Subordinate Board Structures

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Abstract

The board of directors is a flat governance structure where each director has an equal vote in determining the collective actions taken by the group. Yet, some boards choose to delegate authority for specific tasks to numerous committees, while others choose to create relatively few subcommittees of the board. We investigate the determinants of subordinate board structures, exploring both their benefits and costs. Using a sample of the S&P 1500 we find that subordinate board structures are positively related to board size and the proportion of outside directors, even after controlling firm characteristics such as complexity and ownership structure. Further tests indicate that these board structures can offset the negative associations that board size and the proportion of outsiders can have with firm performance. Yet, in firms with relatively small or insider oriented boards, we find that subordinate board structures are negatively related to firm performance. Categorizing committees as either monitoring or advisory, we find that both types of committees appear related to firm performance. Taken as whole, these results are consistent with the idea that subordinate board structures can be a costly remedy to alleviate problems that arise with larger, more outsider dominated boards.

Keywords: Board committees, social loafing, corporate governance

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Introduction

Board composition is viewed as an important issue because independent directors are seen as critical factor in mitigating collusive behavior (Monks and Minnow, 1995). Several studies, however, have emphasized that outside directors are costly and can increase the co-ordination, communication and asymmetric information problems of the board (Baysinger and Butler, 1985). Raheja (2005) shows how communication problems between insiders and outsiders on the board can limit board effectiveness. Adams and Ferriera (2007) suggest that presence of independent directors on the board reduces information flows and exacerbate asymmetric information problems. Another potential cost of having outsiders on board is the potential for greater co-ordination problems. Eisenhardt (1989) and Vafeas (1999) point out that outside directors spend only a limited amount of time with each other, restricting the potential for informal communication and increasing co-ordination and control costs. Goodstein, Gautam and Boeker (1994) suggest that outside directors can increase board conflict and allow directors to become more factionalized, thereby hindering the decision-making process. The implication is that boards with a greater proportion of outside directors have the potential for greater co-ordination and communication problems, potentially limiting board efficacy.

The total number of directors is also considered an important aspect of board oversight. One body of literature indicates that larger boards provide greater monitoring (Pfeffer, 1972; Anderson, Mansi and Reeb, 2004). For instance, Baker and Gompers (2003) and Coles, Daniel and Naveen (2008) suggest that more complex firms require larger boards because of the difficulty of the monitoring task. In contrast, others indicate that the number of directors negatively affects the cohesiveness and decision-making of the board (Eisenberg, Sundgren and Wells, 1998). Lipton and Lorsch (1992) argue in favor of limiting the number of directors on a board, suggesting that larger groups face problems of social loafing and free riding. Similarly, Jensen (1993) argues that larger

boards are less effective because of inefficiency in decision-making due to greater co-ordination and communication problems. In general, as Yermack (1996) concludes, large boards are thought to be associated with problems of communication and cohesiveness, even if they are needed in more complex situations (Coles et al, 2008).

We examine the role of the delegation of authority by the board to various subcommittees (subordinate board structures) in alleviating barriers to board effectiveness. We argue that committee structure serves a dual purpose, reducing the communication and co-ordination problems of the board and reducing social loafing. Our board composition arguments focus on how committee structures arise to solve specific co-ordination and free-riding problems that stem from having larger boards or those with a greater proportion of outside directors[1]. To this end we address three specific questions. First, are subordinate board structures related to board size and board composition, after controlling for firm characteristics such as corporate complexity and ownership structure? Second, are these board characteristics related to the use of both advisory and monitoring committees, or are these issues only important in certain types of committees? Third, are there performance benefits (costs) associated with subordinate structures in larger (smaller) boards and/or in boards with more outside directors?

Using a sample comprised of the 1500 S&P firms (large, mid, and small cap firms) we examine the relation between committee use and both board and firm characterizes. We find that committee use is positively related to board size and the proportion of outside directors, even after controlling firm characteristics such as complexity and ownership structure. Specifically, we find that firms with larger boards (top half of sample) have about 1.2 more committees than firms with

[1]Another common perspective is that larger boards improve the committee assignment process. Klein (1998) and Anderson et al (2004) indicate that larger boards allow firms to give fewer committee assignments to each director. Implicit in this perspective is the idea that the number of committees is exogenous with board size and independence. We consider a different viewpoint and explore why firms need diverse committee structures and how these requirements vary across board and firm characteristics.

smaller boards (bottom half of board size). Similarly, boards with a larger proportion of outside directors (top half of sample) have about 1.1 more committees than those boards with fewer outside directors (bottom half of outsider ratio). Comparing the top and bottom quartile demonstrates an even starker difference with firms in the top quartile of board size (proportion of outsiders) using almost 1.32 (1.12) more committees than those in the bottom quartile.[2] These results are in sharp contrast to the common notion that larger boards simply allow firms to have less overlap amongst their committees. Instead, these results are consistent with the idea that committees are used to overcome problems of the board as a whole.

Categorizing committees as either monitoring or advisory allows us to separately examine the determinants of both types of committees. We find that board size and the proportion of outside directors are positively related to the use of both types of board committees. To test if subordinate board structures are used to alleviate co-ordination, communication, and free-rider problems in the board, we analyze the relation between subordinate board structures and firm performance. Controlling for endogeneity concerns, we find in firms with large boards or those with a high proportion of outsiders that subordinate board structures offset the negative associations between board size (outsider ratio) and firm performance. Among firms with large boards (top half of sample) those with four or more committees have a 7.6% higher Tobin's Q than those with less subordinate board structures. However, these subordinate board structures can also be quite costly. For instance, firm performance is 5.1% lower for firms in bottom half of board size with four or more committees relative to those with less subordinate board structures. More generally, our

[2] Our primary tests use binary variables to denote boards in the top halves of size and proportion of outsiders. In untabulated results we use the top/bottom quartiles (as well as continuous measures) of board size and the proportion of outside directors in our regressions with similar inferences. Simple univariate statistics show a similar pattern.

	Top Quartile Board Size	Bottom Quartile Board Size	Top Quartile of Outsiders	Bottom Quartile of Outsiders
Number Committees	4.53	2.89	4.09	3.28

analysis suggests that the performance implications of larger boards and more outsider dominated boards are especially sensitive to the number of committees of the board, even after controlling for operational complexity and ownership structure. We interpret this to suggest that subcommittees are an effective tool to reduce communication and free-rider problems in larger boards and those with greater proportion of outside directors. However, the costs outweigh the benefits of these structures for firms with smaller boards and those with a greater proportion of inside directors. Differentiating between monitoring and advisory committees, the results indicate the greatest value impact occurs with advisory committees.

The results of the empirical analyses on the association between firm performance and board structure are consistent with the view that committees are used to alleviate communication, co-ordination, and free-rider problems on the board. An alternative explanation however, suggests that some firms, for a variety of reasons, need more committees composed of outside directors, leading them to develop larger boards with a greater proportion of outside directors. Although, our empirical analysis includes numerous other factors that may influence the number of committees needed by the firm, we also examine both 2-SLS (IV) and 3-SLS methods to estimate the influence of board size and composition on subordinate board structures. We find similar results to our primary specifications. Still, we cannot rule out the possibility that some underlying factor causes both subordinate board structures and board composition or that causality runs in the opposite direction. However, our testing provides consistent evidence that subordinate board structures can be a costly remedy to reduce problems that arise with larger, more outsider dominated boards.

This work advances our understanding of the organizational structure of the board of directors and contributes to the literature in several ways. Prior literature focuses on how board characteristics allow greater flexibility in making committee assignments, we provide an alternative perspective that focuses on using committees to mitigate the costs of associated with certain board

characteristics. In this context, subordinate board structures are viewed as a choice of the firm which should vary based on both firm and board characteristics, allowing the board to foster greater communication and co-ordination among disparate directors. Second, we present evidence that indicates that some of the costs associated with larger boards and/or boards with a greater proportion of outsiders can be offset by using subcommittees of the board. This use of subcommittees to mitigate the communication and co-ordination problems of the board occurs in both advising and monitoring subcommittees. Our findings also suggest alternative approaches to dealing with ongoing demand for smaller, more prescriptive boards; namely focusing on the use of committees to achieve some of these same benefits. Finally, our analyses suggest that mandates concerning the use of subcommittees of the board can be counter-productive in firms with smaller boards or fewer outside directors.

I. The Role of Subordinate Board Structures

Board composition is thought to vary across firms depending on the difficulty of the monitoring and advising task. As firms become more complex and opaque, the board tends to have more directors and greater percentage of outsiders (Boone, Field, Karpoff and Raheja, 2007; Coles et al., 2008; Linck, Netter and Yang, 2008a and Lehn, Patro and Zhao, 2009). Others have emphasized that larger, more independent boards can also improve corporate monitoring and facilitate shareholder interests (Pfeffer, 1972). Coles et al. (2008) find that larger, more diversified firms have a greater number of directors on board. Boone et al. (2007) and Linck et al. (2008a) find that board size and independence increase as firms become larger and more diversified. The composition of corporate boards has also varied substantially over time with boards becoming smaller and more independent over the past few decades (Anderson and Reeb, 2004; Lehn et al., 2009).

