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The relation between board size and firm performance in firms with a history of poor operating performance

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Abstract Focusing on a sample of smaller firms with a history of poor operating performance, this paper posits that increases in board size will be associated with better share price performance. Notably, board sizes studied here are, on average, much smaller than those typically studied by prior research. Mostly consistent with predictions, board size is found to be positively correlated with firm value in between-firms tests, and changes in board size are found to be positively associated with annual stock returns. Last, event study results suggest that the market responds favorably to board size increases and unfavorably to large board size decreases. Together, these results identify a setting in which larger board sizes appear to be positively related to shareholder value.

Keywords Board size · Firm performance

1 Introduction

The relation between board structures and board workings to firm value has been in the epicenter of a long-standing debate in the finance literature.[1] A growing stream

[1] See, for example, Byrd and Hickman (1992), Brickley et al. (1994), Cotter et al. (1997), and Field and Karpoff (2002) for studies conditioning the board-performance relation on a specific corporate decision, and Hermalin and Weisbach (1991), Yermack (1996), Bhagat and Black (1999), Adams and Mehran (2005), and Bebchuk and Cohen (2005) for studies linking boards to firm performance in a general day-to-day sense. Hermalin and Weisbach (2003) and Gillan (2006) provide an overview of this research.

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of research studying corporate boards focuses on board size in particular as an important but not fully understood dimension of board structure. Specifically, while the costs of larger boards of directors have been well argued and documented,[2] relatively little empirical attention has been paid to their potential benefits. Yet, as boards grow in size, there are more directors upon whom to draw leading to a greater knowledge base, more expertise, and more capacity for monitoring and sharing the workload. Indeed, Lipton and Lorsch (1992) recognize that there is an apparent tradeoff in the costs and benefits of adding new directors to boards, and tentatively suggest a range of acceptable board sizes. Also, the general management literature typically recognizes that there exist both advantages and disadvantages to adding members to groups (e.g., Hackman 1990). In light of this, the relatively one-sided empirical evidence in the finance literature on the adverse performance effects of larger boards is only partly intuitive.

Notably, empirical work by Coles et al. (2008) moderates the view larger boards are detrimental to shareholders. They specifically show that for firms with greater advising requirements, proxied by firm size, degree of diversification, and degree of financial leverage, there is, in fact, a positive correlation between board size and firm value. The Coles et al. (2008) findings suggest the issue of board size has not been definitively resolved by academic research, and remains an open empirical question. This evidence also highlights the need for further research on the relation between board size and firm performance. Similarly, Di Pietra et al. (2008) do not find that larger boards are detrimental to firm value for a sample of Italian firms with concentrated ownership structures.

Drawing on this debate in the literature, the present study attempts to further illuminate the association between corporate board size and firm performance by focusing on a sample of poorly performing firms. By focusing on poorly performing firms this study aims to improve the inherently low signal to noise ratio that often plagues studies in the field, given that boards are more likely to take purposeful action in the face of crisis, rather than they would be in a day-to-day sense when they usually engage in noisy, routine tasks.[3] The paper's contention that larger board sizes are associated with better share price performance is mostly supported by the evidence presented herein, and is robust to alternative types of tests.

It is important to note that screening firms for chronically poor operating performance has eliminated most large firms from consideration. As a result, most sample firms studied here are quite small and, by extension, have boards that are much smaller in size compared to the boards of firms previously studied (e.g., in Yermack 1996). Smaller sample firm size provides greater opportunities for studying the performance-related effects of board size at the lower end of the board size distribution, which are under-represented in prior studies. Importantly, Chhaochharia and Grinstein (2007) provide evidence that firm size moderates firm response to the 2002 corporate governance rules, suggesting smaller firms may have

[2] See Lipton and Lorsch (1992) and Jensen (1993) for a discussion on the costs and benefits of larger boards, and Yermack (1996), Eisenberg et al. (1998), and Boone et al. (2007) for related empirical evidence.

[3] See, for example, Gilson (1990), Vafeas (1999), Perry and Shivdasani (2005), and Srinivasan (2005) for the importance of boards when firms are in trouble.

different corporate governance needs. Next, the paper discusses the related literature and develops the research question.

2 Background and research question

The early consensus had been that larger boards are detrimental to board effectiveness. Lipton and Lorsch (1992) argued that larger boards are more likely to become dysfunctional because, as board size increases, directors become less likely to criticize the policies of top managers. Also, larger boards experience greater productivity losses such as greater co-ordination problems, slower decision making, and more director free riding, and are more risk averse. Jensen (1993) similarly argues that larger groups are easier to control by the CEO. Thus, boards end-up serving a more symbolic than a strategic and monitoring function.

In his seminal paper on board size, Yermack (1996) finds empirical evidence in line with this view, documenting that, for a sample of large US firms, firm value is inversely related to board size. This conclusion is robust to alternative controls and different types of tests. Eisenberg et al. (1998) similarly document that, for a sample of smaller Finnish firms, board size is inversely related to profitability. Also consistent with that, Faleye (2004) finds that larger boards are less likely to oust a CEO or replace a CEO with an outsider, and that CEO turnover-related return is lower when the board is larger.[4]

Notwithstanding evidence on the costs of larger boards, empirical research to date has paid only limited attention to the many benefits of adding directors to a corporate board.[5] In theory, as the number of directors increases, a board's capacities for monitoring increase. Also, a larger board offers a broader pool of knowledge and expertise upon which to draw. In fact, both Lipton and Lorsch (1992) and Jensen (1993) advocate boards that are neither too small, nor too large. Lipton and Lorsch favor boards of eight or nine, while Jensen argues boards should not exceed seven or eight people. Empirically, Adams and Mehran (2005), find that banking firms with larger boards do not underperform their peers in terms of Tobin's Q, and conclude that constraints on board size in the banking industry may be counterproductive. Notably, even Yermack (1996) suggests that "no consistent association between board size and firm value exists over the lowest range of board sizes".

Although intuitively appealing, results on the value-relevance of board size are subject to alternative interpretations having different policy implications (see Hermalin and Weisbach 2003). Out-of-equilibrium, these results would suggest that there exists a fairly inexpensive way for firms to increase their performance; by simply managing the size of their boards. Thus, policy makers would be justified in mandating board size restrictions across firms. In contrast, interpreted as an equilibrium phenomenon, this result would be consistent with firms economizing on

[4] A negative relation between various measures of firm performance and board size, used as a control variable, is also found by Tufano and Sevick (1997), Core et al. (1999), Fich and Shivdasani (2006), and Graham and Narasimhan (2004), among others.

[5] Notably, adding outside directors to the board (Rosenstein and Wyatt, 1990) and, under certain conditions, adding insiders (Rosenstein and Wyatt 1997) is perceived positively by the market.

their consumption of monitoring mechanisms, selecting an optimal mix of each, including board size, depending on their economic realities. In this view optimal board size differs across firms, and the relationship that has been empirically documented between board size and firm performance may be the by-product of a set of other unobserved factors that determine both board size and firm performance, leading to the observed, spurious relation.

The latter possibility has given rise to a series of recent papers attempting to understand the determinants of, among other board characteristics, board size. That is, by identifying factors causing fluctuations in board size, this line of work corroborates with the efficient contracting view discussed earlier, suggesting that board size is endogenously determined in a manner that is consistent with firm value maximization.

