.940	7.113	0.000	2.000	5.000	10.000	21.000
Panel C: Firm Characteristics (N=31,821)							
Assets ($ billion)	28.944	25.168	8.383	14.402	21.411	34.121	76.319
Assets *(as log(x))*	3.125	0.663	2.126	2.667	3.064	3.530	4.335
Book Leverage	0.226	0.209	<0.001	0.045	0.204	0.337	0.579
Firm Age (years)	24.728	16.068	4.999	11.001	19.001	37.999	54.001
Firm Age *(as log(x))*	2.957	0.757	1.609	2.398	2.944	3.638	3.989
Number of Analysts	11.949	9.369	1.000	5.000	10.000	17.000	31.000
Number of Analysts *(as log(1+x))*	2.258	0.861	0.693	1.792	2.398	2.890	3.466
Number of Employees (thousand)	20.437	63.538	0.288	1.660	5.300	16.000	84.800
Number of Employees *(as log(x))*	1.640	1.706	−1.245	0.507	1.668	2.773	4.440
Number of Segments	6.496	5.208	1.000	3.000	3.000	10.000	16.000
Number of Segments *(as log(x))*	1.516	0.890	0.000	1.099	1.099	2.303	2.773
Research and Development	0.047	0.135	<0.001	<0.001	0.004	0.053	0.198
Stock Return (annual)	0.045	0.252	−0.319	−0.084	0.036	0.150	0.414
Stock Volatility (annualized)	0.487	0.257	0.210	0.312	0.422	0.589	0.990
Tobin's *q*	2.148	2.006	0.932	1.239	1.632	2.394	5.001

(*Continued*)

Table 2
Continued

			Distribution				
	Mean	SD	p5	p25	Median	p75	p95
Panel D: Trade Characteristics (N=23,677)							
Book to Market	0.687	0.800	0.095	0.283	0.485	0.834	1.854
Book to Market *(as log(x))*	−0.768	0.933	−2.357	−1.263	−0.725	−0.181	0.617
Buy and Hold Return (N=18,406)	0.003	0.250	−0.384	−0.183	−0.020	0.165	0.474
Cumulative Abnormal Return	0.018	0.067	−0.065	−0.012	0.010	0.040	0.126
Filing Frequency	6.409	12.829	1.000	1.000	2.000	6.000	27.000
Market Capitalization ($ billion)	4.496	22.673	0.016	0.067	0.285	1.296	16.359
Market Capitalization *(as log(x))*	−1.090	2.122	−4.158	−2.703	−1.255	0.260	2.795
Strong Buy	1.758	1.478	1.000	1.000	1.000	2.000	4.000
Trade Size	0.001	0.010	<0.001	<0.001	<0.001	<0.001	0.002
Panel E: Acquisition Characteristics (N=1,688)							
All Cash Deal	0.443	0.497	0.000	0.000	0.000	1.000	1.000
Announcement CAR (Market Adjusted)	0.002	0.076	−0.125	−0.031	0.003	0.037	0.122
Announcement CAR (Model Adjusted)	0.001	0.080	−0.130	−0.037	0.002	0.042	0.132
Cash Flow	0.103	0.282	−0.195	0.066	0.117	0.178	0.322
Diversifying Acquisition	0.400	0.490	0.000	0.000	0.000	1.000	1.000
High-Tech Deal	0.401	0.490	0.000	0.000	0.000	1.000	1.000
Hostile Deal	0.003	0.053	0.000	0.000	0.000	0.000	0.000
Private Target	0.445	0.497	0.000	0.000	0.000	1.000	1.000
Public Target	0.446	0.497	0.000	0.000	0.000	1.000	1.000
Relative Deal Size	0.220	0.492	0.002	0.021	0.072	0.214	0.906
Stock Deal	0.668	0.471	0.000	0.000	1.000	1.000	1.000
Stock Runup	0.303	0.834	−0.462	−0.092	0.152	0.433	1.456
Tender Offer	0.124	0.330	0.000	0.000	0.000	0.000	1.000
Transaction Value ($ billion)	0.751	3.117	0.007	0.037	0.129	0.440	3.014