I.A. The Benefits of Subordinate Board Structures

Empirical research on board size and independence suggests that larger, more independent boards suffer co-ordination and communication problems, thereby impairing board effectiveness (Lipton and Lorsch, 1992; Yermack, 1996; Eisenberg et al., 1998). Raheja (2005) shows how communication problems between insiders and outsiders on the board decrease board effectiveness. Recently, Cheng (2008) finds that firms with a large board have lower variability in performances. He suggests that this effect is driven by the communication and co-ordination problems in large groups. In addition, it is difficult to observe the operations of board from outside (Klein, 1998) suggesting that group actions can be affected by shirking and free riding problems (Jensen, 1993). Lipton and Lorsch (1992) and Jensen (1993) posit that as boards increase in size, free-riding increases and the efficacy of the board is reduced. Consistent with this notion, Yermack (1996) reports a negative relation between board size and Tobin's Q. Harrison (1987) suggests that subcommittees can help mitigate some of the problems associated with poor attendance of directors because these directors now have a specific task or responsibility. Experimental research in social psychology shows that task complexity and uniqueness reduces the problems of social loafing in groups (Harkins and Petty, 1982). Sub-groups of a team may also facilitate communication between inside and outside members of the board (Aiken and Hage, 1968).

Klein (1998) observes that the number of subcommittees differs substantially across firms, with boards of directors having anywhere from 1 to 9 subcommittees. Others have focused on the number of committees that directors serve on (Ferris, Jagannathan and Pritchard,2003) or the gender of committee members (Bilimoria and Piderit, 1994). Our analyses centers on the use of subcommittees to define the roles and responsibilities for individual directors and help mitigate the problems associated with board opacity. Because committees are smaller in size and have clearly defined specific mandates (Klein, 1998), we argue they are more likely to foster accountability for

specific directors, thereby reducing free-riding problems. Thus, we argue that committee structure serves two purposes, i.e. reducing the communication and co-ordination problem and increasing observability of individual director's performance. As such, the benefits or need for committees of the board should be increasing in board size and decreasing in insider control. If so, we anticipate that firms with more outsiders and/or a greater number of directors will use more subordinate board structures relative to firms with smaller and less independent boards. Furthermore, this effect would be more pronounced in firms having advisory committees which are not mandated by SEC.

Fama and Jensen (1983) suggest that boards also perform advisory roles, overseeing long-term investments and strategy formulations. To address the specific needs of firms, boards establish committees to perform various functions which may be either of advisory nature or of monitoring nature (Klein, 1998). In firms where the management is in greater need of advice; such as firms with greater operational complexity, managers are more willing to share information with board members (Adams and Ferreira, 2007). Utilizing the platforms of specialized committees would be more effective in this process. Consequently, we posit that firms with complex operations or firms whose managers have greater need of advice would perform better with larger boards and the costs of larger boards are mitigated in the presence of a greater number of committee of board.

We also examine the types of committees that firms develop. We focus on the advisory and monitoring roles of the board of directors, arguing that both types of committees are important aspects of effective board oversight. Researchers in social psychology argue that the identifiability of individuals also helps in controlling the social loafing in teams (Latane, Williams and Harkins, 1979). The SEC mandates detailed disclosure about the directors on important monitoring committees such as audit, nominating or compensation committees, which we argue serves to help mitigate the social loafing. Consequently, we expect the use of monitoring committees to be especially sensitive to the Sarbanes-Oxley Act (2002). Thus, we posit that the specificity of the responsibilities, coupled

with identification of directors responsible for fulfillment of important tasks, can improve board effectiveness. However, we expect to see differential effects of monitoring and advisory committees as Sarbanes-Oxley Act (2002) and subsequent mandates from national stock exchanges concentrate on monitoring committees.

The internal organization is reflected in the distribution of work among the committees, the flow of information to the directors and the level of participation by individual directors. The functioning of boards through committees brings legitimacy and accountability to the corporations (Harrison, (1987). If subordinate board structures reduce costs, then they should have a positive impact on firm performance, especially in firms with greater potential for conflicts or complexity. In firms with greater atomistic equity holdings, the demand for channels of communication between managers and board of directors should be greater in order to facilitate board monitoring. Therefore, we posit that in firms with greater atomistic stock-holdings, subordinate board structures should facilitate firm performance. In contrast, to the extent that subcommittees of the board are costly, we expect their use to be constrained (and have limited value) in firms with smaller and more insider dominated boards.

I.B. The Costs of Subordinate Board Structures

Subordinate boards however are costly. Separating directors into specialized committees of the board with differing responsibilities can create information asymmetries among directors, allowing information to become isolated in differing silos in the board. For instance, the well-publicized case of Tyco International is a prominent example because many directors were reportedly unaware of the compensation and loan packages given to executives, while the members of the compensation committee apparently approved the packages (Sorkin and Glater, 2002). In addition to concerns about these information asymmetries among directors, committees can foster

members becoming immersed in their own particular responsibilities, instead of focusing on the overall output of the board. Directors may therefore concentrate more on the tasks that are directly attributable to them, limiting their involvement in other areas where they may have relevant knowledge or expertise.

Consequently, we argue that subordinate boards are a costly solution to problems of co-ordination and free-riding among directors. If committees are indeed costly remedy as we posit, then we expect to observe fewer of them in firms with smaller boards and fewer outside directors. In addition, our arguments suggest potential performance benefits and costs associated with subordinate board structures, depending on the potential for co-ordination and free-riding problems in the board. More specifically, we posit that subordinate board structures in small or insider controlled boards have only limited benefits, suggesting their costs will be the dominant effect and thereby negatively influence firm performance.

II. Data and Descriptive Statistics

We use a sample of 1500 S&P firms (large cap, madcap and small cap) from 2000 to 2003. We exclude utilities and financial services firms because it is difficult to compute and interpret market-based measures of firm performance for firms in these regulated industries. We use data from Institutional Shareholders Services as well as hand collected data on board characteristics and committees. Data on board characteristics come from proxy reports submitted by the firms to the SEC. These reports provide data on independent board members, employee board members and affiliated members. For accounting and financial data, we use the COMPUSTAT database. Compensation related data comes from the ExecuComp.

Information on the board committee structure, specifically the number of committees, directors serving on the committees and the charter of the responsibilities of the committees comes

from the proxy reports. We read the charters of the committees and based on the functions described in the proxy reports, committees are classified as either monitoring or advisory committees. We categorize several potential committees that a firm may have as monitoring committees, including the audit, nominating, compensation committees, corporate governance, and executive committees (Klein, 1998).[3] In addition to these five committees, many firms choose to have other committees, such as finance, investment, public issues, diversity, mergers and acquisition, ethics, environment, technology advisory and employee development committees. We categorize them as advisory committees.

We classify directors as either insiders or outsiders. We assume that with employee directors, problems of co-ordination and communication would not be as high as it would be with non-employee directors. Thus for our purpose, inside directors are the employees, retired employees or relatives of employees of the firm. Since our focus is on the communication and co-ordination issues in the board, we use a simple classification of directors as insiders and outsiders (Coles et al., 2008; Lehn et al., 2009).[4] Board size is the number of all directors on the corporate board and use a logarithmic transformation of board size in regressions.

We also include presence of influential block holders and the equity held by institutional investors as controls. We measure diffuse ownership structure, as the ratio of outside equity (equity not held by the officers and directors or insiders of a firm) to total outstanding equity. Presumably, these outside equity owners have limited access to information about firm's state of affairs, relative to inside owners of the firm. Thus, in a firm with lower insider ownership, we posit that the need for

[3] Some firms occasionally have committees such as compliance or succession committee. We categorize them as other monitoring committees.

[4] We also consider independent and affiliated directors separately in subsequent tests. Affiliated directors are directors with existing or potential business ties to the firm such as legal counsel, investment bankers or consultants. Independent directors are those directors whose only relationship with the firm is their directorship.

dedicated and specialized channels of communication between the firm and owners should be greater, than for firms with greater insider ownership.

We create a factor score variable for corporate complexity of each firm in the sample based on three specific firm attributes: corporate diversification, firm size, and leverage (Coles et al., 2008). To the extent that these attributes are positively correlated, a factor score would provide more robust measure of corporate complexity. We measure corporate diversification as the number of business segments in which the firm reports operations. We compute firm size using the natural log of the book value of a firm's assets[5]. Leverage is the ratio of book value of debt to total assets, where debt is measured as the sum of the firm's long term and short debt. Firm performance is the natural log of Tobin's Q, which we approximate as the market value of assets minus book value of assets, scaled by book value of assets (Coles et al, 2008). Specifically we measure Tobin's Q as:

$$\text{Tobin's Q} = \frac{[(\text{Market value of equity} + \text{Book value of debt}) - \text{Book value of assets}]}{(\text{Book value of assets})} \quad (1)$$

II.A. Other Variable Measures:

We use CEO tenure, free cash flow and an indicator variable for the Sarbanes-Oxley Act (2002) as control variables in our regressions on the determinants of board hierarchy. Tenure is a proxy of the CEO's influence. Boone et al. (2007) argue that CEO's influence affects board composition and size as CEOs may seek lower monitoring. Jensen (1986) argues that free cash flow increases managerial entrenchment and Coles et al. (2008) argue that firms with large free cash flow are more likely to have larger and more independent boards. We include an indicator variable for Sarbanes-Oxley Act 2002 (SOX), which assumes a value of one if the year is 2002 or 2003, otherwise zero. Since the SOX mandated both an independent audit committee and an independent director

[5] We also use other measures of firm size such as the natural log of firm's capital, the natural log of sales and the natural log of market capitalization and find similar results.

recruitment process, we expect the number of committees to increase in the post-SOX period. Linck et al. (2008a, b) also find a systematic change in board composition post-SOX. Growth opportunities are measured by R&D and capital investments scaled by book value of firm's assets. We also include firm risk in our tests, which is measured using the standard deviation of ROA for the firm over the prior 20 quarters. Furthermore, all the regressions include 4-digit SIC dummies to control for the industry effects and an intercept, but coefficients on the SIC dummies and the intercept are not reported.