Boone et al. (2007) track board development for the first 10 years following a firm's IPO. They find that boards grow in size as firms grow and become more diversified (their "scope of operations" hypothesis), and that board size is determined by the tradeoff between the benefits and costs of monitoring. Notably, the boards examined in that paper are smaller than boards previously studied, and resemble in size boards studied in this paper. Boone et al. (2007) conclude that economic considerations such as a firm's competitive environment and managerial team are significant determinants of board size. One interesting implication of these results is that the costs and benefits of appointing additional directors to a board change over an organization's life cycle. Firms weigh these costs and benefits in determining their board structures.

In a related vein, Lehn et al. (2004) trace the board size and composition of 81 publicly traded firms from 1935 to 2000. They find that boards grow larger as firms grow in size, and as growth opportunities shrink. Lehn et al. (2004) conclude that boards are selected rationally and optimally, casting doubt on studies claiming that board characteristics determine firm performance. Linck et al. (2008) track corporate board structures for 7,000 firms over 15 years. They similarly find that board size increases with firm size and decreases with growth opportunities and insider ownership levels. Linck et al. (2008) argue that recent regulatory efforts may have resulted in sub-optimal changes on board structures and also conclude that firms structure their boards in an economically efficient way. In sum, these studies exploit sample firm age, length of period studied, and sample size, respectively, attempting to better identify what determines board size, and generally find results that are consistent with an efficient contracting view of the firm.

Importantly, however, even though these studies improve our understanding on the determinants of board structures, they do not definitively preclude the possibility that boards are sometimes over- or under-sized, such that firms could benefit from restructuring their boards. The point is that documenting statistical significance on the determinants of board size does show that the choice of board size is not random statistically and that it is consistent with economic intuition, but that is not to say that *all* the variation in board size for any one firm in time is explained by economic factors that are consistent with shareholder wealth maximization.

Motivated by this consideration, and by competing views on the importance of board size in company operations, this paper re-examines the link between board

size and firm performance, attempting to address the benefits of larger boards. That is, "common sense" as they may appear, the benefits of larger boards have not been sufficiently documented in the literature. This study focuses on a sample of poorly performing firms, suggesting that any benefits of increasing board size will be illuminated more clearly in such a setting. The paper offers two main insights to this end: First, by focusing on poor performers, this study addresses the contention that corporate governance practices in general, and boards in particular are of greater importance when firms are in trouble. Also, the choice of a sample of poorly performing firms addresses a fundamental empirical problem; i.e., that in a day-to-day, unconditional sense, there is a notoriously low signal-to-noise ratio when attempting to discern a link between any one board characteristic with firm performance. The present study posits that the signal induced by a change in board size for this sample is likely to be stronger compared to such a signal in the broader population of firms, because in troubled firms there is a greater need and opportunity for directed and purposeful action by the board as opposed to noisy routine tasks.

Second, the resulting sample firms have much smaller boards of directors than those previously studied.[6] Studying smaller boards allows a closer look at the perceived benefits of having a larger pool of directors upon whom to draw. This inquiry implies that the relation between board size and firm performance is not negative, but is in fact non-monotonic; positive as boards grow from small to medium, and negative as boards grow from medium to large. The sample of firms with smaller boards used in this study provides a better setting for discerning the benefits of moving from small to medium-sized boards because the costs of increasing board size discussed in earlier work are likely to be less applicable to this sample.

Similarly conditioning governance changes on poor prior performance, Gilson (1990) studies changes in ownership structure and boards following 61 bankruptcy filings and 50 private restructurings of corporate debt for the period 1979–1985. Contrary to the expectation posited in this study, Gilson (1990) finds that, in addition to ownership blocks being transferred to banks and other creditors, surviving firms shrink their boards. Only 46% of directors retain their seats, while boards shrink from an average (median) of 9.2 (8) directors prior to bankruptcy to 7.3 (7) directors five years later. There are, however, some important differences between this paper and Gilson: Firms in the Gilson sample undergo bankruptcy, concurrently experiencing significant changes in ownership structure which effectively determine board size changes. That is, board turnover is likely to be endogenous in that case because it is directly related to changes in the bankrupt firm's property rights. With rare exceptions, firms in my study do not undergo such pronounced ownership changes. Thus, any changes in board size observed here are carried out in the ordinary course of business by firms trying to recover from poor prior performance. Also, five years following financial trouble, boards in both samples converge towards seven directors. That is, boards in the Gilson (1990) sample are roughly 50% larger in the year prior to bankruptcy compared to the boards studied here (9.2 vs. 6.3 directors).

[6] For example, the average firm in this sample had a board comprising just over six members, only about half the size of the average board in Yermack (1996).

One particular problem that is common in studies on corporate boards is failure to account for potentially important correlated variables. That is, boards are endogenously determined depending on each firm's economic environment, such as other internal control mechanisms and external market pressures, making it very difficult to control for all correlated factors in cross-sectional tests on board levels.[7] By tracking the sample firms' board characteristics over several years, the tests used here focus on changes in the board variables, in addition to variable levels, essentially using each firm as its own control at a different point in time. Tests on variable changes are an effective solution to endogeneity if the unobserved characteristics that drive both market values and board sizes vary across firms but are not significantly different for any one firm from one year to the next. Also, there is likely to be less "stickiness" in board sizes for these troubled firms over time, given that they are more likely to respond to financial problems by restructuring their boards. Such changes offer a richer empirical setting for tests on variable changes.[8] Next, the paper discusses the sample selection process and variable descriptions.

3 The data

To study the research question in-hand we seek a sample of firms that are characterized as poor performers. The main idea in this paper is to study how firms change their boards after they cross a threshold point of poor operating performance. We opted to use accounting-based operating losses to define this threshold point of poor performance, and thus to identify the sample firms, because operating performance is less volatile than stock price performance, and because share prices include the expected value of any improvements in corporate governance. In addition, we also deem that a single year of operating losses is not sufficient to cast a firm as "problematic" because of the transitory component of accounting earnings, and earnings management considerations, that may give rise to reversible losses in any given year. Accordingly, to reduce misclassification due to noise, and to focus on the permanent component of operating earnings, firms are only characterized as poor performers for sampling purposes if performing poorly in three consecutive years.

To measure operating performance, this study uses operating income before depreciation (OIBDP, item #13) divided by total assets (AT, item #6). This measure is then industry-adjusted, subtracting for each firm the corresponding median operating performance of firms in the same two-digit SIC code for each year. Industry adjustments are necessary because we are interested in firm-specific managerial performance abstracting from fluctuations in operating performance

[7] See, for example, Himmelberg, Hubbard, and Palia (1999) and Coles et al. (2003).

[8] In a year-to-year sense, board sizes often remain unchanged. Denis and Sarin (1999) report that in a random sample of firms, board size remained the same in 60.7% of the years studied, the figure rising to 72.6% for boards comprising up to six directors. Denis and Sarin (1999) find that less than 13% of firm-years pertained to a change in board size of more than one.

across industries. Industry-adjusted figures are necessary to improve comparability across firms.