Table 3
Board and committee meetings

The table reports results for fixed effects models examining the relations among meetings of the board of directors and committees, Post-SOX, non-SOX targeted, and stock returns. The dependent variable in columns (1) through (6) is the number of board meetings. Columns (1) and (2) report estimates from firm-year-level regressions in which each firm-year is an individual observation; columns (3) through (6) show results from director-level regressions in which each observation is a unique director-firm-year. The dependent variable in columns (7) through (12) is the number of committee meetings. Columns (7) and (8) reports estimates from a firm-year regression of the average number of director committee meetings. The average is taken over all directors of a board irrespective of directors' status as committee members during the fiscal year. Columns (9) through (12) show results from director-level regressions in which each observation is a unique director-firm-year. The dependent variable in these columns is a director's total number of meetings for committees of which they were a member over a firm's fiscal year. *Post-SOX* is an indicator variable equal to 1 for observations with fiscal year ends in and after 2002, and 0 otherwise. *Non-SOX Targeted* is an indicator that equals 1 for firms that were not explicitly targeted by SOX for corporate governance changes as of the 2001 fiscal year end, and 0 otherwise. A non-targeted firm is one that had a majority of outside directors on its board and had fully outside committees responsible for audit, corporate governance/director nomination, and executive compensation. *Stock Return* is the cumulative annual stock return including dividends over the fiscal year. All other controls are defined in Table 2 and are measured contemporaneously with the meetings and stock return variables. Specifications in columns (1) and (7) include firm fixed effects; specifications in columns (2) and (8) include firm and year fixed effects; director level specifications in columns (3), (5), (6), (9), (11), and (12) include director and firm fixed effects; and director level specifications in columns (4) and (10) include director, firm, and year fixed effects. Standard errors in columns (1), (2), (7), and (8) are clustered by firm; Standard errors in columns (3) through (6) and (9) through (12) are clustered in two dimensions by firm and by director. *t*-statistics are reported in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5% and 10% level, respectively.

	Board Meetings						Committee Meetings					
			Director-level						Director-level			
	Firm-year-level		All		Insider	Outsider	Firm-year-level		All		Insider	Outsider
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Post-SOX	0.328***		0.258***		0.236***	0.247***	1.816***		1.761***		–0.382***	2.097***
	(4.474)		(3.669)		(3.080)	(3.346)	(22.896)		(21.316)		(–5.217)	(22.070)
Post-SOX ×	–0.191		–0.121		–0.208	–0.117	0.581***		0.641***		0.085	0.575***
Non-SOX Targeted	(–1.248)		(–0.798)		(–1.213)	(–0.746)	(3.343)		(3.392)		(0.419)	(2.732)
Stock Return	–0.373***	–0.460***	–0.375***	–0.420***	–0.346***	–0.374***	–0.085	–0.201***	–0.032	–0.193***	–0.013	–0.063
	(–4.507)	(–7.092)	(–4.414)	(–6.088)	(–3.675)	(–4.294)	(–1.308)	(–4.191)	(–0.447)	(–3.616)	(–0.268)	(–0.731)
Firm-level controls:												
Book Leverage	0.937***	0.571**	1.014***	0.729***	0.871***	1.046***	0.183	–0.022	0.470**	0.229	–0.038	0.384
	(3.834)	(2.509)	(4.192)	(3.409)	(3.233)	(4.155)	(0.827)	(–0.144)	(2.146)	(1.313)	(–0.248)	(1.497)
Log Assets	0.920***	0.388**	0.953***	0.522***	0.678**	0.998***	1.323***	0.479***	1.958***	0.600***	–0.419**	1.965***
	(4.034)	(2.114)	(4.183)	(2.800)	(2.398)	(4.275)	(6.339)	(3.118)	(8.912)	(3.687)	(–2.302)	(7.569)
Log Board Size	–0.024	–0.116	–0.112	–0.130	–0.155	–0.062	–2.378***	–2.306***	–1.571***	–1.366***	0.335	–1.909***
	(–0.114)	(–0.690)	(–0.540)	(–0.771)	(–0.654)	(–0.290)	(–10.909)	(–14.745)	(–7.338)	(–8.308)	(1.593)	(–7.464)
Log Firm Age	1.055***	0.762***	0.874***	0.680***	0.647***	0.894***	2.724***	1.644***	2.150***	0.731***	0.052	2.928***
	(6.962)	(4.932)	(5.738)	(4.451)	(3.816)	(5.574)	(17.434)	(10.993)	(13.453)	(4.466)	(0.361)	(15.111)

(*Continued*)

