

Boards and Bonds

January 22, 2002

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We would like to thank Anup Agrawal, John Bizjak, Augustine Duru, Walter Enders, Scott Lee, Mike Lemmon, Michel Robe, Leigh Riddick, Pat Rudolph, and seminar participants at American University, and the University of Alabama for their helpful suggestions. Both Anderson and Reeb would like to acknowledge support they received as Kogod Endowed Faculty Fellows. All remaining errors are the sole responsibility of the authors.

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Abstract

Although boards of directors act on the behalf of shareholders, bondholders can also benefit from board activity that limits managerial opportunism. Based on this notion, we investigate the cross-sectional relation between board of director composition and the cost of debt financing for a sample of 252 large industrial firms from 1993 to 1998. Consistent with the hypothesis that independent directors are effective monitors of firm management, we find that independent boards are associated with a lower cost of debt financing (about 35.9 basis points). Additionally, we find that board size is negatively related to corporate debt yield spreads (about 59.9 basis points), suggesting that bondholders view larger boards as more effective monitors than smaller boards. In further testing, we examine the impact of independent director experience, ownership, and tenure on the cost of debt. The results suggest that the primary concern of bondholders is board size and independence rather than director expertise. Overall, the results are consistent with the idea that board composition is an important factor in the cost of debt financing, suggesting that debt claimants view boards as an important monitoring mechanism.

JEL Classification: G32, G34

Key Words: Board Independence, Board Size, Corporate Governance, Cost of Debt

A firm's board of directors is responsible for monitoring and evaluating senior management. Central to the board's effectiveness is the question of board structure or composition (Hermalin and Weisbach (1991)). Inside directors provide firm and project specific knowledge that assists the board in understanding the detailed aspects of the firm's business. In contrast, independent directors contribute expertise and objectivity that ostensibly mitigates managerial entrenchment and expropriation of firm resources. The governance literature generally suggests that as boards become increasingly independent of managers, their monitoring effectiveness increases thereby decreasing managerial opportunism and enhancing firm performance.

Empirical studies however, fail to find any relation between board independence and firm performance (Hermalin and Weisbach (2001)). Bhagat and Black (2000) argue that because independent directors are often "lapdogs" rather than "watchdogs" of management, board structure has little impact on shareholder value. Monks and Minow (1995) suggest that independent directors are indebted to management for their nomination and compensation and are therefore, unwilling or unable to provide effective oversight. Hermalin and Weisbach (1991,1998) observe however, that the absence of a relation between board structure and firm performance is possibly due to imprecise measures of performance (e.g., Tobin's Q) or because performance and board composition are interdependent (endogeneity). In general, prior empirical research indicates that board independence has little, if any, cross-sectional relation to shareholder value.

We examine the relation between board structure and firm performance from an alternative perspective; that of corporate creditors or bondholders.¹ Based on the notion that independent directors are superior monitors of management, we argue that bondholders' view board independence as an important governance mechanism. Blair and Stout (2001) suggest that a variety

¹ The board of directors has a legal responsibility to serve shareholder interest by monitoring managerial decision-making and mitigating managerial opportunism. As such, we do not argue that boards explicitly act to protect bondholders interests. Instead, we argue that bondholders can also benefit from board activity that protects shareholder interests. For example, board activity that limits value reducing empire building or excessive perquisite consumption can increase shareholder cash flows and thereby reduce the probability of default. In this context, because the yield-to-maturity is well defined (relative to Tobin's Q) we posit that the cost of debt can provide a powerful market-based test of relative board effectiveness.

of groups benefit from boards actively monitoring managerial actions. More specifically, Kalay (1982) notes that debtholders show great concern with monitoring managerial activity, demonstrated by the use of costly debt covenants. However, because covenants are expensive to enforce and maintain, bond prices command premiums in situations where managerial decision-making is difficult to observe (Smith and Warner (1979)). Berlin and Loeys (1988) show that using external or delegated monitors can potentially offset weaknesses in bond covenants. Since bondholders bear significant default risk, we argue they have a strong concern with managerial opportunism, and anticipate that yield spreads exhibit a negative relation with board independence.

We also examine the relation between board size and the cost of debt financing. Because larger boards potentially increase the level of managerial monitoring, we expect debt yields to decrease as board size increases. However, Lipton and Lorsch (1992) and Jensen (1993) argue that big boards are unwieldy and more formal in their activities, suggesting that firm performance is negatively related to board size. Yermack (1996) notes that board size has two competing effects: the greater monitoring of big boards versus the more rigid decision-making of this larger group. We posit that the monitoring function is more important to creditors due to their short investment horizons and well-defined payouts. As such, we expect to find a negative relation between board size and the cost of debt financing.

Using a sample of 252 industrial firms from the Lehman Brothers Fixed Income database and the S&P 500, we find that board independence is associated with a lower cost of debt financing. After controlling for industry and firm specific attributes, our analysis indicates that firms with independent boards (75 percent independent directors) versus inside boards (25 percent independent directors) have significantly lower debt costs (about 35.9 basis points). The results are robust to various measures of board independence, endogeneity, and are both economically and statistically significant. Overall, our analysis suggests that bondholders view board composition as an important element in the pricing of the firm's debt.