Accordingly, for each fiscal year between 1994 and 2000, the population of firms from the *Compustat* active and research files were ranked by industry-adjusted operating performance. Financial firms (SIC codes 6000-6999) were excluded from this analysis. Non-financial firms being ranked in the bottom quintile of the *Compustat* population according to industry-adjusted performance were characterized as poor performers for a year. Firms being ranked in the bottom quintile of industry-adjusted operating performance for a third consecutive year are characterized as poor performers. That is, the third year of poor industry-adjusted operating performance for a firm is set as year 0, and it is the starting point for the empirical analysis for that firm. To study the post-crisis (i.e., post-year 0) changes in boards and performance, electronic proxy filings for year zero and the five years subsequent to zero are required. Firms for which the third consecutive year of poor industry-adjusted performance occurs by fiscal year 2000 are identified as potential sample candidates. (This time restriction is necessary because the analysis presupposes data availability for five years following year zero)[9].

Two final restrictions are imposed on the sample selection process: First, to balance the effects of survivorship bias and the benefits of having a relatively balanced panel dataset, only poorly performing firms that have available governance data for at least two of the five years after year 0 are selected. Also, to limit the possibility that start-up companies, that usually perform poorly early on, dominate the sample, in order to be included in the sample firms are required to be publicly traded for five years prior to the start of the three-year poor performance period. This screening process yields a final sample of 257 firms that are characterized as poor performers and are the focus of this paper. Despite two-digit industry-adjustments in performance, firms from high-growth industries are over-represented, probably due to the variation in growth opportunities across finer industry categories within any one-two-digit SIC code. Firms from chemicals and allied products (SIC 28; 26.8% of the sample), electronics equipment (SIC 37; 14.2%), and business services (SIC 73; 10.7%) account for about half the sample. (In addition to the main tests presented in Sect. 4 of the paper, finer analysis of the research question accounting for the variability in market-to-book ratios and industry affiliation is described in Sect. 5).

All data on corporate governance and ownership come from annual proxy statements filed with the SEC. Financial data are collected from the *Compustat* database, and returns data are collected from CRSP. The main variable of interest is board size, defined as the total number of directors on the proxy statement date. Throughout the empirical tests, the models control for three other dimensions of governance. First, board independence is defined as the fraction of outside directors on the board. (Separately screening out grey directors, defined as the fraction of directors who are not insiders, but have a material fiduciary connection to the firm,

[9] The sampling method used here is similar to Denis and Kruse (1999) who focus on large operating performance declines and track subsequent managerial discipline and corporate restructuring activity across active and less active takeover periods. Unlike this study, Denis and Kruse (1999) focus on operating performance changes for one year, impose a $100 million floor on asset value, and control for industry performance at the three-digit SIC.

does not meaningfully affect the study's main results)[10]. Total board activity is defined as the sum of board and committee meetings where board meetings is the number of meetings held by the board in a year and total committee meetings is the sum of all meetings by standing committees of the board in a year [e.g., Klein (1998); and Vafeas (1999)]. Unlike prior research, by using a composite board and committee meeting measure, this paper attempts to account for the fact a certain portion of a board's activity is delegated. Thus, many board meetings simply rubber-stamp decisions that were made at the board committee level.[11] Last, insider ownership is the fraction of common stock owned by officers and directors as a group.

Table 1 presents descriptive information on the board characteristics (panel A) and financial data (panel B) of the 257 sample firms. Detailed definitions of each of the governance and financial variables used in my analysis is also presented in Table 1 and, where appropriate, in the subsequent tables. By sample construction, almost all sample firms survive through the second year after the crisis, while there is a steady decline in the number of surviving firms in the following three years, down to 138 firms by year +5. (It is important to note that most of the decline in sample size from 200 firms in year +4 to 138 firms in year +5 is due to the unavailability of more recent data for several firms being characterized as poor performers in year 2000; i.e., firms for which no data for year +5 were yet available at the time the study was carried out). In general, there appears to be stickiness in the board characteristics in time; i.e., there are few noteworthy changes. Notably, in year 0 the average board of firms in this sample is only about half the size of boards of firms studied in Yermack (6.33 vs. 12.25 directors). The first and third quartile board sizes, not tabulated, are seven and five, respectively. Thus, there is reason to believe these boards are not susceptible to the types of problems larger boards face, such as inefficiencies and process losses.

The fact board size does not increase, on average, for these firms, is not necessarily in conflict with the notion poor performers could benefit by increasing board size. One possibility is that some sample firms want to expand board size but cannot attract new directors because of their financial difficulties. Further, some managers may simply be unwilling to relinquish control by expanding, and thus strengthening the board of directors. Conversely, it could be that heterogeneity among sample firms explains part of the stickiness in board sizes. That is, board size increases may not be uniformly beneficial for the sample firms.

Among the controls, sample firm boards have fewer committees, and a lower fraction of outside directors, but greater ownership concentration compared to larger financially healthy firms. Their boards and committees meet less frequently, and their directors hold fewer outside board seats.[12] By year 5 there is a significant

[10] Somewhat differentiated from the conventional view that more outside directors are better, recent theoretical work by Raheja (2005) and Harris and Raviv (2008) shows there are tradeoffs in determining the proper mix between inside and outside directors on a board.

[11] Although there is not a one-to-one correspondence between board and committee meetings, separating the two measures does not alter in any way the results on board size in the tests presented throughout this paper.

[12] See Yermack (2004) for evidence on the importance of director incentive compensation, and Ferris et al. (2003) and Perry and Peyer (2005) on the importance of board seats.

Table 1 Descriptive statistics for 257 firms experiencing poor operating performance in three consecutive years ending between 1996 and 2000

Years	Year 0	+1	+2	+3	+4	+5	Year 3 vs. 0	Year 5 vs. 0
Panel A-Board and ownership data								
Sample size	257	257	254	218	200	138		
Board size	6.335	6.304	6.327	6.294	6.335	6.471	−0.25	0.68
Total no. of committees	2.354	2.400	2.465	2.500	2.700	2.739	1.57	3.60***
Pct. inside directors	0.329	0.328	0.316	0.286	0.277	0.276	−2.44**	−2.63***
Pct. independent directors	0.519	0.528	0.552	0.582	0.593	0.607	2.99***	3.66***
Pct. Grey directors	0.152	0.144	0.132	0.130	0.128	0.118	−1.43	−1.95*
Board meetings	5.961	6.027	5.877	6.032	5.965	6.188	0.22	0.66
Total committee meetings	3.938	4.093	4.161	4.651	5.665	6.775	2.05**	6.16***
Total board activity	9.910	10.137	10.055	10.108	11.648	12.964	1.47	4.52***
Total insider ownership	0.248	0.241	0.244	0.249	0.229	0.211	0.07	−1.83*
Outside director ownership	0.025	0.026	0.036	0.061	0.037	0.028	1.57	0.37
Director incentive plan	0.755	0.773	0.787	0.794	0.795	0.833	1.00	1.80*
Total no. of committees	2.354	2.400	2.465	2.500	2.700	2.739	1.57	3.62***
Average directorships held	1.025	1.064	1.101	1.140	1.065	1.054	1.18	0.25
Pct. directors with >3 seats	0.146	0.165	0.165	0.179	0.154	0.139	1.62	−0.30