Table 3
Continued

	Board Meetings						Committee Meetings					
			Director-level						Director-level			
	Firm-year-level		All		Insider	Outsider	Firm-year-level		All		Insider	Outsider
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Log # of Employees	–0.287**	–0.122	–0.231**	–0.133	0.048	–0.266**	–0.119	0.227***	–0.346***	0.120	0.194**	–0.190
	(–2.567)	(–1.481)	(–2.059)	(–1.579)	(0.343)	(–2.315)	(–1.233)	(3.117)	(–3.351)	(1.599)	(2.097)	(–1.618)
Log # of Segments	–0.118***	–0.022	–0.100**	–0.015	–0.086*	–0.094**	–0.105**	–0.044	–0.023	–0.033	0.019	–0.052
	(–2.886)	(–0.499)	(–2.565)	(–0.348)	(–1.704)	(–2.381)	(–2.320)	(–0.944)	(–0.525)	(–0.705)	(0.390)	(–1.026)
R&D	0.421	0.177*	0.334	0.130	0.557*	0.302	0.198	–0.084	0.130	–0.107*	–0.032	0.241*
	(1.406)	(1.753)	(0.964)	(1.587)	(1.660)	(0.867)	(1.267)	(–1.449)	(1.024)	(–1.677)	(–0.396)	(1.677)
Stock Volatility	1.123***	1.132***	1.091***	1.160***	0.824***	1.115***	–0.586***	0.189***	–0.315***	0.194***	–0.201**	–0.540***
	(7.332)	(5.314)	(6.666)	(5.038)	(4.746)	(6.586)	(–4.679)	(2.755)	(–2.614)	(2.730)	(–2.341)	(–3.842)
Year FE	No	Yes	No	Yes	No	No	No	Yes	No	Yes	No	No
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Director FE	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Clustering	Firm	Firm	Firm/ Director	Firm/ Director	Firm/ Director	Firm/ Director	Firm	Firm	Firm/ Director	Firm/ Director	Firm/ Director	Firm/ Director
N	17,897	31,821	161,353	264,532	31,039	130,314	17,897	31,821	161,353	264,532	31,039	130,314
R^2	0.055	0.053	0.535	0.586	0.599	0.535	0.422	0.380	0.628	0.659	0.671	0.609

Table 4
Meeting- and LDA-based outsider-only fractions

The table reports results for fixed effects models examining the relations among the outsider-only fractions (OOF), Post-SOX, non-SOX targeted, and stock returns. Columns (1), (2), (5) and (6) report estimates from firm-year-level regressions in which each firm-year is an individual observation. The dependent variable in columns (1) and (2) is *Meeting-based Outsider-Only Fraction*, defined as the average fraction of total annual meetings board directors have in committees composed entirely of outsider directors. The dependent variable in columns (5) and (6) is *LDA-based Outsider-Only Fraction*, defined as the average fraction of total (board and committees) information gathering and decision-making responsibilities directors have attributed to committees composed entirely of outsider directors (responsibility weights are determined using Latent Dirichlet Allocation (LDA)). Both outsider-only fractions are initially calculated for each director and then averaged over all directors to derive firm-year values. Columns (3), (4), (7) and (8) show results from director-level regressions where each observation is a unique director-firm-year. The dependent variable in columns (3) and (4) is each director's fraction of total annual meetings with committees composed entirely of outside directors. The dependent variable in columns (7) and (8) is each director's fraction of total (board and committees) information gathering and decision-making responsibilities attributed to committees composed entirely of outsider directors. As outsider-only fractions are 0 by definition for inside directors, these columns only include outside directors. *Post-SOX* is an indicator variable equal to 1 for observations with fiscal year ends in and after 2002, and 0 otherwise. *Non-SOX Targeted* is an indicator that equals 1 for firms that were not explicitly targeted by SOX for corporate governance changes as of the 2001 fiscal year end, and 0 otherwise. *Stock Return* is the cumulative annual stock return including dividends over the fiscal year. All variables are defined in Table 2 and Section 4 of the Online Appendix. Controls are measured contemporaneously with the outsider-only fraction and stock return. The specifications in columns (1) and (5) includes firm fixed effects; the specifications in columns (2) and (6) includes firm and year fixed effects; the specifications in columns (3) and (7) includes director and firm fixed effects; and the specifications in columns (4) and (8) includes director, firm, and year fixed effects. Standard errors in columns (1), (2), (5) and (6) are clustered by firm. Standard errors in columns (3), (4), (7) and (8) are double clustered by director and firm. *t*-statistics are reported in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5% and 10% level, respectively.

	Meeting-based OOF				LDA-based OOF			
			Director-level				Director-level	
	Firm-year-level		Outsider directors		Firm-year-level		Outsider directors	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post-SOX	0.075***		0.078***		0.027***		0.025***	
	(25.895)		(21.292)		(6.211)		(5.143)	
Post-SOX ×	0.013**		0.012		−0.012		−0.014	
Non-SOX Targeted	(2.189)		(1.609)		(−1.388)		(−1.478)	
Stock Return	0.007***	0.002	0.009***	0.003	−0.011***	−0.010***	−0.010**	−0.011***
	(2.605)	(1.223)	(2.910)	(1.024)	(−2.737)	(−3.707)	(−2.279)	(−3.334)
Firm-level controls:								
Book Leverage	−0.027***	−0.024***	−0.025**	−0.022***	0.005	−0.003	0.007	0.001
	(−3.298)	(−4.390)	(−2.543)	(−3.263)	(0.459)	(−0.422)	(0.590)	(0.124)
Log Assets	0.038***	0.003	0.047***	0.002	0.005	0.003	0.007	0.001
	(5.188)	(0.472)	(4.849)	(0.300)	(0.431)	(0.417)	(0.545)	(0.087)
Log Board Size	−0.110***	−0.108***	−0.089***	−0.084***	−0.120***	−0.140***	−0.111***	−0.131***
	(−15.193)	(−19.956)	(−9.266)	(−11.483)	(−11.554)	(−18.489)	(−10.331)	(−15.578)
Log Firm Age	0.080***	0.040***	0.088***	0.041***	0.047***	0.038***	0.042***	0.034***
	(14.369)	(7.344)	(10.916)	(5.141)	(6.092)	(5.093)	(4.660)	(3.797)