In firm performance regressions, we include several control variables that affect firm performance but are not included in board structure regressions. These controls are profitability, lagged firm profitability, and board's meeting frequency. Firm profitability (ROA) is the ratio of operating profit to book value of assets.

II.B. Descriptive Statistics and Univariate Results

Descriptive statistics of key variables are presented in Panel A of Table 1. We find the average firm in the sample has total assets of $6.487 billion. The average firm has an ROA of 0.027. The median board size is 9. The average firm has 78.8 % outsiders or non-employees on the board and the officers and directors hold about 11.7% of average firm's outstanding equity. The median firm has 4 subcommittees whereas the range of number of committees is from 1 to 9. On average, firms appear to have substantially more monitoring committees than advisory committees. In general, these results suggest that the use of subordinate board structures differs substantially across the firms in our sample.

Table 1, Panel B presents results from univariate tests. For these tests, the sample is split into two groups (above and below average/median board size and outside ratio). Our expectation is that firms with larger boards and/or those with a greater proportion of outside directors will have a

greater number of subcommittees. We present both the mean and median results. In general, these univariate tests indicate that firms with bigger boards or a higher proportion of outside directors have on average a greater number of subcommittees, both advising and monitoring committees. The mean results provide perhaps the most informative evidence in analyzing the relatively small numbers of discrete subcommittees. These results are consistent with the argument that subordinate board structures are used to mitigate the co-ordination, communication, and free-riding problems that can occur in boards with larger size and greater proportion of outsiders.[6] However, these results are potentially consistent with other rationales as well.

Panel C of Table 1, presents the correlation matrix of number of committees, firm performance, board size and other firm and board characteristics. The number of committees and board size are negatively correlated with the Tobin's Q. Consistent with our arguments on the use of committees to mitigate communication and free-riding, we find that the number of committees is positively correlated with both board size and the proportion of outsiders on the board and also with the proxies of firm complexity, i.e. firm size, diversification and leverage. The number of committees is negatively correlated with insider stock holding, which is consistent with the need of a committee structure in more atomistic ownership environment. These simple univariate results suggest that communication and free-riding problems are especially important to shareholders as firms become increasingly more complex or have more atomistic ownership structures.

III. Multivariate Tests

In this section, we examine the determinants of board hierarchy in a multivariate setting. Specifically, we investigate the determinants of the total number of subcommittees, the number of

[6] Appendix 1 gives detailed information about the distribution of committee structure. We find that every firm in sample has an audit committee and over 98% have compensation committees. In contrast, the use of nominating committees and governance committees is significantly lower but increasing from 2000 to 2003. The use of advisory committees appears to be relatively stable across our sample period.

advisory committees, and the number of monitoring committees. Due to the discrete, ordered nature of the dependent variable we use Poisson regressions in our primary tests, which are based on the following specification:

$$\begin{aligned} \textit{Number Committees} = {} & A_0 + A_1\,(\text{Big Board}) + A_2\,(\text{High Outsider}) + A_3\,(\text{High Complexity}) + \\ & A_4\,(\text{High Diffuse}) + A_5\,(\text{Block Holder}) + A_6\,(\text{Institutional Ownership}) + A_7\,(\text{Risk}) + A_8 \\ & (\text{R\&D Investment}) + A_9\,(\text{Capital Investment}) + A_{10}\,(\text{CEO Tenure}) + \\ & A_{11}\,(\text{Free Cash Flow}) + A_{12}\,(\text{SOX Dummy}) + A_{13}\,(\text{SIC Dummies}) + e \end{aligned} \qquad (2)$$

Our arguments on co-ordination and free-riding suggest that the number of committees should be positively related to both board size and the proportion of outside directors, as well as proxies for firm complexity and diffuse ownership structure. We use dummy variables in our primary regressions to facilitate the use of interaction terms. Big board is an indicator variable denoting firms in the top 50th percentile of the number of directors on the board. High Outsider is an indicator variable denoting firms in the top 50th percentile of the proportion of outside directors on the board. High Diffuse is an indicator variable denoting firms in the top 50th percentile of diffuse shareholding percentage. High complexity is an indicator variable denoting firms in top 50th percentile of the factor score variable based on the firm size, number of business segments and leverage. We also include year dummies and SIC dummies to control for industry level effects. In section IV, we consider alternative specifications and statistical techniques, including continuous variables, alternative measures, and other control variables. We find our results are robust to several different methods.

The regression results for equation 2 are presented in Table 2. Column 1 presents results from a Poisson regression that uses total number of subcommittees as the dependent variable. We find that the coefficient estimates on both board size (Big Board) and outside directors (High Outsider) are positive and significant at the 1% level. Corporate complexity (High Complexity) and diffuse shareholding (High Diffuse) are also positively related to the number of committees. We

interpret these results to suggest that both larger boards and those with a greater proportion of outside directors use subordinate board structures (i.e. a greater number of committees) to mitigate the costs of these governance choices. The evidence on corporate complexity and diffuse ownership structures is also consistent with the notion that as the complexity of firm's operations increases and when ownership is more dispersed, boards use a greater number of committees to facilitate communication and reduce free-riding among the members of the board.

Because each of the primary variables of interest in this specification are binary variables denoting the largest or highest values for each item, we are able to make some inferences about the relative magnitude of each of the right-hand side variables. However, as these variables are unlikely to be truly independent of one another some caution is required. Still, it appears that the coefficient estimate for board size is approximately twice as large as those for outsider boards, firm complexity, and diffuse ownership.

Column 2 of Table 2 presents results from another Poisson regression that uses number of advisory committees as the dependent variable. We find that larger boards and those with a greater proportion of outside directors tend to make a greater use of subordinate board structures. This suggests that the communication and free –riding concerns do not stem completely from the monitoring role of the board but also impact board's advisory roles. In addition, both complexity of operations and diffuse shareholdings are also related to the use of advisory subcommittees of the board. Interestingly, when comparing the relative size of the coefficient estimates in this test, we find that both board size and corporate complexity appear to have substantially larger impacts, relative to outsider boards and diffuse shareholdings, on the number of advisory committees. One implication is that the advisory role of the board is quite important in more complex firms and that subcommittees of the board facilitate this process. Interestingly, the coefficient estimate on the dummy variable for the Sarbanes-Oxley Act (DSOX) is insignificantly different from zero.

In column 3, we examine the determinants of the number of monitoring committees. Consistent with our hypothesis, we find that firms use committees to mitigate the co-ordination, communication, and free-riding problems that can occur with larger boards, and boards with a greater ratio of outsiders. The coefficient on the high complexity is positive and significant at the 5% level and the coefficient on high diffuse shareholding is marginally significant at the 10% level in column 3. These results generally suggest that the monitoring role of the board is affected by the ownership structure of the firm. The implication is that inside ownership leads to a lower use of monitoring committees by the board of directors. Also of note is that in general the coefficient on board size is again larger than the coefficients on the other factors, with DSOX having the second largest impact on the number of monitoring committees (although this difference is statistically insignificant).

An interesting finding in this table is the difference in the values of pseudo Adj. R-Squared for advisory committees (0.1201) and monitoring committees (0.0110) in the Poisson regressions. One potential interpretation is that social loafing and free-riding are larger potential concerns in director advising than in director monitoring. Yet, the difference in the two R-squared values could also occur because of lower variability in the number of monitoring committees across the firms and over the sample period. Since every firm has an audit committee and almost every firm has a compensation committee (over 98% firms), the amount of variability in the number of monitoring committees across firms is smaller than the variability in the number of advisory committees. If we estimate the number of monitoring committees excluding audit committee, the adjusted R-Squared improves to over 2.556%.

In aggregate, the results in Table 2 indicate that board size and the proportion of outside directors are positively related to the use of both advisory and monitoring committees by the board. The largest economic impact appears to come from the board size and corporate complexity on the

number of advisory committees of the board. One potential interpretation is that regulatory pressure to establish monitoring committees creates a level playing field regarding the number of monitoring committees. Another interesting result is the negative coefficient on the CEO tenure in columns 1 and 3 of Table 2. A negative coefficient on CEO tenure implies that firms with more influential CEOs have a lower likelihood of subordinate board structure. Overall, analyses in this section indicate that firms with larger board size and a greater outsider ratio have a greater likelihood of a subordinate board structure. Furthermore, positive coefficients on complexity and diffuse shareholding indicate that firms with these characteristics choose to have committee structure to mitigate the costs associated with the large and outsider dominated boards.