	Year 0	+1	+2	+3	+4	+5
Panel B-Financial data						
Sales (in $millions)	45.775	50.674	50.436	54.765	78.992	62.725
	13.065	13.608	15.178	14.929	15.568	15.725
Total liabilities/total assets	0.557	0.578	0.652	0.588	0.548	0.487
	0.371	0.352	0.391	0.392	0.368	0.305
Market-to-book ratio	4.808	8.075	33.27	8.428	25.66	3.389
	2.413	2.227	2.393	2.229	1.838	2.054
Pct. firms paying dividends	0.005	0.010	0.009	0.010	0.010	0.011
	0.000	0.000	0.000	0.000	0.000	0.000
Net income/assets	−0.421	−0.449	−0.716	−0.511	−0.940	−2.050
	−0.164	−0.144	−0.145	−0.112	−0.162	−0.188
Operating income/assets	−0.324	−0.383	−0.663	−0.430	−0.916	−2.128
	−0.091	−0.074	−0.072	−0.075	−0.122	−0.190
Raw stock return during the fiscal year	0.251	0.342	0.045	0.195	0.102	0.277
	−0.078	0.015	−0.202	−0.076	−0.127	−0.052

Table 1 continued

	Year 0	+1	+2	+3	+4	+5
Market-adjusted return during the fiscal year	0.034	0.111	−0.054	0.111	0.127	0.235
	−0.252	−0.207	−0.320	−0.174	−0.083	0.001

Sample firms were ranked in the bottom quintile in industry-adjusted operating performance among all Compustat firms for three consecutive years. Operating performance is measured as operating income before depreciation (Compustat item #13) divided by total assets (#6). Board size is the total number of directors on the proxy statement date. Total number of committees is the number of standing board committees as disclosed in the proxy statement. Pct. inside directors is the fraction of board members who are firm employees, relatives of employees, or directors employed by the firm within the past three years. Pct. grey directors is the fraction of board members who have a fiduciary business relation to the firm as disclosed in the proxy statement. Pct. independent directors are non-executive directors who do not have a fiduciary relation to the firm. Year 0 is the third consecutive year of poor operating performance. Board (committee) meetings is the number (sum) of board (standing committee) meetings in a year. Total board activity is the sum of board and committee meetings during a year. Insider (outside director) ownership is the fraction of common stock owned by officers and directors (by independent and grey directors) as a group. Director incentive plan is set to one if the firm has adopted a plan granting equity-based incentives to outside directors, and zero otherwise. Average directorships held is the average number of additional board seats held by a non-executive member of the board. Percent directors with more than three seats is the fraction of the firm's outside directors holding more than three other outside directorships. Mean variable values are presented in panel A. The right hand columns in panel A report *t*-statistics for the differences in variable values between year +3 and year +5 with year 0, respectively. In panel B, mean (median) variable values are presented in the top (bottom) row

*,**,*** Significant at $P < 0.10$, 0.05, and 0.01, respectively

Item Compustat numbers are in parentheses. Sales comprise total gross sales minus discounts returns and allowances for the year (#12). Total liabilities comprise long-term debt plus current liabilities (#181). Market to book ratio equals closing stock price at fiscal year end (#199) times common shares outstanding (#25), plus total liabilities (#181), all divided by total assets (#6). Pct. firms paying dividends is the fraction of firms for which there was at least one non-zero ex-dividend day in the fiscal year. Ex-dividend data are based on item #26. Net income (loss) is the difference between all revenues and expenses for the year (#172). Operating income (#13) is calculated before subtracting depreciation expense. Raw return is the firm's stock return during the fiscal year. Market-adjusted return is the difference between raw return and the return of the equally weighted market index during the fiscal year

decrease in the fraction of insider and grey directors serving on these boards, and an increase in the number and meeting frequency of their committees. Further untabulated test results showed these effects are not the byproduct of a survivorship bias, but persist when the tests isolate and trace the characteristics of the 138 surviving firms only. Also, changes in total committee activity primarily spring from the increased meeting frequency of audit committees, probably because of more stringent stock exchange regulations, and of the more frequent use of nominating committees among the sample firms in the later years.

The descriptive statistics in panel B suggest these firms are quite small based on sales volume, are highly levered financially, and rarely pay dividends. In year 0, the third poor performance year upon which the sample selection was made, the median sample firm had asset-adjusted net income of −16.4%, operating income of −9.1%, raw stock return of −7.8%, and market-adjusted stock return of −25.8%. Notably, market-to-book ratios tend to be high, on balance, and vary greatly, reflecting the market's uncertain assessment about these firms surviving in the long run. Although

the sample design attempted to exclude start-ups, the high average market-to-book values observed among firms may reflect the fact this sample includes, in addition to many poorly performing firms that are deemed unfavorably by the market, firms with poor operating performance and high growth prospects, that are highly regarded by the market despite their poor operating results. Finally, the median firm in the sample continues to exhibit negative operating and negative market-adjusted stock performance throughout the sample period, notwithstanding sharp variation across firms and a small performance recovery in the later years.

4 Results

Baseline regressions are initially estimated linking market-to-book ratios to board characteristics and control variables. The expectation is that for this sample, firms with relatively larger boards are valued more highly by the market. The model is estimated twice to explain the between- and within-firm variation in market values. The results are presented in Table 2. In both estimations, observations in the upper 2% of the market-to-book variable distribution are set at the 98th percentile value to tone down the effect of outliers. Estimating the model on the unadjusted market-to-book ratio produces somewhat weaker results that are interpreted in a similar spirit. First, the model addresses the role of board size in explaining the variation in market-to-book ratios across firms. To this end, the mean variable values are used for each firm over the sample period; one observation per firm in the regression. Notably, there is a positive relation between firm value and board size ($t = 2.92$; $P < 0.01$), a finding suggesting that for this sample larger boards are value-enhancing, not value-destroying. Firms with larger boards have higher market values.

This model is also estimated for each of the 6 years with firm data available separately. In four out of the six years the relation between board size and firm value was found to be positive and statistically significant at $P < 0.05$, positive and significant at $P < 0.10$ in one year, and positive but not significant in the last year. Among the control variables, board outsiders are insignificant, while firms with greater board activity are also valued more highly by the market ($t = 3.03$). (The tests were also repeated after breaking board activity down into separate board and committee meeting figures. The positive relation stems from committee activity, suggesting firms with more active board committees are associated with greater market values). Insider ownership is unrelated to market value, possibly because most firms in this sample are closely held (average inside ownership in year 0 is 24.8%), and there is little variation in ownership structure and resulting incentives to manager-owners. Among the remaining control variables, market-to-book ratios are positively related to the degree of financial leverage, and negatively related to firm size, proxied by logged sales.