(*Continued*)

Table 4
Continued

	Meeting-based OOF				LDA-based OOF			
			Director-level				Director-level	
	Firm-year-level		Outsider directors		Firm-year-level		Outsider directors	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log # of Employees	0.002	0.013***	0.001	0.015***	0.008	0.006	0.004	0.004
	(0.470)	(5.021)	(0.225)	(4.324)	(1.325)	(1.454)	(0.531)	(0.865)
Log # of Segments	0.003*	−0.001	0.006***	−0.002	<0.001	0.003	−0.002	0.001
	(1.932)	(−0.573)	(2.935)	(−0.825)	(0.088)	(1.335)	(−0.741)	(0.470)
R&D	<0.001	−0.005	−0.001	−0.007	0.007	−0.002	0.001	−0.001
	(0.012)	(−1.484)	(−0.117)	(−1.568)	(0.947)	(−0.437)	(0.196)	(−0.256)
Stock Volatility	−0.022***	−0.009***	−0.026***	−0.013***	−0.026***	−0.012***	−0.020***	−0.011***
	(−5.192)	(−3.275)	(−4.628)	(−3.078)	(−4.527)	(−3.880)	(−3.222)	(−3.245)
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Director FE	No	No	Yes	Yes	No	No	Yes	Yes
Clustering	Firm	Firm	Firm/ Director	Firm/ Director	Firm	Firm	Firm/ Director	Firm/ Director
N	17,897	31,821	130,314	211,540	16,771	30,269	123,521	202,254
R^2	0.446	0.381	0.603	0.642	0.073	0.073	0.532	0.582

Table 5
Contemporaneous and predictive relations between meeting- and LDA-based outsider-only fractions

The table reports results for fixed effects models examining the relation between the meeting- and the LDA-based outsider-only fractions (OOF) in both contemporaneous and predictive settings. The dependent variable in columns (1) and (2) is *LDA-based OOF*, defined as the average fraction of total (board and committees) information gathering and decision-making responsibilities directors have attributed to committees composed entirely of outsider directors (responsibility weights are determined using Latent Dirichlet Allocation (LDA)). The dependent variable in columns (3) and (4) is *Meeting-based OOF*, defined as the average fraction of total annual meetings board directors have in committees composed entirely of outsider directors. Both outsider-only fractions are initially calculated for each director and then averaged over all directors to derive firm-year values. All other controls are defined in Table 2. Columns (1) and (3) report estimates from regressions in which the dependent variable and control variables are measured contemporaneously. Columns (2) and (4) report estimates from predictive regressions in which all control variables are measured one year prior to the dependent variable. All specifications include firm and year fixed effects. Standard errors are clustered by firm. *t*-statistics are reported in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5% and 10% level, respectively.

	LDA-based OOF		Meeting-based OOF	
	Contemporaneous	Predictive	Contemporaneous	Predictive
	(1)	(2)	(3)	(4)
Meeting-based OOF	0.296***	0.077***		
	(23.764)	(6.298)		
LDA-based OOF			0.136***	0.026***
			(19.233)	(4.679)
Firm-level controls:				
Book Leverage	0.004	0.001	−0.023***	−0.006
	(0.587)	(0.118)	(−4.073)	(−0.954)
Log Assets	0.002	0.003	0.004	0.015**
	(0.242)	(0.332)	(0.781)	(2.531)
Log Board Size	−0.107***	−0.060***	−0.092***	−0.049***
	(−14.526)	(−7.464)	(−16.853)	(−8.169)
Log Firm Age	0.026***	0.020**	0.038***	0.014**
	(3.580)	(2.470)	(6.926)	(2.382)
Log # of Employees	0.002	<0.001	0.012***	0.004
	(0.539)	(0.082)	(4.359)	(1.244)
Log # of Segments	0.003	0.006**	−0.001	0.002
	(1.436)	(1.992)	(−0.634)	(0.981)
R&D	<0.001	−0.002	−0.004	0.002
	(−0.084)	(−0.552)	(−1.287)	(0.700)
Stock Return	−0.011***	0.004	0.003*	0.007***
	(−3.974)	(1.277)	(1.793)	(3.019)
Stock Volatility	−0.009***	−0.011***	−0.007***	−0.007**
	(−3.167)	(−2.752)	(−2.617)	(−2.467)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Clustering	Firm	Firm	Firm	Firm
N	30,269	24,989	30,269	24,752
R^2	0.110	0.051	0.388	0.318