III. A. Board Hierarchy and Firm Performance

In this section we analyze performance implications of board committee structure. We present results from the analysis of the relation between firm performance and the subordinate board structures, focusing on instances where we expect the communication and free-rider problems to be severe. The primary specification used to test the cross sectional relation between firm performance and subordinate board structure is:

$$\begin{aligned} \textit{Firm Performance} = {} & B_0 + B_1\,(\text{Number Committees}) + B_2\,(\text{Big Board}) + B_3\,(\text{High Outsider}) + \\ & B_4\,(\text{High Complexity}) + B_5\,(\text{High Diffuse Shareholdings}) + B_6\,(\text{Block Holder}) + \\ & B_7\,(\text{Institutional ownership}) + B_8\,(\text{Risk}) + B_9\,(\text{ROA}) + B_{10}\,(\text{ROA}_{t-1}) + \\ & B_{11}\,(\text{R\&D Investment}) + B_{12}\,(\text{Capital Investment}) + B_{13}\,(\text{Meetings}) + \\ & B_{14}\,(\text{DSOX}) + B_{15}\,(\text{SIC Dummies}) + e \end{aligned} \qquad (3)$$

If subcommittees mitigate the costs of communication, co-ordination and free riding, then we expect their use to be positively related to firm performance. Firm specific control variables are firm risk, return on assets, R&D investment, capital investment and board meeting frequency. We

also include fixed effects for industry (4-digit SIC dummies).[7]

The results from OLS regressions are reported in Table 3. In column 1, the key variable of interest is the number of committees. In this baseline test, we find that the estimated coefficient on the number of committees is 0.019 with a t-statistic at 2.595. Holding all else constant, column 1 of Table 3 indicates that firm performance is about 3.974 percent (1*0.019/Ln(1.613)=0.03974 or 3.974%) greater for the median firm with one additional committee

We also expect the number of committees to be of greater importance in firms with larger boards and/or a greater proportion of outside directors. To test this notion, we introduce an interaction term of the number of committees and board size (Big Board) in column 2 of Table 3. Our expectation is that the interaction term will have a positive coefficient. The results suggest that the number of committees is quite important in firms with larger than average boards. Specifically, we find that firms with big boards and only 2 committees have a significantly lower firm performance, with performance being about 5% lower than the median firm in the sample. In contrast, in firms with big boards and five committees, firm performance is about 10% higher than the median firm in the sample.[8] In addition, our results suggest that big boards that have 4 or more committees completely offset the negative aspects of larger boards. We interpret this to suggest that subordinate boards are important tool in reducing the costs associated with larger boards.

[7] Again we focus primarily on the reduced form equation. However, we find similar results in a 2-SLS (IV) framework. In 2-SLS (IV) estimations, we estimate board structure related variables, i.e. number of committees, board size and ratio of outsiders using the specification from equation 2. In the second stage, we estimate subordinate board structures on firm performance.

[8] The sum of coefficients on the interaction term of number of committees and big board and the big board level variables from Table 3 are used to calculate this. For two committees and a big board, the sum is (2*0.024-0.073=-0.025). For 5 committees and a big board, the combined effect will be (5*0.024-0.073=0.047). Comparing with the median firm, a firm in first scenario would have (-0.025/0.478) 5.23% lower value. In second scenario, the firm with 5 committees and a big board would have (0.047/.478) or 10.04% higher value.

To see if subordinate board structure mitigates the costs associated with outsider dominated boards, we introduce an interaction term of the number of committees and outsider boards (High Outsider) in column 3. The results from column 3 suggest that the use of board committees offsets the negative relation between outsider boards and firm performance. For instance, moving from 1 to 5 committees appears to offset the negative relation between high outsiders and firm performance. Overall, results from Table 3 are consistent with the idea that firms adopt subordinate board structures to mitigate the costs of large and outsider dominated boards.

Recent studies document evidence that firms adjust board characteristics depending on their advising and monitoring needs (Boone et al., 2007; Coles et al., 2008 and Linck et al., 2008a). These studies motivate us to analyze the association between Tobin's Q and subordinate board structures in more complex firms and in firms with potentially greater co-ordination and communication problems. We segregate firms into high and low complexity groups using the same measure as used in Table 2. For co-ordination and communication problems of the board, we use its meeting frequency as a proxy. The results from OLS regressions on complexity and board meeting frequency are reported in Table 4. Columns 1 and 2 show that in more complex firms, subordinate boards appear to offset the higher costs associated with larger boards but have no impact in less complex firms (Columns 3 and 4). Similarly, columns 5 and 6 indicate that in firms with greater communication and co-ordination problems, subordinate board structures appear to offset the costs of larger boards and boards with a greater proportion of outsiders, but have a limited impact in firms with lower communication problems.[9] These results are consistent with our hypothesis that firms use committees to mitigate costs of communication and co-ordination.

[9] We also examine the interaction results for diffuse shareholdings with the number of committees. The interaction term is again positive, suggesting that the number of committees is used to minimize communication and free-rider problems when such problems could be more costly to the firm.

III. B. Firm Performance: Advisory and Monitoring Committees

To determine whether the value impact of board's subordinate structures differs if a firm has more advisory and/or more monitoring committees, we examine the use of these committees separately. Specifically, we estimate the regression as specified in Equation 3 with the number of advisory committees and the number of monitoring committees replacing the number of committees. The results from these analyses are presented in Table 5.

In column 1 of Table 5, the primary variables of interest are number of advisory committees and number of monitoring committees. Estimated coefficients on the number of advisory and the number of monitoring committees in column 1 indicate that the valuation impact of board hierarchy stems from advisory committees and not from the monitoring committees. The economic impact of having one additional advisory committee in median (mean) firm is approximately 8.37 (5.42) percent increase in firm value.

In Column 2 we introduce an interaction term of number of advisory committees with the board size. The F-test for the combined effect of advisory committees ($\delta 1+\delta 3=0.047$) is positive and significant at the 1% level. Compared with the stand-alone term in column 1, a larger economic value of the combined effect of number of advisory committees in column 2 indicates a greater valuation impact of subordinate board structures in firms with larger boards. We find similar valuation impact of subordinate board structures in firms with a greater proportion of outsiders. In the 3rd column that includes an interaction term of advisory committee with High Outsider, the combined effect of advisory committee ($\delta 1+\delta 4=0.046$) is positive and significant at the 1% level. On the other hand, the overall effects of the number of monitoring committees in both columns 4 and 5, i.e. in firms with large boards ($\delta 2+\delta 3$) and also in firms with boards that have a larger proportion of outsiders ($\delta 2+\delta 4$) are insignificant. Overall, these results suggest that the value enhancing impact of subordinate boards is driven by the number of advisory committees.

III. C. Presence of Specific Committees and Firm Performance

Although we argue and find that firms mitigate the costs of communication and social loafing associated with their large and outsider dominated boards by organizing them into various committees, an important issue arises whether the firm performance results are driven by the presence of some specific committees. If management forms some committees to legitimize its decision, we do not expect such committees to positively affect firm performance. Yet, in committees that help management by offering critical advices their presence should be positively associated with the firm performance. To disentangle these conflicting effects of various types of committees, we analyze the performance effect of presence of specific committees. The results from this analysis are presented in Table 6.

We start our analysis with the specific committees that are most prevalent, focusing on those that occur in more than 15% of firms in our sample. These are finance, executive, compensation, nominating and corporate governance committee. We exclude audit committee because every firm in our sample has an audit committee. Then, in the 6th column of Table 6, we include all major committees in the same regression model. The committee variables take a value of one if a firm has a specific committee, otherwise zero. The results from Table 6 indicate that the corporate governance committee and finance committee are positively related to Tobin's Q, whereas the presence of the executive committee negatively affects Tobin's Q. We do not find any significant association between the presence of either compensation or nominating committees and Tobin's Q. From column 6, we notice that presence of some other advisory committees is also positively associated with Tobin's Q. These are public issue/diversity, employee development and the other advisory committees.

Column 7 tests whether SOX created a level playing field by encouraging firms to create a separate corporate governance committee. In our data, we see that the percentage of firms with

corporate governance committee suddenly jumps up in 2003. The interaction term of corporate governance committee dummy with DSOX dummy in column 7 captures the impact of SOX on the association between the presence of corporate governance committee and Tobin's Q. As expected, we find a positive coefficient on the interaction term of DSOX and corporate governance committee in column 7, which indicates that the positive effect of corporate governance committee on Tobin's Q is driven by SOX. Overall, these results suggest that firms benefit by subordinate boards as committee structure helps mitigate the costs of larger boards and outsider's presence on boards. However, it appears that these benefits stem from mostly advisory committees.

IV. Robustness Tests and Alternative Specifications

The multivariate tests in the previous section are designed to see if firms with complex operations and atomistic shareholdings use subordinate board structures to mitigate the costs of communication and social loafing in large and outsider dominated boards. However, numerous recent studies have shown that board size and composition is determined endogenously within a broader governance framework (Hermalin and Weisbach, 1998& 2003; Boone et al., 2007; Coles et al., 2008 and Linck et al., 2008a). Empirical studies on the determinants of board structure find that board size is a function of operational complexity, ownership structure and CEO influence (Boone et al, 2007; Coles et al., 2008 and Linck et al., 2008). Raheja (2005) models board structure and shows that board composition and size are a function of verification costs. These studies indicate that external board structure of a firm (size and composition) is a function of its operating environment and ownership structure.

While we are not aware of any formal theories of internal board structure, there are several possibilities for why firms choose to have a subordinate structure. One likely alternative is that some firms, for a variety of reasons, need more committees composed of outside directors, leading them

to develop larger boards with a greater proportion of outside directors. For example, the SEC has encouraged firms to have audit committees composed of outside directors since one of its Accounting Series release in 1940 (Klein, 2002). Firms often adopt industry best practices and it is possible that certain board committees are adopted as part of that strategy (Harrison, 1987). Another perspective indicates that subordinate board structures are used to legitimize insider-dominated decision-making. According to this view, managers create board subcommittees to provide cover for the decisions and actions that they plan to take (Newman and Mozes, 1999; Anderson and Reeb, 2004). This perspective suggests that subordinate board structures are used to facilitate insider control and opportunism (Dechow, Huson, and Sloan, 1994).