To address the role of board size in explaining the within-firm variation in market values, a fixed effects model is estimated. This model addresses more directly the problem of endogeneity outlined earlier by using different intercepts for each firm and each year. In contrast to earlier findings, board size is insignificant in this model. This suggests board size has no power in explaining the variation in market

Table 2 The relation between market-to-book ratios and board characteristics for firms reporting poor operating results for three consecutive years

Variable name	Between-firm variation	Within-firm variation
Intercept	2.134**	1.902
	(2.18)	(0.64)
Board size	0.383***	(−0.09)
	(2.92)	−0.012
Pct. outside directors	1.312	0.295
	(1.19)	(0.25)
Total board activity	0.136***	−0.019
	(3.03)	(−0.58)
Log (Insider ownership)	−0.056	0.010
	(−0.23)	(0.04)
Capital expenditures/	−2.502	1.716
Total assets	(−0.62)	(0.94)
Total liabilities/total assets	0.828***	1.667***
	(2.67)	(5.79)
Log (sales)	−1.292***	−0.560***
	(−10.78)	(−3.37)
Firm effects		Yes
Time effects		Yes
Adjusted R^2 (%)	37.8	65.7
F-test	22.92***	6.60***
Sample size	253	1,191

Sample firms were ranked in the bottom quintile in industry-adjusted operating performance among all Compustat firms for three consecutive years. Item Compustat numbers are in parentheses. Operating performance is measured as operating income before depreciation (#13) divided by total assets (#6). The dependent variable is the market-to-book ratio defined as closing stock price at fiscal year end (#199) times common shares outstanding (#25), plus total liabilities (#181), all divided by total assets (#6). Board size is the total number of directors on the proxy statement date. Outside directors comprise corporate directors who were not firm employees or relatives of employees, and who were not employed by the firm in the previous three years. Total board activity is the sum of board and committee meetings during a year. Insider ownership is the fraction of common stock owned by officers and directors as a group. Capital expenditures is the total of cash outflows on property plant and equipment (#128) divided by total assets (#6). Leverage is defined as long-term debt plus current liabilities (#181) divided by total assets (#6). Sales comprise total gross sales minus discounts returns and allowances for the year (#12). Year 0 is the third consecutive year of poor operating performance. The between-firms model uses the average from year 0 to year +5 for each variable (one observation per firm) to explain the variation in market-to-book ratios across firms. *t*-statistics for this model are computed using robust standard errors. The within-firm model is a generalized likelihood model using firm and year fixed effects to examine the variation in market-to-book ratios for each firm in time

*,**,*** Significant at $P < 0.10$, 0.05, and 0.01, respectively

values for any one firm in time. Nevertheless, this approach is also not immune to criticism because it usually reduces the statistical power of the tests given that board sizes exhibit little intertemporal variation (e.g., see Coles et al. 2003, for a critique of this approach). The fixed effects regression lacks power because it relies purely

on within-firm variation to identify the relation between board size and firm performance and ignores factors such as managerial ability that may vary in the cross-section and do not vary much through time.[13] In sum, between-firms results suggest that cross-sectional differences in market values are discernibly explained by differences in board sizes across firms. At a minimum, the results in Table 2 are consistent with Adams and Mehran (2005) who also fail to find a negative relation between board size and firm value. Given that no single empirical approach is immune to problems, putting the data in this paper through a series of additional tests using alternative empirical approaches sheds further light on the issue under study.

One complementary approach is to study how changes in corporate governance measures are related to changes in firm values, essentially using each firm as its own control at a different point in time. The intuition behind this approach is that it is much less likely for any omitted correlated variable to vary intertemporally for a single firm than it is for such a variable to vary across firms at a single point in time. One additional advantage of this approach is that stock returns are not affected by the accounting book value denominators used in computing market-to-book ratios, which are inevitably depressed following operating losses and may have influenced the results in Table 2.

Accordingly, in two separate regressions, the tests proceed by relating the stock returns of the sample firms cumulated over three and five years after year zero to board characteristics. The three- and five-year return is regressed on corresponding three- and five-year changes in board characteristics. The return accumulation period starts at the end of year 0. Thus, each firm is only used once in the sample. The results are presented in Table 3.

Consistent with results from between-firms tests in Table 2, three- and five-year changes in board size are positive and statistically significant in explaining corresponding stock returns. Thus, firms that increase their boards during the sample period, appear to recover faster in the stock market than firms maintaining smaller boards, or those decreasing their boards. This finding reinforces the notion that a greater knowledge base upon which to draw helps boards to cope with problems more successfully. Among the controls, larger firms, as proxied by logged sales, experience lower returns than the rest.[14]

To probe further into the relation between board size and stock market performance, an event-study is executed assessing how the market reacts to announced changes in board size. Prior research by Shivdasani and Yermack (1999) and Fich and Shivdasani (2006), focusing on large public firms finds that director changes are often announced prior to the proxy filing date. However, in the sample used in this paper firms are very small, and do not publicly announce their director

[13] Another approach that has been used in the literature to address endogeneity is to model these relations in systems of equations. This approach is also unlikely to provide adequate remedy for this problem because it is very difficult to definitively eliminate the risk of firm-specific omitted correlated variables in the cross-sectional equations.

[14] The tests in Table 3 were repeated using market-adjusted return as the dependent variable, with substantially similar results. In further tests, board size is found to be positively, albeit weakly, related to one-year changes in accounting return on assets, and unrelated to long-term accounting performance.

Table 3 The relation between board characteristics and raw returns cumulated over three and five years following the period of poor operating performance

Explanatory variables	Three-year return (2)	Five-year return (3)
Intercept	0.892***	1.838***
	(3.03)	(3.09)
Change in board size	0.227***	0.257**
	(2.77)	(1.91)
Change in pct. of outside directors	0.499	−1.773
	(0.69)	(−1.30)
Total board activity	−0.002	0.009
	(−0.34)	(1.23)
Change in pct. inside ownership	−1.180	−1.873
	(−1.10)	(−1.13)
Market to book	0.001	0.003
	(0.09)	(0.06)
Log (sales)	−0.153**	−0.432***
	(−2.24)	(−3.08)
F-value	2.50**	2.07*
Adjusted R^2 (%)	4.4	5.5
Sample size	198	138

Sample firms were ranked in the bottom quintile in industry-adjusted operating performance among all Compustat firms for three consecutive years. Operating performance was measured as operating income before depreciation (Compustat #13) divided by total assets (Compustat #6). The dependent variable is raw return cumulated over three and five years starting at the end of year 0, respectively. The left-hand model includes firm-year observations for all firms for the five years following year 0. Each firm is included once in the sample. Board size is the total number of directors on the proxy statement date. Outside directors comprise corporate directors who were not firm employees or relatives of employees, and who were not employed by the firm in the previous three years. Total board activity is the sum of board and committee meetings during a year. Insider ownership is the fraction of common stock owned by officers and directors as a group. Leverage is defined as long-term debt plus current liabilities (#181) divided by total assets (#6). Sales comprise total gross sales minus discounts returns and allowances for the year (#12). Year 0 is the third consecutive year of poor operating performance

*,**,*** Significant at $P < 0.10$, 0.05, and 0.01, respectively

appointments and resignations prior to the proxy filing date. Yermack (2004) also uses proxy statement dates to assess the market reaction to perquisite disclosures. One advantage of using proxy statement dates to study the market's assessment of board size changes is that such changes are cumulative in the proxy statement, and are thus more likely to be material, whereas director appointment announcements only capture board size changes gradually, one at a time.[15] Accordingly, the tests assume that the proxy statement electronic filing date is the first date any director

[15] All public announcements concerning each sample firm over the sample period that were published in the Wall Street Journal were identified. The search attempted to ascertain the extent to which director turnover was publicly announced prior to a firm's electronic filing with the SEC, given that director changes could have been impounded on stock prices before the proxy filing date. No announcements of director appointments or departures were identified. The search identified three announcements of CEO appointments and one announcement of a CEO departure over this period.

turnover is formally announced and the date on which related information is impounded on stock prices. It is important to note that to the extent additional value-relevant information is included in the proxy statement, the related noise will make the value-relevance of board changes more difficult to discern, and thus work against identifying the hypothesized effects.