Table 6

Director stock purchase abnormal returns and outsider-only fraction

The table reports estimation results from ordinary least squares models examining how the market reaction to director share purchases varies with the outsider-only fractions (OOF). The dependent variable in columns (1) through (5) is *Cumulative Abnormal Return (CAR)*, defined as the sum over the two-day window of daily abnormal returns for company stock over a benchmark portfolio. The CAR window begins on the day the trade report was received by the SEC. Observations are director-firm-disclosure days, where a disclosure day is categorized as a purchase day if the net transactions executed by the director was positive. The CAR sample period begins on August 29, 2002, when regulations requiring corporate directors to electronically report trades to the SEC within two days of execution came into effect, and runs through the end of 2010. The dependent variable in columns (6) and (7) is *Buy and Hold Abnormal Return (BHAR)*, defined as the six-month return of a stock in excess of the benchmark portfolio. Observations are director type-firm-months, where a month is categorized as a purchase month if the net transactions executed by all directors of a given type was positive. The BHAR sample period is from 1996 through 2010. Benchmark portfolios for both dependent variables are six Fama-French (1993) 2×3 size and book-to-market matched portfolios. We match each stock from July of year t through June of year $t+1$ to the corresponding portfolios based on the cutoffs reported by Fama-French. Size matches are based on the market value of equity as of June in year t. Book-to-Market matches are based on the ratio of the book-value of equity for the fiscal year ending in calendar year $t-1$ to the market value of equity as of calendar year-end $t-1$. *Meeting-based OOF* is the average fraction of total annual meetings directors have in committees composed entirely of outsider directors. *LDA-based OOF* is the average fraction of total (board and committees) information gathering and decision-making responsibilities directors have attributed to committees composed entirely of outsider directors (responsibility weights are determined using Latent Dirichlet Allocation (LDA)). *Outside Director* is an indicator variable that takes a value of 1 if the director is not a corporate insider, and 0 otherwise. In columns (6) and (7), *Strong Buy*, *Trade size*, and *Filing frequency* are summed over all directors within a given type, and *Director-level control* variables are averaged across directors within a given types. textitMissing D-L Control Dummies are included in columns (6) and (7); these are a set of dummy variables (one for each characteristic) that take the value of 1 if the characteristic is missing in ISS, and 0 otherwise. All other variables are defined in Table 2. Specifications in columns (1) through (5) include unique industry fixed effects for every year-month in the sample (Industry $\times$ Year-Month). Specifications in columns (6) and (7) include industry and year fixed effects. Industry definitions use Fama-French 48 industry classifications. Standard errors in columns (1) through (5) are clustered by year-month; standard errors in columns (6) and (7) are double clustered by year-month and firm. t-statistics are reported in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5% and 10% level, respectively.

	CAR					BHAR	
	Outside	Inside	All			All	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Meeting-based OOF $\times$				−0.019**		−0.084**	
Outside Director				(−2.248)		(−2.711)	
Meeting-based OOF	0.019	0.039**		0.025***		0.063	
	(1.475)	(2.151)		(3.191)		(1.462)	
LDA-based OOF $\times$					−0.004		−0.023
Outside Director					(−0.694)		(−0.960)
LDA-based OOF					0.004		0.009
					(0.739)		(0.328)
Outside Director			−0.004***	0.003	−0.002	0.014	0.015
			(−2.769)	(0.995)	(−0.922)	(1.514)	(1.614)
Board Meetings	<0.001*	<0.001	<0.001	<0.001*	<0.001	0.003***	0.003***
	(1.816)	(0.617)	(1.490)	(1.925)	(1.201)	(3.529)	(3.700)

(*Continued*)