Although, we argue that board size and/or the proportion of outside directors may lead firms to use subordinate board structures, causality may actually flow in the opposite direction. We address this reverse causality issue by using 2-SLS (IV) estimation of impact of firm characteristics and other governance mechanisms, allowing board size and board composition to be determined as a function of firm characteristics and other governance mechanism and then examining the impact of board size and board composition on committee structures.[10]

Under the 2-SLS (IV) approach, we estimate board structure in the first stage and then in the second stage we estimate the number of committees (the number of advisory and monitoring committees using the estimated board structure from the first stage). In estimating board size and board composition, we follow Boone et al. (2007), Coles et al. (2008) and Linck et al. (2008 a, b). These studies find the variables that measure operational complexity of a firm such as size, number of operating segments and leverage influence its board structure. We include firm size, diversification, and leverage as instruments in the first stage of 2-SLS (IV). In addition, in the first

[10] Another common approach is to use firm fixed effects. However, board structure remains relatively stable from year to year (Coles et al. (2008)), suggesting that firm fixed effects may be inappropriate.

stage CEO ownership is used as a proxy of CEO influence and ratio of intangible assets captures the cost of verification and firm specific knowledge (Baker and Gompers, 2003 and Coles et al., 2008).

The results from 2-SLS (IV) analyses are presented in columns 4 through 6 of Table 2. The results are generally similar to the results presented in columns 1 through 3. In general, these results are consistent with the notion that larger boards and those with a greater proportion of outside directors use a greater number of committees, including both advisory and monitoring committees. However, one exception is the regression result for the number of monitoring committees (column 6); we find that the coefficients on the dummy variables for High Outsider and High Complexity are insignificant. While the dummy variables make interpreting the results easier, the use of continues variables allows the use of more information. Repeating these tests with continuous variables provides similar inferences to the reduced form tests in columns 1-3 of Table 2.

Similar to the reverse causality problem that we face in determining subordinate board structure, there is a potential reverse causality problem in estimating the subordinate board structure and firm performance relation. While we argue that the subordinate board structures should improve firm performance by reducing the costs of communication and social loafing associated with large and outsider dominated boards, causality may actually flow in the opposite direction. It is equally plausible that better performing firms have larger and/or outsider dominated boards and also more committees for public relations or window dressing, suggesting that firm performance leads to subordinate board structures. [11] For example some firms have executive committee of the board that can exercise the authority of whole board. In their re-negotiation based model, Hermalin and Weisbach (1998) argue that the CEOs of successful firms try to adopt a board structure that is less vigilant. It is certainly possible that the CEOs of successful firms create certain committees such

[11] A related issue is the use of temporary committees of the board. To assess temporary committees, we repeat the primary regression by including an indicator variable for the presence of temporary committees (such as succession planning, mergers and acquisitions or special transactions committee). We find that the primary results are robust to these specifications.

as executive or finance/investment committees to facilitate their control over board's decision making powers or investment strategies. Thus reverse causality may potentially be driving our results on subordinate board structure and firm performance.

Once again, we address this issue of reverse causality by using 2-SLS (IV) estimation of impact of board hierarchy on the firm performance allowing board size and board composition to be determined as a function of number of committees in addition to other firm characteristics. In another approach, following Coles et al. (2008), we also use a system of equation in which we simultaneously determine firm performance, committee structure, board size and board composition using a 3-SLS estimation approach. Prior works on board structuring have found firm performance affecting board composition (Hermalin and Weisbach, 1988 and Bhagat and Black, 1999). Coles et al. (2008) and Lehn et al. (2008) present evidence that board composition also affects board size. Since both size and composition of board affect committee structure, using a system of equations would help disentangling the complex relationship between different aspects of board structure and firm performance.

In 2-SLS (IV) approach, in the first stage of estimation we model board structure using number of committees and other determinants such as firm size, leverage, diversification, R&D intensity, firm risk, free cash flow, ratio of intangible assets, CEO tenure and CEO ownership. In the second stage estimation, we use Tobin's Q as the dependent variable and the number of committees (advisory and monitoring committees) along with estimated board size and outsider ratio from the 1st stage as right hand side variables. In unreported results, we again find that the number of committees and especially the number of advisory committees is positively associated with Tobin's Q.

In a second approach, we use a system of equations approach (3-SLS). We estimate subordinate board and firm performance regressions using a 3-SLS approach. Similar to studies on

determinants of board size and board composition (Boone et al., 2007; Linck et al., 2008a; Lehn et al., 2009), we estimate board size, board composition, the number of committees and Tobin's Q regressions simultaneously.

In untabulated results, we find that the number of committees is significantly related to firm performance (positive). However, in the second regression we find that the coefficient of Ln (Tobin's Q) is negative and significant at 10% level, suggesting that firm performance has nominal impact on the use of subordinate board structures. Overall, these tests indicate that larger boards are a function of poor performance and the number of committees. One additional noteworthy result in this analysis is that CEOs with longer tenures encourage larger boards with limited committee structures[12].

To further examine the robustness of our results, we use two additional approaches. Following Anderson et al. (2004) and Klein (1998), we use lagged firm performance as additional control in Tobin's Q regressions and find similar results. We also use lagged subordinate board structures on the right hand side in the firm performance regressions. We continue to find that subordinate board structures appear to off-set the costs associated with larger boards and those with a greater proportion of outside directors.

IV.A. Non-Linearity and Future Performance

Coles et al. (2008) find that board size and performance relationship is non-linear and follows a U-shaped pattern. We test for this possibility in board hierarchy and estimate the Tobin's

[12] We also examined a 3-SLS estimation approach for each type of committee (advisory or monitoring) and board size, and firm performance. Results from this analysis generally suggest that firm performance is a function of the number of advisory committees (positive relation) and the number of monitoring committees (negative relation). Another interesting result is the coefficient of CEO tenure, which is unrelated to the number of advisory committees but is negatively related to the number of monitoring committees.

Q regressions with the squared term of the number of committees as an additional independent variable. We find that the coefficients on the number of committees and its squared term are insignificant. In additional tests, we find that among firms with the largest boards, benefits from the number of committees appear to diminish at around 6 committees.

Since benefits from a board with better internal organization might not occur in the same period, we also repeat the performance analysis using one-year lead Tobin's Q as dependent variable. We find that the number of committees is positively associated with future performance. We also repeat our performance tests using accounting measures of firm performance (ROA). Again, we find that firm performance is positively related to the number of committees, offsetting the costs associated with larger boards and those with a greater proportion of outside directors. Furthermore, using Tobin's q without the log normalization procedure yields similar results.

IV.B. Additional Robustness Tests

We argue that firms choose subordinate board structures to mitigate the costs of communications and social loafing, therefore we classify directors as outsiders or insiders. Insider directors are an important source of information and presence of outside directors increases communication costs. However, our outside director categorization might become a problem when we consider the role of monitoring committees since affiliated directors are considered weaker monitors and they are included in our outside director category. To see if this classification scheme impacts our results, we include the ratio of affiliated directors, i.e. directors who have non-employment relationship with the firm, in all our analyses and we find that inclusion of affiliated directors as additional control does not qualitatively change our results.

Second, in the committee structure regressions (Table 2), we use CEO-Board chair dummy as an alternative proxy for CEO influence. We replace CEO tenure by CEO-Board Chair dummy

that takes a value of one if a firm's CEO also holds board chair position, otherwise zero. We find that our primary results are robust to the use of this alternative proxy of CEO influence.

Third, we use an alternative measure of Big Board dummy which takes a value of one if a firm's board size is larger than the median board size of the firms belonging to the same 2-digit SIC code. We find that using a big Board dummy relative to industry median does not qualitatively affect our primary results. Finally, we consider the use of continuous measures instead of binary measures of board and firm characteristics. Our primary results are presented using indicator variables for board size, outsider ratio, complexity and diffuse shareholdings. In subsequent analysis, we use continuous measures of these variables and find results qualitatively similar to the primary results.

V. Conclusion

Corporate governance research suggests that the size and composition of the board of directors are important elements in understanding board activity. Several studies have emphasized how outside directors increase the co-ordination, communication and asymmetric information problems of the board, potentially limiting the effectiveness of this governance device (Baysinger and Butler, 1985; Eisenhardt, 1989; Goodstein et al., 1994; Vafeas, 1999; Adams and Ferriera, 2007). Others have suggested that the number of directors on the board can also affect the cohesiveness and decision-making of the board, leading to substantial concerns about the ability of the board to advise and monitor senior managers (Lipton and Lorsch, 1992; Jensen, 1993; Yermack, 1996; Eisenberg et al., 1998).

Our analysis begins with the observation that boards in publicly-traded firms are usually created with a flat governance structure where each director has an equal vote in board decision-making. Boards, however, often choose to delegate much of their authority to sub-committees of the board, thereby creating a subordinate board structure. We explore the determinants of

subordinate boards and argue that firms use committees to mitigate the co-ordination, communication, and free-riding problems that can occur with larger boards and/or those with more outside directors. However, the use of committees can also create information asymmetries among directors, suggesting that firms with small boards or few outside directors will develop fewer subordinate structures. We also examine the types of committees that boards create, focusing on the relative roles of advisory and monitoring committees. Finally, we consider several alternative viewpoints that suggest subordinate board structures are used to legitimize managerial decision-making, are endogenous with board characteristics, or a window dressing for high performing firms.