Given that year zero is a reference year used to assess any board changes in year 1, the initial sample comprises firm-year proxy filings from year 1 to year 5. The sample is then reduced by all firm-years for which all board members remained the same as in the previous year, and firm-years without available data on prices from CRSP. The final sample comprises 715 firm-year observations for which there was at least one director change compared to the previous year. The sample is then divided into three sub-samples; 151 observations where the board increased in size compared to the previous year; 425 observations where some directors were replaced but the board remained the same in size; and 139 observations where board size was reduced compared to the previous year.

Event-study results are presented in panel A of Table 4. First, there appears to be a positive and statistically significant stock market reaction in the three day period surrounding an announced increase in board size ($n = 107$; AR = 1.60%; $t = 2.05$). Somewhat oddly, this springs from increases in board size by one director. One possibility may be that increases by more directors ($n = 44$) signify other structural changes in firms that are unrelated to boards per se, but may convey information about other control issues. This general finding reinforces earlier results from Tables 2 and 3 on increases in board size being valued positively by investors in smaller firms.[16] (Prior research by Fich (2005) finds no relation between the market's assessment of a director appointment and board size. However, the average firm in that sample has an average (median) board comprising 12.02 (11) directors; also much larger than the average board in this sample)[17].

Results also suggest that the market does not respond in a statistically meaningful way to director changes that maintain board size. Finally, in line with earlier evidence, board size decreases by more than one director elicit a significantly negative stock market response (CAR = −4.04%; $t = -2.22$).

Next, in panel B of Table 4 the tests attempt to explain the stock market reaction to director turnover. The three-day market-adjusted return surrounding the proxy statement filing date is the dependent variable in each case. The model is estimated three times; for all board changes together, and for board increases and board decreases separately. Of the 715 observations examined in panel A, 684 have available data on all control variables and are considered in panel B. The results from the full sample suggest the greater the increase in board size, the greater the stock market response. This result appears to be driven by a) the fact director increases by one dominate director increases by more than one, in both frequency

[16] Yermack (1996) finds negative returns for 6 large board size increases and positive returns for 4 large board size decreases. Differences in results between this study and Yermack (1996), beyond sample size differences, most likely result from the larger board sizes in the Yermack sample.

[17] DeFond et al. (2005) find that the market reaction to director appointments to the board also depends on a director's accounting financial expertise. Also, Agrawal and Knoeber (2001) find that certain firms benefit from the employment of politically useful directors.

Table 4 The market reaction to changes in board size for a sample of poorly performing firms

	Sample size	Abnormal return (−1, +1) around proxy filing w/SEC (%)	*t*-statistic
Panel A: Mean cumulative abnormal returns			
All board increases	151	1.60	2.05**
Board increases by one	107	3.01	3.06***
Board increases by more than one	44	−1.82	−1.71*
Director turnover w/no change in board size	425	0.22	0.44
All board decreases	139	−0.04	−0.51
Board decreases by one	105	0.69	0.67
Board decreases by more than one	34	−4.04	−2.22**

Variable name	Model 1 All board changes	Model 2 Board increases	Model 3 Board decreases
Panel B: OLS regression analysis of cumulative abnormal returns			
Intercept	0.007	0.082**	0.003
	(0.52)	(2.43)	(0.09)
Change in board size	0.007*	−0.025***	0.027*
	(1.82)	(−2.59)	(1.88)
Change in pct. of outside directors	0.079**	0.065	0.106*
	(2.48)	(1.25)	(1.61)
Total board activity	0.0005	−0.001	0.003
	(0.58)	(−0.80)	(1.24)
Log (inside ownership)	−0.001	−0.004	−0.002
	(−0.26)	(−0.48)	(−0.22)
Log (market value of equity)	−0.004	−0.007	−0.001
	(−1.13)	(−1.24)	(−0.17)
Market-to-book ratio	0.0009	0.0003	−0.0006
	(1.12)	(0.25)	(−0.28)
F-value	1.54	1.26	1.53
Adjusted R^2 (%)	0.5	1.1	2.4
Sample size	684	145	133

The market reaction to a change in board size is the cumulative market-adjusted return in the three-day period surrounding the firm's electronic proxy statement filing with the SEC. Board size is the total number of directors on the proxy statement date. Outside directors comprise corporate directors who were not firm employees or relatives of employees, and who were not employed by the firm in the previous three years. Total board activity is the sum of board and committee meetings during a year. Insider ownership is the fraction of common stock owned by officers and directors as a group. Equity capitalization, defined as closing price at fiscal year end times common shares outstanding (#199 * #25) is log-transformed in the model. The market-to-book ratio is defined as closing stock price at fiscal year end (#199) times common shares outstanding (#25), plus total liabilities (#181), all divided by total assets (#6). The tests only consider firm years with at least one director change, partitioned into three subsamples: more directors join the board than those leaving (a board increase); an equal, but non-zero number of directors leaving and joining (no change in board size); and a greater number of directors leaving than those joining (a board decrease). *t*-statistics for the regressions are computed using robust standard errors

*,**,*** Significant at $P < 0.10$, 0.05, and 0.01, respectively

and economic import; and b) the fact that board decreases by more than one are clearly assessed more negatively by the market than smaller board decreases. Finally, in the full sample model, increases in the fraction of outside directors on the board are associated with a more favorable market response to board turnover. In contrast, notwithstanding the overall result, but consistent with the results from panel A, the regressions in panel B suggest the market penalizes greater board size increases and decreases. In sum, the results presented in Tables 2, 3, and 4 mostly suggest that greater board size is related to more favorable share price performance.

5 Further tests

5.1 Survivorship bias

One concern about the sampling method used here is survivorship bias: some sample firms underperformed their industry for three years (enough to be included in the sample), and failed thereafter, either going bankrupt or otherwise becoming eliminated. It is not clear whether the results for these firms are different compared to results for chronic underperformers lasting the full five years under examination. To address this issue, we re-estimated the between-firms model from Table 2, interacting the board size and control governance variables with a survivorship bias dummy. This dummy is set to one for the 48 firms becoming eliminated from the sample within three years from the base year, and zero otherwise. The results, presented in Table 5 of the paper, do not reveal a significant difference in the relation between board size and market value across the two groups of firms. The sample of firms being eliminated is relatively small, and the separate estimation of

Table 5 Further tests of the relation between market-to-book ratios and board characteristics testing for the effects of survivorship bias and industry bias on the results