Table 6
Continued

	CAR					BHAR	
	Outside	Inside	All			All	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Trade-level controls:							
Log Book to Market	−0.002	−0.005	−0.003	−0.001	−0.001	−0.006	−0.006
	(−0.917)	(−1.372)	(−1.124)	(−0.462)	(−0.527)	(−1.166)	(−1.082)
Log Market Capitalization	0.001	−0.005	−0.001	<0.001	<0.001	0.058***	0.057***
	(0.320)	(−1.210)	(−0.610)	(0.296)	(0.133)	(8.779)	(8.167)
Strong Buy	0.003***	0.003*	0.003***	0.001***	0.001***	0.007**	0.007**
	(3.603)	(1.730)	(3.128)	(3.383)	(3.256)	(2.417)	(2.755)
Trade Size	0.496***	0.068	0.392***	0.117***	0.119***	<0.001	<0.001
	(3.991)	(0.495)	(3.961)	(3.357)	(3.465)	(−0.696)	(−0.682)
Filing Frequency	<0.001***	<0.001	<0.001***	<0.001***	<0.001***	<0.001	<0.001
	(−3.402)	(−1.265)	(−4.846)	(−5.101)	(−5.228)	(0.255)	(0.155)
Firm-level controls:							
Book Leverage	0.013**	−0.011	0.007	0.003	0.003	0.079***	0.078***
	(2.339)	(−1.345)	(1.522)	(1.172)	(0.993)	(4.687)	(4.743)
Log Assets	−0.004	0.019*	0.003	−0.002	−0.002	−0.113***	−0.112***
	(−0.813)	(1.685)	(0.526)	(−0.800)	(−0.580)	(−5.997)	(−5.824)
Log Board Size	0.003	−0.004	−0.002	−0.001	−0.002	−0.012	−0.007
	(1.067)	(−0.664)	(−0.650)	(−0.867)	(−1.399)	(−0.849)	(−0.466)
Log Firm Age	−0.002*	−0.003	−0.002*	−0.002***	−0.002**	0.004	0.005
	(−1.687)	(−1.194)	(−1.773)	(−2.815)	(−2.620)	(1.252)	(1.514)
Log # of Analysts	0.001	<0.001	0.001	<0.001	0.001	−0.013***	−0.012***
	(1.082)	(−0.183)	(1.378)	(0.897)	(1.408)	(−3.135)	(−2.903)
Log # of Employees	−0.001	−0.004**	−0.002**	<0.001	<0.001	0.005**	0.006**
	(−1.226)	(−2.198)	(−2.005)	(−0.787)	(−0.656)	(2.091)	(2.147)
Log # of Segments	0.001	0.003	0.001	0.001	0.001	0.003	0.003
	(0.952)	(1.172)	(0.669)	(1.383)	(1.304)	(0.777)	(0.796)
R&D	−0.002***	0.001	−0.001	<0.001	<0.001	−0.007***	−0.007***
	(−3.213)	(0.593)	(−0.983)	(−0.006)	(−0.059)	(−3.069)	(−3.005)
Stock Volatility	0.025***	0.006	0.018***	0.004**	0.004*	<0.001	<0.001
	(3.681)	(0.678)	(2.883)	(1.994)	(1.834)	(−0.009)	(−0.011)

(*Continued*)

Table 6
Continued

	CAR					BHAR	
	Outside	Inside	All			All	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Director-level controls:							
Age	<0.001*	<0.001	<0.001**	<0.001***	<0.001***	<0.001	<0.001
	(−1.978)	(0.139)	(−2.271)	(−3.244)	(−3.138)	(0.623)	(0.107)
Education	−0.001	−0.002	−0.001	<0.001	<0.001	−0.033**	−0.033**
	(−1.010)	(−0.999)	(−0.704)	(0.168)	(0.442)	(−2.472)	(−2.423)
Female	−0.005*	0.001	−0.005**	−0.003**	−0.003**	−0.055*	−0.060*
	(−1.825)	(0.204)	(−2.136)	(−2.122)	(−2.195)	(−1.861)	(−1.811)
Tenure	<0.001***	<0.001	<0.001*	<0.001***	<0.001***	0.001	0.001
	(2.670)	(−0.098)	(1.985)	(3.578)	(3.247)	(1.079)	(1.437)
Log # of Public Boards	0.005**	0.001	0.004*	0.003*	0.003*	−0.011**	−0.009*
	(2.027)	(0.162)	(1.915)	(1.853)	(1.969)	(−2.388)	(−2.034)
Log # of Private Boards	<0.001	<0.001	<0.001	0.001	0.001	−0.013**	−0.013**
	(−0.193)	(0.093)	(−0.136)	(0.909)	(0.856)	(−2.376)	(−2.383)
Constant	0.003	−0.039	0.007	0.016**	0.023***	0.413***	0.403***
	(0.184)	(−1.263)	(0.501)	(2.040)	(3.088)	(7.115)	(6.811)
Industry × Year-Month FE	Yes	Yes	Yes	Yes	Yes	No	No
Year FE	No	No	No	No	No	Yes	Yes
Industry FE	No	No	No	No	No	Yes	Yes
Missing D-L Control Dummies	No	No	No	No	No	Yes	Yes
Clustering	Year×Month	Year×Month	Year×Month	Year×Month	Year×Month	Year×Month/ Firm	Year×Month/ Firm
N	17,097	6,012	23,677	23,677	23,613	18,406	17,402
R^2	0.227	0.266	0.172	0.185	0.184	0.061	0.060