We test our hypotheses using a sample comprised of the 1500 S&P firms and examine the relation between committee use and both board and firm characteristics. We find that committee use is positively related to board size and the proportion of outsider directors. We conduct several supplementary tests to help distinguish among differing explanations for these results, finding evidence consistent with the notion that boards use committees to reduce co-ordination and communication problems. Categorizing committees into monitoring and advisory roles, we find that board size and composition are positively related to the use of both types of committees. Further tests indicate that the relation between firm performance and board hierarchy is significantly affected by these board and firm characteristics. We find that the number of committees is positively associated with firm performance, resulting in 3.974 percent performance differential for the median firm with one additional committee, which offsets the costs associated with larger boards and those with a greater proportion of outside directors. Overall, our analysis suggests that subordinate board structures are an important device mitigating the communication, co-ordination, and free-rider problems that can occur in boards of directors.

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Table 1: Panel A: Descriptive Statistics

Firm Size is the book value of total assets. Leverage is the ratio of book value of long term and short term debts to total assets. ROA is operating income scaled by book value of total assets. Tobin's Q is (market value of equity+ book value of debt/ book value of assets). R&D investment is the ratio of R&D investment to book value of assets and capital investment is the ratio of capital expenditure to book value of assets. Intangible assets is 1-(Net PPE/Assets). Risk is the standard deviation of ROA for the prior twenty quarters. Free Cash Flow is the ratio of operating cash flow less dividends to book value of assets. Diversification is the number of business segments. CEO Tenure is the number of years CEO has been in the office. CEO Ownership is the percentage of equity held by the CEO. Board size is the number of directors on board. Outsider ratio is the percentage of non-employee directors to the board size. Diffuse Shareholdings is the percentage of equity held by non-insiders. Block Holding is the percentage of equity held by 5% block holders. Institutional Ownership is the percentage of equity held of institutional investors. Meeting frequency is the frequency of board meetings in a year. Number Committee is the number of board committees. Monitoring Committee is the number of monitoring committees, which are audit, compensation, nominating, governance and executive committees and other committees performing similar tasks. Advisory Committee is number of committees other than the monitoring committees.

Variables	Mean	Median	Std. Dev.
Firm Size ($million)	6487.1	1372.1	26586.1
Leverage	0.222	0.224	0.174
ROA	0.027	0.047	0.174
Tobin's Q	2.092	1.613	1.495
R&D Investment	0. 033	0. 004	0.055
Capital Investment	0.055	0.039	0.053
Intangible Assets (%)	71.260	76.966	21.229
Risk	0.056	0.032	0.098
Free Cash Flow	0.095	0.093	0.121
Diversification	2.439	2.000	1.797
CEO Tenure	8.225	6.000	7.576
CEO Ownership (%)	2.450	0.700	6.399
Board size	9.056	9.000	2.467
Outsider Ratio (%)	78.795	81.818	11.533
Diffuse Shareholdings (%)	88.289	94.200	15.237
Block Holding (%)	16.952	15.171	13.287
Institutional Ownership (%)	66.661	69.664	19.659
Meeting Frequency	6.875	6.000	2.825
Number Committee	3.683	4.000	1.188
Monitoring Committee	3.149	3.000	0.778
Advisory Committee	0.534	0.000	0.835

Panel B: Univariate Test Results

This table presents difference in number of committees for groups of firms with more than the sample mean board size (outsider ratio) and those with more than the sample mean board size (outsider ratio). * Significant at 10%; ** significant at 5%; *** significant at 1%.

	Big Boards	Small Boards	Difference	High Outsider	Low Outsider	Difference
Number Committees	4.260	3.314	0.946***	3.906	3.466	0.440***
Advisory Committees	0.865	0.322	0.543***	0.628	0.442	0.186***
Monitoring Committees	3.395	2.992	0.403***	3.278	3.024	0.254***

Univariate Test Results (Based on Median Board Size and Outsider Ratio)

	Big Boards	Small Boards	Difference	High Outsider	Low Outsider	Difference
Number Committees	4.000	3.000	1.000***	4.000	3.000	1.000***
Advisory Committees	1.000	0.000	1.000***	0.000	0.000	0.000
Monitoring Committees	3.000	3.000	0.000	3.000	3.000	0.000

Panel C: Correlation Matrix

This table presents correlation between important variables.

	Number Committee	Tobin's Q	Board Size	Outsider Ratio	Size	Diver.	Insider Holding	Risk	CEO Tenure
Number Committee	1.000								
Tobin's Q	-0.093	1.000							
Board Size	0.447	-0.130	1.000						
Outsider Ratio	0.262	-0.092	0.231	1.000					
Size	0.443	-0.064	0.569	0.225	1.000				
ROA	0.028	0.221	0.095	-0.019	0.072				
Leverage	0.195	-0.292	0.270	0.150	0.324				
R&D Investment	-0.020	0.050	-0.061	-0.010	-0.075				
Diversification	0.139	-0.145	0.198	0.119	0.239	1.000			
Insider Holding	-0.190	0.013	-0.088	-0.330	-0.246	-0.096	1.000		
Block Holding	-0.106	-0.153	-0.138	0.053	-0.203	-0.051	0.054		
Institutional Ownership	-0.047	0.100	-0.110	0.079	-0.044	-0.085	-0.128		
Risk	-0.088	0.083	-0.184	0.016	-0.171	-0.056	-0.038	1.000	
Meeting Frequency	0.122	-0.082	0.092	0.153	0.185	0.108	-0.172	0.080	
CEO Tenure	-0.158	0.065	-0.106	-0.271	-0.106	-0.038	0.273	-0.046	1.000
CEO Ownership	-0.172	0.012	-0.156	-0.286	-0.187	-0.072	0.500	-0.041	0.397
Free Cash Flow	-0.005	0.243	0.011	-0.051	-0.008	-0.049	0.018	-0.160	0.031

Table 2: Determinants of Subordinate Board Structure
This table provides results from the following specification:

Number Committees = A_0 + A_1 (Big Board) + A_2 (High Outsider) + A_3 (High Complexity) + A_4 (High Diffuse Shareholdings) + A_5 (Block Holder) + A_6 (Institutional Ownership) + A_7 (Risk) + A_8 (R&D Investment) + A_9 (Capital Investment) + A_{10} (CEO Tenure) + A_{11} (Free Cash Flow) + A_{12} (SOX Dummy) + A_{13} (SIC Dummies) + e

The dependent variable is the number of committees of the board (total, advisory, and monitoring). Monitoring committees include audit, compensation, nominating, governance and executive committees. Big board is an indicator variable denoting firms in top 50% of the number of directors on the board. High Outsider is an indicator variable denoting firms in top 50% of the percentage of outside directors on the board. High complexity is an indicator variable denoting firms in top 50% in terms of factor score based on firm size, number of business segments and leverage. High Diffuse Shareholding is an indicator variable denoting firms in top 50% of the percentage ratio of stock held by outsiders, other than firm's directors and executives. Block Holder takes a value of 1 if there is a 5% block holder. Institutional ownership is percentage ratio of equity held by institutional investors. R&D Investment is ratio of R&D investment to book value of assets and capital investment is ratio of capital investment to book value of assets. Risk is the standard deviation of ROA of the firm for the past twenty quarters. CEO Tenure is number of years CEO has been in the office. Free Cash Flow is the ratio of operating cash flows less dividends to assets. DSOX is an indicator variable that assumes a value of one if the year is 2002 or 2003, otherwise zero. In two 2-SLS IV columns, Big Board and High Outsider are estimated using firm size, diversification, R&D investment, capital investment, CEO ownership, CEO tenure, intangible assets, free cash flow and leverage. Z- statistic in parenthesis. * Significant at 10%; ** significant at 5%; *** significant at 1%.