Consistent with our prediction that larger boards provide better monitoring of managerial actions, we find a negative relation between board size and the cost of debt financing. Specifically, we find that firms with large boards (top quartile), relative to firms with small boards (bottom quartile), have about a 59.9 basis point lower cost of debt financing. Again, the results are robust to various measures of board size and are both statistically and economically significant.

In further analysis, we investigate the relation between independent director attributes and debt yields. Our results indicate that employment characteristics (executive, retired, academic, etc.), while all significantly related to lower debt costs, are not substantively different from one another.² The investigation also suggests that director equity ownership is not related to the cost of debt financing. Finally, we find that both affiliated and inside directors are associated with greater debt costs (relative to independent directors). This suggests that simple dichotomizations of boards into insiders and outsiders (affiliated plus independents) is problematic.³ Instead, our analysis indicates that bondholders' are concerned with independent director monitoring, rather than just having non-insiders on the board.

This research contributes to the literature in several important ways. First, our analysis provides empirical evidence that board independence and board size influence the cost of debt financing. We interpret this to suggest that bondholders are concerned with governance mechanisms used by shareholders that limit managerial opportunism. Second, we provide cross-sectional evidence using market-based data that board composition is associated with improved firm performance. As Klein (1998) notes “although prior literature finds that independent directors provide monitoring in specific short-term events (e.g., acquisitions and corporate restructuring), no study has found an association between board composition and improved firm performance on a day-to-day basis.” To our knowledge, this is the first cross-sectional evidence that documents that

² See Agrawal and Knoeber (2001) for evidence on the benefits of government/political ties of board members.

³ Bhojraj and Sengupta (2001) classify directors as employees or non-employees and find only an insignificant benefit from non-employee directors. In our analysis, after controlling for credit ratings and board size, we find that affiliate directors are associated with a significantly higher cost of debt, while independents are associated with a significantly lower cost of debt.

board independence improves firm performance. Third, our analysis suggests that larger boards provide a measurable and significant benefit to the firm, namely through a lower cost of debt financing. Fourth, we find that director independence, rather than director expertise, is the relevant issue in the cost of debt capital. In aggregate, our analysis suggests that bondholders view the board of directors as an effective managerial monitoring mechanism.

The remainder of this paper is organized as follows. Section I presents our arguments on the influence of board composition on the cost of debt financing. Section II describes our sample and provides sample statistics. Section III provides the multivariate analysis and the robustness testing. Section IV concludes the paper.

I. Board Structure and the Cost of Debt Financing

A. Board Independence and Cost of Debt Financing

Investors and managers develop contracts that specify the manner in which firms invest and subsequently distribute available funds to shareholders (e.g., Jensen (1983)). Shleifer and Vishny (1997) observe however, that because future contingencies are difficult to foresee and because small investors have few incentives to monitor the firm (free-rider problem), managers obtain extensive control rights and discretion. With this vast discretion, managers are free to pursue pet projects, consume excessive perquisites, engage in non-value enhancing growth, entrench themselves, or directly expropriate wealth from the firm.⁴ In other words, concerns arise over how the firms assets are being mismanaged or embezzled (Monks and Minow (1995)), since managers are inherently less vigilant and trustworthy with other peoples money (Adam Smith (1776)).

One of the devices that shareholders use to control managerial opportunism and protect shareholder interest is the board of directors. Byrd and Hickman (1992) suggest that independent directors contribute expertise and objectivity in evaluating managers' decisions and are able to seek

⁴ See Shleifer and Vishny (1997), Jensen and Ruback (1983), and Monks and Minow (1995).

answers to the tough questions that managers prefer to avoid.⁵ Independent directors may also facilitate changes in corporate control by providing information and candor in evaluating potential offers, or protect investors' interests in acquisitions initiated by the firm's managers (Bacon (1985)). Thus, independent boards potentially render greater monitoring than inside boards and thereby mitigate managerial opportunism and enhance firm performance.

Boards of directors have an explicit responsibility to act on the behalf of shareholders in monitoring, controlling, and evaluating management.⁶ However, the firm's other claimants also have strong interests with the expert decision-making and monitoring of the board of directors because of the simultaneous benefit they potentially receive. For instance, actions that reduce production costs can increase cash flows available to shareholders and decrease the probability of default, thus benefiting bondholders (Fama and Jensen (1983)). Consequently, the board's role in monitoring and disciplining managers provides benefits to a variety of the firm's claimants including shareholders and bondholders (Blair and Scott (2001)).⁷ If, as prior literature suggests, independent directors provide better monitoring than inside directors, then we expect to observe a negative relation between board independence and debt yield spreads.