Variable name	Survivorship bias	Industry bias
Intercept	2.534**	3.296***
	(2.41)	(3.38)
Board size	0.440***	0.471***
	(2.84)	(3.31)
Pct. outside directors	0.304	0.723
	(0.25)	(0.51)
Total board activity	0.090*	0.111**
	(1.81)	(2.34)
Log (insider ownership)	−0.289	0.390
	(−0.88)	(1.06)
Capital expenditures	−4.748	−4.123
	(−1.22)	(−1.17)
Total liabilities	1.020***	0.948***
	(2.97)	(3.41)

Table 5 continued

Variable name	Survivorship bias	Industry bias
Log (sales)	−1.236***	−1.007***
	(−9.95)	(−8.81)
Board size * bias	−0.263	−0.388**
	(−1.21)	(−2.19)
Pct. outside directors * bias	2.447	−0.260
	(0.87)	(−0.14)
Total board activity * bias	0.076	−0.031
	(0.39)	(−0.25)
Log (insider ownership) * bias	0.496	−0.322
	(0.79)	(−0.64)
Adjusted R^2 (%)	35.0	41.6
F-test	13.03***	17.14***
Sample size	247	250

Sample firms were ranked in the bottom quintile in industry-adjusted operating performance among all Compustat firms for three consecutive years. Item Compustat numbers are in parentheses. Operating performance is measured as operating income before depreciation (#13) divided by total assets (#6). The dependent variable is the market-to-book ratio defined as closing stock price at fiscal year end (#199) times common shares outstanding (#25), plus total liabilities (#181), all divided by total assets (#6). Board size is the total number of directors on the proxy statement date. Outside directors comprise corporate directors who were not firm employees or relatives of employees, and who were not employed by the firm in the previous three years. Total board activity is the sum of board and committee meetings during a year. Insider ownership is the fraction of common stock owned by officers and directors as a group. Capital expenditures is the total of cash outflows on property plant and equipment (#128) divided by total assets (#6). Total liabilities are defined as long-term debt plus current liabilities (#181) divided by total assets (#6). Sales comprise total gross sales minus discounts returns and allowances for the year (#12). Year 0 is the third consecutive year of poor operating performance. In the "Survivorship bias" model, bias is set to one for firms becoming eliminated from the sample for whatever reason within three years after base year 0, and zero otherwise. In the "Industry bias" model, bias is set to one for firms with market-to-book ratios above the sample median in base year 0, and zero otherwise. The survivorship bias (industry bias) model uses the average from year 0 to year +3 (+5) for each variable (one observation per firm) to explain the variation in market-to-book ratios across firms. *t*-statistics are computed using robust standard errors

*,**,*** Significant at $P < 0.10$, 0.05, and 0.01, respectively

the model for these firms is not appropriate. However, we also find a positive pairwise correlation between market-to-book ratio and board size for these firms separately (Pearson $r = 0.23$; Spearman rho $= 0.32$; both P-values < 0.04).

Another dimension of survivorship bias that is endemic to the research design concerns the fact companies had to under-perform for three years to be included in this sample. By sample construction, firms which underperformed for one or two years and then recovered were eliminated from the sample. This route is chosen in this paper because the costs of including one- or two-year underperformers in the sample were deemed higher. First, there would be a lot more noise in a sample comprising, say, one-year underperformers, that are much greater in number. Short-term underperformance is often the result of a one-time event trickling down to the income statement, and not of chronic managerial failures, which are the study's

primary aim. Also, accounting underperformance in any one year may be the result of the well-documented transitory component of earnings, possibly due to earnings management, comprising a temporary and reversible shift in accruals levels. Earnings management is a much lesser problem over the three-year performance assessment window used here.

5.2 Industry bias

The use of two-digit industry codes to control for firm performance ensures a relatively large sample of industry peers against whom to compare a firm's performance. However, this treatment may misrepresent finer industry categories given heterogeneity within the relatively broad two-digit codes, as evidenced by the clustering of sample firms in SICs 28, 37, and 73. The danger from this clustering is that a high proportion of high growth firms, that have high market values despite their poor earnings, are better able to attract outside directors. Firms whose earnings and market values are both depressed may lose directors as a result.

We probe into this issue by splitting the sample firms into two groups according to their median market-to-book ratio on year zero, separating "low growth" firms from all others. Similar to the survivorship bias tests above, we re-estimate the between-firms model from Table 2 after including variables that interact the low growth dummy with the board size and governance control variables. The rationale behind this test is to explore whether the relation between board size and market value is different depending on market values in year zero. The results are also presented in Table 5. Both board size and board activity are positively correlated with market-to-book ratios. Most importantly, the relation between board size and market value is considerably weaker among low growth firms ($t = -2.17$; $P < 0.05$). Separately estimating the model for firms with low market values in year zero produces an insignificant board size coefficient. This finding is consistent with the notion that larger board size is associated with greater firm value for poor performers with good growth prospects, compared to firms with poorer growth opportunities.

5.3 Direction of causation

The tests in Tables 2 and 5 do not definitively establish the direction of the relation between market values and board sizes. One possibility is that expanding, and thus strengthening the board leads to better share price performance. Another possibility, though, is that poorly performing firms lose directors and are unable to replace them, which would suggest the relation runs the opposite way: poor stock price performance leads to smaller board sizes. Firms performing well in the market (e.g., sample firms valued highly by the market despite poor operating performance) might be able to attract additional directors, such that positive market performance drives future board size increases.

To better address the issue of causality, we initially estimate OLS regressions examining how current year board size changes can be explained by prior year stock returns. The results are presented in Table 6. We find that stock return in year t − 1

Table 6 The association between one-year changes in board size and annual stock returns

Variable name	Dependent variable is change in board size from $t-1$ to t			Dependent variable is annual stock return in year t		
	All firms	High market-to-book	Low market-to-book	All firms	High market-to-book	Low market-to-book
Intercept	−0.014	−0.078	0.108	0.178**	0.287**	0.228**
	(−0.13)	(−0.42)	(0.74)	(2.30)	(2.10)	(2.18)
Change in board size from year $t-1$ to year t				0.038*	−0.016	0.987***
				(1.66)	(−0.48)	(3.00)
Pct. of outside directors $_{t-1}$	−0.249	−0.219	−0.268	0.201*	0.221	0.161
	(−1.55)	(−0.99)	(−1.15)	(1.70)	(1.34)	(0.91)
Total board activity $_{t-1}$	−0.005	−0.006	−0.003	0.001	−0.001	0.001
	(−0.90)	(−0.78)	(−0.30)	(0.02)	(−0.26)	(0.16)
Log (inside ownership) $_{t-1}$	−0.033	−0.038	−0.006	−0.042	−0.049	−0.013
	(−0.90)	(−0.73)	(−0.11)	(−1.50)	(−1.27)	(−0.31)
Log (market value of equity) $_{t-1}$	0.049**	0.068**	0.017	−0.063***	−0.074***	−0.064***
	(2.25)	(2.12)	(0.51)	(−3.97)	(−3.21)	(−2.71)
Market-to-book ratio $_{t-1}$	−0.011	−0.016*	−0.019	−0.006	−0.009	−0.029**
	(−1.52)	(−1.67)	(−0.84)	(−1.25)	(−1.39)	(−2.07)
Raw stock return in year $_{t-1}$	0.095**	0.168***	0.029			
	(2.09)	(2.60)	(0.43)			
F-value	2.81**	3.34***	0.46	4.37***	2.88***	4.34***
Adjusted R^2	1.06%	2.61%	−0.00	1.95%	2.11%	3.92%
Sample size	1,013	525	488	1,016	525	491