Table 7

Acquisition cumulative abnormal returns and outsider-only fraction

The table reports estimation results for ordinary least squares models examining the relationship between the market reaction to acquisition announcements and the outsider-only fractions (OOF). Acquisitions included in the sample consist of those where (i) prior to the deal announcement, the acquirer controls less than 50% of the target company's shares, (ii) the acquirer controls 100% of the target's shares after the transaction is completed, and (iii) the transaction value exceeds $1 million. The dependent variable is the acquiring firm's cumulative abnormal return (*Announcement CAR*), which is aggregated over the 5-day window beginning 2 trading days prior to and ending 2 trading days following the merger announcement. In columns (1) and (2), Model Adjusted Announcement CAR is total adjusted daily stock returns over the market model. The market model is estimated from 230 days to 11 days before the announcement using the CRSP equally-weighted return as the market index. In columns (3) and (4), Market Adjusted Announcement CAR is total market adjusted returns, where excess returns are the differences between the acquiring firm's daily returns and the CRSP equally-weighted return. *Meeting-based OOF* is the average fraction of total annual meetings board directors have in committees composed entirely of outsider directors. *LDA-based OOF* is the average fraction of total (board and committees) information gathering and decision-making responsibilities directors have attributed to committees composed entirely of outsider directors (responsibility weights are determined using Latent Dirichlet Allocation (LDA)). All other controls variables are as defined in Table 2 and are measured as of the fiscal year-end preceding the merger announcement. All specifications include unique industry (defined using Fama-French 48 industry classifications) fixed effects for every year-month in the sample (Industry × Year-Month). Standard errors are clustered by firm. *t*-statistics are reported in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5% and 10% level, respectively.

	Announcement CAR			
	Model Adjusted		Market Adjusted	
	(1)	(2)	(3)	(4)
Meeting-based OOF	−0.060***		−0.059***	
	(−2.771)		(−2.668)	
LDA-based OOF		−0.005		−0.004
		(−0.296)		(−0.251)
Board Meetings	<0.001	<0.001	<0.001	<0.001
	(−0.421)	(0.453)	(−0.535)	(0.262)
Bidder controls:				
Book Leverage	0.021	0.021	0.023	0.024
	(1.324)	(1.258)	(1.492)	(1.447)
Cash Flow	0.037***	0.038***	0.038***	0.040***
	(3.631)	(3.672)	(3.850)	(3.880)
Log Assets	−0.015**	−0.014**	−0.015**	−0.014**
	(−2.395)	(−2.074)	(−2.274)	(−1.969)
Log Board Size	−0.011	−0.012	−0.011	−0.011
	(−0.960)	(−1.008)	(−0.931)	(−0.913)
Log Firm Age	−0.001	<0.001	<0.001	<0.001
	(−0.268)	(−0.126)	(−0.044)	(0.003)
Log # of Employees	0.007**	0.005*	0.008**	0.006*
	(2.415)	(1.750)	(2.427)	(1.792)
Log # of Segments	−0.001	−0.002	−0.001	−0.002
	(−0.252)	(−0.477)	(−0.300)	(−0.483)
R&D	0.034*	0.026	0.032	0.021
	(1.786)	(1.553)	(1.612)	(1.274)
Tobin's *q*	−0.001	<0.001	<0.001	<0.001
	(−0.810)	(−0.436)	(−0.478)	(−0.091)
Stock Runup	0.003	0.001	0.003	0.001
	(0.507)	(0.224)	(0.437)	(0.115)
Stock Volatility	−0.016	−0.011	−0.014	−0.008
	(−0.904)	(−0.577)	(−0.746)	(−0.445)

(*Continued*)