	Dependent Variable = Number Committees			*Dependent Variable = Number Committees 2-SLS- IV*		
Variables	*Total Number Committees*	*Number Advisory Committees*	*Number Monitoring Committees*	*Total Number Committees*	*Number Advisory Committees*	*Number Monitoring Committees*
Big Board	0.163***	0.663***	0.092***	1.240***	0.542***	0.690***
	(7.544)	(10.344)	(3.994)	(9.743)	(5.811)	(7.818)
High Outsider	0.073***	0.155***	0.057***	0.503***	0.432***	0.075
	(3.731)	(2.990)	(2.716)	(3.279)	(3.866)	(0.709)
High Complexity	0.119***	0.540***	0.054**	0.214***	0.187***	0.029
	(5.424)	(8.612)	(2.304)	(3.589)	(4.299)	(0.703)
High Diffuse Shareholdings	0.074***	0.269***	0.040*	0.232***	0.097***	0.132***
	(3.598)	(4.800)	(1.802)	(4.576)	(2.626)	(3.753)
Block Holder	-0.069**	-0.146**	-0.049	-0.278***	-0.125***	-0.151***
	(-2.463)	(-2.090)	(-1.580)	(-4.729)	(-2.915)	(-3.709)
Institutional Ownership	0.021	-0.227	0.059	0.220*	-0.061	0.275***
	(0.352)	(-1.469)	(0.939)	(1.798)	(-0.680)	(3.229)

Risk	-0.055	-0.238	-0.028	-0.022	-0.008	-0.030
	(-0.529)	(-0.704)	(-0.255)	(-0.104)	(-0.053)	(-0.203)
R&D Investment	0.007	-0.294*	0.014	0.023	-0.014	0.036
	(0.349)	(-1.677)	(0.706)	(0.553)	(-0.453)	(1.283)
Capital Investment	-0.001	0.304	-0.009	0.036	0.027	0.008
	(-0.019)	(1.398)	(-0.240)	(0.500)	(0.520)	(0.167)
CEO Tenure	-0.004***	-0.006	-0.003**	-0.008***	0.001	-0.009***
	(-2.701)	(-1.597)	(-2.241)	(-2.653)	(0.703)	(-4.567)
Free Cash Flow	0.037	0.055	0.027	0.178	0.105	0.075
	(0.446)	(0.206)	(0.306)	(1.109)	(0.900)	(0.678)
DSOX	0.049***	0.010	0.057***	0.161***	-0.015	0.175***
	(2.662)	(0.200)	(2.865)	(4.078)	(-0.506)	(6.402)
Intercept & SIC Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number Observations	3335	3335	3335	3278	3278	3278
Pseudo R-Sqd.	0.0308	0.1201	0.0110	0.1907	0.0948	0.0941

Table 3: Subordinate Board and Performance

Firm Performance = B_0 + B_1 (Number Committee) + B_2 (Big Board) + B_3 (High Outsider) + B_4 (High Complexity) + B_5 (High Diffuse Share.) + B_6 (Block Holder) + B_7 (Inst. Own.) +B_8 (DSOX) + B_9 (Risk) + B_{10} (ROA) + B_{11} (ROA_{t-1}) + B_{12} (R&D Inv.) + B_{13} (Cap. Inv.) + B_{14} (Mtgs. Freq.) + B_{15} (SIC Dummies) + e

Dependent variable is Ln(Tobin's Q). The standard errors are corrected for serial correlation and heteroskedasticity using White estimator. t-statistic in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

	Dependent Variable = Ln (Tobin's Q)		
	Baseline	*Board Characteristics*	
Number Committee (β_1)	0.019***	0.008	0.012
	(2.595)	(0.966)	(1.323)
*Number Committee * Big Board (β_2)*		0.016***	
		(3.637)	
Big Board	-0.040**	-0.073***	-0.041**
	(-2.244)	(-3.590)	(-2.271)
*Number Committee * High Outsider (β_3)*			0.014
			(1.088)
High Outsider	-0.055***	-0.054***	-0.107**
	(-3.316)	(-3.230)	(-1.986)
High Complexity	-0.052**	-0.060***	-0.052**
	(-2.545)	(-2.917)	(-2.522)
High Diffuse shareholdings	-0.019	-0.019	-0.019
	(-1.074)	(-1.082)	(-1.068)
Block Holder	-0.204***	-0.202***	-0.204***
	(-8.342)	(-8.284)	(-8.344)
Institutional Ownership	0.357***	0.357***	0.360***
	(6.889)	(6.913)	(6.952)
DSOX	-0.104***	-0.102***	-0.104***
	(-7.489)	(-7.369)	(-7.468)
Risk	1.024***	1.026***	1.029***
	(4.186)	(4.185)	(4.200)
ROA	0.482***	0.479***	0.482***
	(3.654)	(3.633)	(3.662)
ROA_{t-1}	0.509***	0.507***	0.511***
	(3.679)	(3.656)	(3.688)
R&D Investment	0.049**	0.049**	0.049**
	(2.272)	(2.277)	(2.285)
Capital Investment	-0.032	-0.032	-0.032
	(-0.817)	(-0.826)	(-0.820)
Meeting Frequency	-0.013***	-0.013***	-0.013***
	(-4.611)	(-4.524)	(-4.609)
Intercept & SIC Dummies Included	Yes	Yes	Yes
Number of Observations	3335	3335	3335
Adj. R-Sqd	0.4395	0.4411	0.4396
F-Test (Effect of Number of Committees)		*(β_1+ β_2)=0.024****	*(β_1+ β_3)=0.026****
p>F-Stats.		0.000	0.009

Table 4: Complexity and Communication

This table provides results from the analysis of impact of firm complexity and board meeting frequency on how they affect the impact of subordinate board on firm performance. High Complexity is the group of firms in which firm complexity is greater than the median firm. Low Complexity is the group of firms in which firm complexity is lower than the median firm. High Meeting Frequency is the group of firms in which board meeting frequency is greater than the median firm. Low Meeting Frequency is the group of firms in which board meeting frequency is lower than the median firm. Dependent variable is Ln(Tobin's Q). The standard errors are corrected for serial correlation and heteroskedasticity using White estimator. t-statistic is in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

	Dependent Variable = Ln (Tobin's Q)							
	High Complexity		**Low Complexity**		**High Meeting Frequency**		**Low Meeting Frequency**	
Number Committee (β_1)	0.002	0.025**	0.013	-0.006	0.011	0.018	0.008	0.011
	(0.180)	(2.285)	(0.874)	(-0.330)	(1.003)	(1.489)	(0.543)	(0.704)
*Number Committee * Big Board (β_2)*	0.021***		-0.011		0.018***		0.010	
	(4.508)		(-1.183)		(3.287)		(1.213)	
Big Board	-0.040	0.008	-0.064**	-0.085***	-0.070***	-0.032	-0.098***	-0.080**
	(-1.546)	(0.321)	(-1.965)	(-3.074)	(-2.686)	(-1.377)	(-2.630)	(-2.333)
*Number Committee * High Outsider (β_3)*		-0.010		0.033		0.011		0.005
		(-0.652)		(1.338)		(0.695)		(0.203)
High Outsider	-0.031	0.004	-0.046	-0.158*	-0.048**	-0.094	-0.067*	-0.082
	(-1.559)	(0.063)	(-1.633)	(-1.772)	(-2.344)	(-1.369)	(-1.945)	(-0.851)
High Complexity					-0.067***	-0.058**	-0.074*	-0.069
					(-2.638)	(-2.262)	(-1.754)	(-1.634)
High Diffuse shareholdings	0.022	0.022	-0.025	-0.027	-0.017	-0.018	-0.038	-0.038
	(0.965)	(0.970)	(-0.903)	(-0.960)	(-0.784)	(-0.790)	(-1.090)	(-1.108)
Block Holder	-0.153***	-0.153***	-0.176***	-0.174***	-0.171***	-0.174***	-0.247***	-0.246***
	(-5.756)	(-5.745)	(-4.235)	(-4.212)	(-5.798)	(-5.888)	(-5.268)	(-5.200)
Institutional Ownership	0.254***	0.252***	0.465***	0.469***	0.292***	0.293***	0.480***	0.479***
	(4.375)	(4.266)	(5.428)	(5.497)	(4.399)	(4.387)	(4.958)	(4.951)
DSOX	-0.056***	-0.058***	-0.148***	-0.147***	-0.103***	-0.104***	-0.094***	-0.095***
	(-3.512)	(-3.628)	(-6.451)	(-6.388)	(-5.991)	(-6.054)	(-3.552)	(-3.612)
Risk	1.585***	1.574***	0.858***	0.864***	0.772***	0.782***	1.395***	1.382***
	(3.558)	(3.543)	(3.477)	(3.497)	(2.924)	(2.953)	(3.750)	(3.712)

ROA	0.504**	0.510**	0.549***	0.546***	0.466***	0.470***	0.504	0.504
	(2.108)	(2.121)	(4.407)	(4.361)	(3.351)	(3.382)	(1.425)	(1.424)
ROA_{t-1}	0.898***	0.902***	0.351**	0.353**	0.392***	0.400***	1.063***	1.058***
	(4.682)	(4.698)	(2.303)	(2.303)	(2.656)	(2.710)	(3.263)	(3.247)
R&D Investment	0.189*	0.188*	0.042***	0.042***	0.024	0.023	0.442**	0.442**
	(1.842)	(1.779)	(3.243)	(3.276)	(1.283)	(1.229)	(2.438)	(2.438)
Capital Investment	0.007	0.002	-0.033	-0.033	0.062	0.067	-0.460**	-0.460**
	(0.075)	(0.020)	(-1.418)	(-1.453)	(0.560)	(0.603)	(-2.280)	(-2.282)
Meeting Frequency	-0.006*	-0.006*	-0.014***	-0.013***	-0.013***	-0.013***	-0.037**	-0.037**
	(-1.850)	(-1.853)	(-2.910)	(-2.813)	(-3.646)	(-3.730)	(-2.243)	(-2.245)
Intercept & SIC Dummies Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	1660	1660	1675	1675	1765	1765	1570	1570
Adj. R-Sqd.	0.5917	0.5877	0.3745	0.3749	0.4490	0.4468	0.4679	0.4674
F-Test (Effect of Number of Committees)	$(\beta_1+\beta_2)=$ *0.023***	$(\beta_1+\beta_3)=$ *0.015*	$(\beta_1+\beta_2)=$ *0.002*	$(\beta_1+\beta_3)=$ *0.027*	$(\beta_1+\beta_2)=$ *0.029***	$(\beta_1+\beta_3)=$ *0.029***	$(\beta_1+\beta_2)=$ *0.018*	$(\beta_1+\beta_3)=$ *0.016*
p>F-Stats.	0.007	0.18	0.9205	0.1540	0.0027	0.020	0.1807	0.4127