Sample firms were ranked in the bottom quintile in industry-adjusted operating performance among all Compustat firms for three consecutive years. Firm-years used here comprise the five years following the third year of poor performance (base year zero). Item Compustat numbers are in parentheses. Board size is the total number of directors on the proxy statement date. Raw return is the firm's annual stock return during the fiscal year. Outside directors comprise corporate directors who were not firm employees or relatives of employees, and who were not employed by the firm in the previous three years. Total board activity is the sum of board and committee meetings during a year. Insider ownership is the fraction of common stock owned by officers and directors as a group. Equity capitalization, defined as closing price at fiscal year end times common shares outstanding (#199 * #25) is log-transformed in the model. The market-to-book ratio is defined as closing stock price at fiscal year end (#199) times common shares outstanding (#25), plus total liabilities (#181), all divided by total assets (#6). The sample is split into high and low market-to-book sub-samples based on the market-to-book ratio median in base year zero

*,**,*** Significant at $P < 0.10$, 0.05, and 0.01, respectively

is positively associated with changes in board size in the current year. This effect stems from the sub-sample of firms with high market-to-book ratios in year 0, and it is consistent with the notion that firms performing well in the market are subsequently able to attract more directors. This effect is not present for firms with low market-to-book ratios. Among the control variables, greater equity capitalization also explains board size increases.

Next, we attempt to examine whether current year stock performance is related to board size changes since the end of the prior year. The results, presented in the three right-hand models of Table 6, are telling. For the full sample of firms there is a weak positive relation between board size increases and share price increases. Most importantly, this effect is highly positive among firms with low market-to-book ratios, consistent with the notion that poor performers stand to benefit from board size increases. This effect is not present for high growth firms. Last, equity capitalization is negatively associated with subsequent returns. Together, the evidence in Table 6 suggests that the board size–firm value relation is complex and may work in both directions. For the sample of firms with small boards studied here, higher share price performance leads to an increase in board size, consistent with good performers attracting more directors. On the other hand, among poor performers, expanding board size appears to be associated with improved stock price performance.

5.4 Financial expertise and committee membership of directors leaving and joining the board

One possibility that has not been addressed thus far in this paper is that, if reasons of financial distress dominate director quality, it is not just the number of directors who leave or join the board that is value-relevant, but also their financial backgrounds (e.g., Karamanou and Vafeas 2005) and the board committees they leave (join). (For a review of the importance of board committees see, for example, Hayes et al. 2004.) Accordingly, for each of the 684 firm-years with some director turnover used in the Table 4 regressions, we separately identified each of the individual directors leaving or joining the board. For each director we coded whether they had any financial expertise classified into two categories: i) experience as a financial executive, such as a CFO, controller, auditor, or treasurer, and/or ii) affiliation with a financial institution. Each director was also coded according to their service in the board's monitoring committees at the time of departure (first year of arrival): the compensation, audit, and nominating committee.

We initially find that there is a balance in the number of directors leaving and joining the board along these dimensions, except for compensation committee members. Out of the 132 compensation committee members departing the firm, only 63 are replaced (the t-statistic for the difference is -5.08; $P < 0.001$).[18] More importantly, we proceed to examine whether the market reaction to the board size change, as presented in the Table 4 models, is also related to the number of financial experts leaving or joining the board, or the number of directors leaving or joining each of the three monitoring committees, both separately and cumulatively. Results on these variables are generally insignificant, except that the number of departures from the audit committee is weakly negatively associated with the market reaction at $P < 0.10$. The board size effects remain. In all, the evidence from these

[18] A total of 95 (93) directors join (leave) the audit committee and 23 (30) directors join (leave) the nominating committee. Also, 43 (56) members of financial institutions join (leave) the board, and 40 (43) other financial executives join (leave) the board. These differences are statistically insignificant.

refinements does not convincingly suggest these finer director attributes drive the results on board size. For brevity, these results are not tabulated in this paper.

6 Conclusions

This study has presented evidence that increasing board size accrued benefits to a sample of smaller firms with chronically poor operating performance. This evidence came first from cross-sectional comparisons linking board size to firm value, and then from tests linking changes in board size to annual stock returns. Event study results reinforced this evidence, suggesting board size increases elicited a favorable market response while large board size decreases elicited an unfavorable stock market response for firms facing financial difficulties.

Endogeneity is an endemic concern in this line of work. Because of this, the positive association between market-to-book ratios and board sizes could be subject to alternative interpretations if unobserved firm characteristics are correlated with both board size and market values. However, the study has carried out additional tests focusing on changes in board sizes and stock returns. Tests on variable changes account for this issue if the unobserved characteristics that drive both market values and board sizes vary across firms but are not significantly different for any one firm from one year to the next. The results from these tests (i.e., event study tests in Table 4 and association tests in Tables 3 and 6) provide some comfort on this issue.

It should be noted that the positive relation between board size and firm performance documented here does not necessarily suggest that poorly performing firms uniformly had sub-optimal board sizes before the poor performance period. In line with recent evidence (e.g., Boone et al. 2007), it could be that board size is determined at each phase of a firm's lifecycle, at least in part, by weighing the related costs and benefits. When performance deteriorated, the incremental cost of expanding board size may have been outweighed by the heightened input and monitoring that could be provided by the appointment of additional directors to the board. Poor performers responding by appointing more directors to their boards experienced share price appreciation.

Together, the results of this study are useful because they add further balance to the literature regarding the performance effects of board size. While the disadvantages of large boards, such as those maintained by large Fortune 500 firms, have been previously well documented, this study presents additional evidence corroborating the positive performance effects of expanding board size when boards are substantially smaller. These results are consistent with the notion that the relation between board size and firm performance is non-monotonic; positive when adding directors to very small boards, and negative as boards grow beyond a certain point. My results are also in agreement with the suggestions of Lipton and Lorsch (1992) and Jensen (1993) who advocate that there exists an optimal board size range.

One should be mindful of the fact this paper studies smaller firms, a by-product of the negative relation between extremely low operating performance and firm size. Nevertheless, there are two advantages to studying such firms. First, smaller firms typically have smaller boards, which allows a more direct analysis of the benefits

and costs of board size changes at the lower end of the range. Second, most financial research is typically carried out on larger firms even though the bulk of public firms are quite small. The collective capitalization of smaller public firms in the US markets suggests the boards of smaller firms are also worth studying separately. Still, one should be cautious in interpreting these results that may not be generalizable to larger firms.

It is recognizably risky to draw definitive policy recommendations from any empirical study linking changes in board size and firm performance, and to mandate board size restrictions across the spectrum of publicly traded firms. Nevertheless, the evidence presented here indicates that policy makers should pay particular attention to the board sizes that younger, smaller, and typically financially troubled firms are required to maintain.

Recent work has shown that a statistically significant portion of the variation in board sizes is explained by systematic factors in a manner that is consistent with economic efficiency. Importantly, the results found in this study are not in conflict, but rather complement prior evidence. This study's results suggest that for smaller and financially troubled firms, changes in board size may also explain a discernible degree of variation in share price performance.

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