Table 7
Continued

	Announcement CAR			
	Model Adjusted		Market Adjusted	
	(1)	(2)	(3)	(4)
Deal-level controls:				
Public Target	−0.032	−0.033	−0.036	−0.037
	(−1.377)	(−1.337)	(−1.523)	(−1.481)
Private Target	−0.044*	−0.045*	−0.050*	−0.050*
	(−1.771)	(−1.723)	(−1.936)	(−1.872)
All Cash Deal	−0.003	0.001	−0.006	−0.003
	(−0.174)	(0.027)	(−0.332)	(−0.136)
Stock Deal	−0.016	−0.018	−0.015	−0.018
	(−0.978)	(−1.067)	(−0.905)	(−1.027)
Public Target × All Cash Deal	0.011	0.008	0.016	0.013
	(0.550)	(0.368)	(0.765)	(0.588)
Public Target × Stock Deal	0.030	0.034*	0.031	0.036*
	(1.572)	(1.703)	(1.608)	(1.771)
Private Target × All Cash Deal	0.024	0.027	0.031	0.034
	(1.057)	(1.147)	(1.320)	(1.398)
Private Target × Stock Deal	0.017	0.021	0.018	0.021
	(0.775)	(0.916)	(0.782)	(0.914)
High Tech Deal	−0.001	−0.002	−0.001	−0.002
	(−0.133)	(−0.309)	(−0.148)	(−0.289)
Relative Deal Size	−0.001	−0.001	0.001	0.001
	(−0.130)	(−0.132)	(0.168)	(0.191)
Hostile Deal	0.069**	0.084**	0.069**	0.082**
	(2.295)	(2.409)	(2.162)	(2.138)
Tender Offer	0.011	0.003	0.008	<0.001
	(1.451)	(0.410)	(1.008)	(−0.013)
Diversifying Acquisition	<0.001	−0.001	−0.001	−0.002
	(−0.060)	(−0.267)	(−0.183)	(−0.377)
Transaction Value	−0.003**	−0.003**	−0.003**	−0.003**
	(−2.075)	(−2.132)	(−2.115)	(−2.208)
Constant	0.112***	0.087**	0.111***	0.085**
	(3.060)	(2.349)	(2.911)	(2.228)
Industry × Year-Month FE	Yes	Yes	Yes	Yes
Clustering	Firm	Firm	Firm	Firm
N	1,688	1,555	1,688	1,555
R^2	0.312	0.319	0.309	0.319

Table 8
Firm value and outsider-only fraction

The table reports estimation results for models examining the relationship between firm value and the outsider-only fractions (OOF). The dependent variable in all specifications is *Log Tobin's q*, defined as the natural log of the market-to-book ratio of assets. The market value of assets is the market value of equity (defined as closing share price at the end of the fiscal year multiplied by the number of common shares outstanding), plus the book value of assets, less the book value of common/ordinary equity. *Meeting-based OOF* is the average director's fraction of total annual meetings spent with committees composed entirely of outsider directors. *LDA-based OOF* is the average fraction of total (board and committees) information gathering and decision-making responsibilities directors have attributed to committees composed entirely of outsider directors (responsibility weights are determined using Latent Dirichlet Allocation (LDA)). Controls are as defined in Table 2 and are measured contemporaneously with the firm value and the outsider-only fraction variables. Columns (1) and (2) present results using fixed effects panel data models. Columns (3) and (4) use the dynamical panel data model of Arellano and Bond (1991) with time-series instruments. Specifications include firm fixed effects (first differences in the dynamic panel models) and year fixed effects. All standard errors are clustered by firm. *t*-statistics are reported in parentheses. Coefficients marked with ***, **, and * are significant at the 1%, 5% and 10% level, respectively.

	Log Tobin's *q*			
	Fixed Effect Panel		Dynamic Panel	
	(1)	(2)	(3)	(4)
Meeting-based OOF	–0.104***		–0.332***	
	(–2.672)		(–3.082)	
LDA-based OOF		–0.032		–0.165**
		(–1.558)		(–2.453)
Log Tobin's q (lagged)			0.320***	0.272***
			(19.941)	(16.602)
Log Tobin's q (twice lagged)			0.035***	0.029**
			(3.163)	(2.543)
Board Meetings	–0.011***	–0.009***	–0.001	0.003
	(–8.950)	(–8.356)	(–0.402)	(1.008)
Firm-level controls:				
Book Leverage	–0.110***	–0.118***	–0.080	–0.063
	(–2.579)	(–2.897)	(–1.086)	(–0.833)
Log Assets	–0.427***	–0.438***	–0.627***	–0.663***
	(–14.262)	(–14.674)	(–7.750)	(–7.884)
Log Board Size	–0.045*	–0.049**	–0.100*	–0.094
	(–1.875)	(–2.022)	(–1.696)	(–1.477)
Log Firm Age	–0.250***	–0.284***	–0.011	–0.075*
	(–9.092)	(–9.488)	(–0.293)	(–1.707)
Log # of Employees	0.044***	0.045***	–0.026	–0.031
	(3.340)	(3.481)	(–0.691)	(–0.835)
Log # of Segments	–0.005	–0.007	–0.007	–0.007
	(–0.682)	(–1.024)	(–0.359)	(–0.331)
R&D	0.065	0.060	0.085	0.049
	(1.477)	(1.436)	(0.495)	(0.301)
Stock Volatility	–0.068***	–0.060***	–0.031	–0.106***
	(–4.137)	(–3.841)	(–0.991)	(–3.122)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Clustering	Firm	Firm	Firm	Firm
Instruments (Time Series)	-	-	Yes	Yes
Dynamic panel specification tests:				
AR(1) (*p*-value)	-	-	0.000	0.000
AR(2) (*p*-value)	-	-	0.762	0.462
Hansen *J* (*p*-value)	-	-	0.160	0.173
N	31,821	30,269	17,039	15,119
R^2	0.196	0.203	-	-