Table 5: Firm Performance and Advisory Committees

Dependent variable is Ln(Tobin's Q). The standard errors are corrected for serial correlation and heteroskedasticity using White estimator. t-statistic is in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

	Dependent Variable = Ln (Tobin's Q)				
	Baseline	***Advisory Committees***		***Monitoring Committees***	
Number Advisory Committees (δ_1)	0.040***	0.025*	0.033***	0.037***	0.040***
	(4.467)	(1.773)	(2.681)	(4.140)	(4.477)
Number Monitoring Committees (δ_2)	-0.006	-0.006	-0.006	-0.015	-0.012
	(-0.585)	(-0.611)	(-0.539)	(-1.391)	(-0.854)
*Number Committee$_{(Adv\ or\ Monitor)}$ * Big Board (δ_3)*		0.022		0.018***	
		(1.454)		(3.299)	
Big Board	-0.039**	-0.044**	-0.039**	-0.071***	-0.039**
	(-2.171)	(-2.429)	(-2.199)	(-3.425)	(-2.166)
*Number Committee$_{(Adv\ or\ Monitor)}$ * High Outsider(δ_4)*			0.013		0.013
			(0.794)		(0.632)
High Outsider	-0.052***	-0.051***	-0.059***	-0.051***	-0.092
	(-3.101)	(-3.066)	(-2.913)	(-3.059)	(-1.341)
High Complexity	-0.053***	-0.055***	-0.053***	-0.061***	-0.053***
	(-2.614)	(-2.681)	(-2.597)	(-2.964)	(-2.608)
High Diffuse shareholdings	-0.018	-0.018	-0.018	-0.018	-0.017
	(-1.011)	(-1.015)	(-1.023)	(-1.020)	(-0.992)
Block Holder	-0.205***	-0.205***	-0.204***	-0.202***	-0.205***
	(-8.372)	(-8.385)	(-8.351)	(-8.282)	(-8.382)
Institutional Ownership	0.366***	0.365***	0.367***	0.365***	0.367***
	(7.054)	(7.028)	(7.080)	(7.071)	(7.080)
DSOX	-0.100***	-0.100***	-0.100***	-0.099***	-0.100***
	(-7.201)	(-7.178)	(-7.208)	(-7.125)	(-7.171)
Risk	1.022***	1.023***	1.025***	1.023***	1.023***
	(4.200)	(4.191)	(4.209)	(4.200)	(4.201)
ROA	0.481***	0.481***	0.481***	0.478***	0.481***
	(3.615)	(3.615)	(3.620)	(3.594)	(3.617)
ROA_{t-1}	0.508***	0.506***	0.508***	0.507***	0.509***
	(3.663)	(3.649)	(3.666)	(3.648)	(3.667)
R&D Investment	0.050**	0.050**	0.050**	0.050**	0.050**
	(2.338)	(2.332)	(2.332)	(2.340)	(2.356)
Capital Investment	-0.032	-0.032	-0.031	-0.032	-0.032
	(-0.829)	(-0.832)	(-0.814)	(-0.835)	(-0.847)
Meeting Frequency	-0.013***	-0.013***	-0.013***	-0.013***	-0.013***
	(-4.537)	(-4.531)	(-4.532)	(-4.445)	(-4.540)
Intercept & SIC Dummies Included	Yes	Yes	Yes	Yes	Yes
Number of Observations	3335	3335	3335	3335	3335
Adj. R-Sqd.	0.4413	0.4411	0.4424	0.4411	0.4413
F-Test (Effect of Number of Committees: Advisory or Monitoring)		*(δ_1+δ_3)= 0.047****	*(δ_1+δ_4)= 0.046****	*(δ_2+δ_3)= 0.003*	*(δ_2+δ_4)= 0.001*
p>F-Stats.		0.000	0.000	0.7874	0.9674

Table 6: Specific Committees

This table presents results from the analysis of firm performance from the presence of a specific committee of board. Specific Committee takes a value of 1 if a firm has that particular committee. Dependent variable is Ln(Tobin's q). The standard errors are corrected for serial correlation and heteroskedasticity using White estimator. t-statistic is in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

	Dependent Variable = Ln(Tobin's Q)						
	1	2	3	4	5	6	7
Finance Committee	0.084***					0.068***	
	(4.403)					(3.367)	
Executive Committee		-0.030*				-0.032**	
		(-1.904)				(-1.981)	
Compensation Committee			-0.093			-0.086	
			(-1.332)			(-1.281)	
Nominating Committee				0.003		-0.037	
				(0.140)		(-1.642)	
Corporate Governance Committee					0.063***	0.075***	-0.008
					(3.823)	(4.049)	(-0.359)
Investment Committee						-0.069	
						(-1.639)	
Public Issue/Diversity Committee						0.074**	
						(2.111)	
Tech Advisory Committee						0.070	
						(1.491)	
Employee Development Committee						0.194**	
						(2.532)	
Other Advisory Committee						0.047*	
						(1.908)	
Other Monitoring Committee						0.010	
						(0.325)	
*Corp. Gov.*DSOX*							0.112***
							(4.165)
Big Board	-0.038**	-0.022	-0.027	-0.030*	-0.033*	-0.045**	-0.033*
	(-2.128)	(-1.234)	(-1.546)	(-1.647)	(-1.901)	(-2.492)	(-1.794)
High Outsider	-0.057***	-0.049***	-0.050***	-0.052***	-0.055***	-0.056***	-0.052***
	(-3.418)	(-2.949)	(-3.004)	(-3.045)	(-3.322)	(-3.282)	(-3.119)

High Complexity	-0.050**	-0.043**	-0.054***	-0.055***	-0.057***	-0.068***	-0.048**
	(-2.467)	(-2.135)	(-2.626)	(-2.664)	(-2.805)	(-3.289)	(-2.403)
High Diffuse shareholdings	-0.026	-0.013	-0.010	-0.011	-0.019	-0.025	-0.030*
	(-1.488)	(-0.744)	(-0.553)	(-0.617)	(-1.109)	(-1.392)	(-1.702)
Block Holder	-0.203***	-0.213***	-0.214***	-0.214***	-0.207***	-0.203***	-0.204***
	(-8.380)	(-8.704)	(-8.720)	(-8.720)	(-8.517)	(-8.311)	(-8.407)
Institutional Ownership	0.350***	0.355***	0.355***	0.354***	0.365***	0.364***	0.350***
	(6.820)	(6.896)	(6.834)	(6.822)	(7.099)	(7.070)	(6.813)
DSOX	-0.116***	-0.102***	-0.107***	-0.108***	-0.102***	-0.121***	-0.165***
	(-8.070)	(-7.321)	(-7.686)	(-7.778)	(-7.375)	(-8.499)	(-8.044)
Risk	0.907***	0.909***	0.764***	0.763***	0.921***	0.747***	0.900***
	(4.210)	(4.145)	(3.261)	(3.254)	(4.188)	(3.259)	(4.258)
ROA	0.475***	0.484***	0.506***	0.506***	0.481***	0.493***	0.468***
	(3.708)	(3.678)	(3.802)	(3.806)	(3.641)	(3.736)	(3.663)
ROA_{t-1}	0.467***	0.466***	0.216*	0.216*	0.467***	0.203*	0.464***
	(3.584)	(3.533)	(1.754)	(1.754)	(3.526)	(1.672)	(3.608)
R&D Investment	0.049**	0.050**	0.044**	0.044**	0.049**	0.044**	0.047**
	(2.305)	(2.381)	(2.201)	(2.194)	(2.313)	(2.289)	(2.230)
Capital Investment	-0.030	-0.030	-0.031	-0.031	-0.031	-0.027	-0.030
	(-0.746)	(-0.780)	(-0.831)	(-0.835)	(-0.792)	(-0.734)	(-0.754)
Meeting Frequency	-0.014***	-0.013***	-0.013***	-0.013***	-0.013***	-0.014***	-0.013***
	(-4.697)	(-4.387)	(-4.605)	(-4.645)	(-4.513)	(-5.016)	(-4.611)
Intercept & SIC Dummies Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	3335	3335	3335	3335	3335	3335	3335
Adj. R-Sqd.	0.4385	0.4365	0.4285	0.4285	0.4381	0.4473	0.4415

Appendix 1: Distribution of Committees: Advisory and Monitoring
This table provides year-wise distribution of the different types of committees.

	2000		2001		2002		2003	
Monitoring	No.	%	No.	%	No.	%	No.	%
Audit	816	100.000	913	100.000	1018	100.000	1082	100.000
Compensation	801	98.162	896	98.138	1004	98.625	1070	98.891
Executive	360	44.118	375	41.073	475	46.660	395	36.506
Nominating	523	64.093	589	64.513	742	72.888	946	87.431
Governance	269	32.966	331	36.254	425	41.749	803	74.214
Others	10	1.225	10	1.095	13	1.277	17	1.571
Advisory	No.	%	No.	%	No.	%	No.	%
Employee Development	113	13.848	117	12.815	118	11.591	113	10.444
Finance	137	16.789	139	15.225	157	15.422	166	15.342
Investment	41	5.025	42	4.600	42	4.126	43	3.974
Public Issues/ Diversity	56	6.863	58	6.353	58	5.697	66	6.100
Tech. Advisory	48	5.882	52	5.696	64	6.287	67	6.192
Others	64	7.843	64	7.010	71	6.974	78	7.209