Furthermore, as Smith and Warner (1979) and Kalay (1982) observe, bondholders' concerns lie with protecting their investment. Rational bondholders recognizing the potential for mismanagement, estimate the costs associated with monitoring the firm, and subsequently price debt to reflect the possibility of wealth expropriation by managers. Bond covenants represent an important element in debtholders ability to restrain managerial actions. However, Berlin and Loeys

⁵ Alternative perspectives suggest that the market place provides appropriate monitoring or other governance mechanisms fulfill this role (Byrd and Hickman (1992)). Similarly, Harford (2000) reports that directors have pecuniary interest in resisting takeover bids (loss of directorship).

⁶ Branch (2000) discusses creditor rights and fiduciary responsibilities in bankruptcy. More generally, the judiciary has consistently ruled that directors have no fiduciary responsibility to bondholders and that bondholder rights are contained exclusively within the terms of the bond contract (Perumpral, Davidson, and Sen (1999)).

⁷ We do not discount the argument that independent directors can expropriate bondholder wealth when such actions are a positive net present value project for shareholders. However, because lower debt costs enhance shareholder value, directors also have strong incentives to minimize the cost of debt financing. Or as Jensen and Meckling (1976) note, shareholders may bear the agency cost of debt indicating their interest in using mechanisms to minimize creditor concerns.

(1988) argue that bond covenants are a rigid and inefficient tool for mitigating opportunistic behavior and thus bondholders can benefit from presence of an independent or delegated monitor.⁸

Park (2000) argues that the “more” senior claimants in default are the investors with the greatest concerns over managerial monitoring. Bondholder wealth for instance, is sensitive to small changes in firm performance, suggesting that creditors can reap large benefits from managerial monitoring. In contrast, because low priority claimants receive little in liquidation, they have weaker incentives to monitor or liquidate the project. If independent directors serve to blunt managerial opportunism and mismanagement, then we expect firms with greater fractions of independent directors to have a lower cost of debt financing.

B. Board Size and Cost of Debt Financing

Recent research also indicates that board size plays an important role in directors’ ability to monitor and control managers. Lipton and Lorsh (1992) and Jensen (1993) for instance, argue that because of difficulties in organizing and coordinating large groups of directors, board size exhibits an inverse relation to firm productivity. Yermack (1996) empirically shows that shareholder value increases as board size decreases. In general, prior research indicates that smaller boards are more effective and flexible in their decision-making processes than larger boards, resulting in greater shareholder value.

Bondholders’ fixed and relatively short-life claims, however, suggest that from a creditor’s perspective, the board’s decision-making process may be secondary to the board’s monitoring function. Specifically, for their finite-life, and well-defined claim, bondholders’ interests lie in ensuring that managers act in a prudent and judicious manner, thereby not placing the value of their

⁸ This raises the question of why debtholders do not have a representative on the board of directors. Smith and Warner (1979) note that bondholders bear legal costs and liabilities if they are deemed to control the corporation. More specifically, when bondholders exercise decision control, they are legally liable to shareholders and other firm claimants for firm losses (Smith and Warner (1979)). Consequently, outside or delegated monitors should represent shareholders, allowing both debt and equity investors to maintain limited liability.

stake in jeopardy.⁹ Yermack (1996) as such argues that larger boards are able to provide more effective monitoring (than small boards) because the firm can draw on more directors for committee assignments. Monks and Minow (1995) and Lipton and Lorsch (1992) extend this argument by suggesting that larger (smaller) boards are able to commit more (less) time and effort to overseeing management.¹⁰ If larger boards are more effective monitors than small boards, we expect a negative relation between debt yield spreads and board size.

C. Director Characteristics and the Cost of Debt Financing

Of course, effective monitoring requires both expertise and proper incentives. Fama and Jensen (1983) suggest that independent directors are effective monitors because of reputation concerns and their desire to obtain additional director positions. Jensen and Meckling (1976) note that director equity-ownership also creates powerful incentives to monitor management. Generally, the literature suggests that professional directors and directors with equity stakes are associated with greater monitoring, and by inference, superior firm performance.

Brickly, Coles, and Terry (1994) report that retired executives from other companies are also effective monitors. Similarly, Monks and Minow (1995) suggest that academics are less effective directors relative to those with business experience. As monitoring expertise increases, managerial opportunism becomes less prevalent, causing the value of investor claims to increase. Furthermore, effective monitoring is potentially an acquired skill, suggesting boards with greater tenure provide greater monitoring. However, as board tenure increases, managers may be better able to influence or sway director opinion indicating director tenure exhibits an inverse relation to monitoring. If

⁹ Larger boards could also provide for greater institutional memory and stability, as changes in one or two board members will be a less disruptive occurrence on a board of 12 directors versus one with only 6 directors.

¹⁰ Monks and Minow (1995) note that most companies typically have a nominating committee, a compensation committee, an audit committee, a finance committee, and an executive committee. In addition many companies have public policy, corporate responsibility, and environmental committees. Larger boards allow for fewer committee assignments per director. Thus, while Lipton and Lorsch (1992) call for boards with only 12 members, explicit in their proposal is that these directors will only serve on one firm's board and their will also be a super/special director. Implicit in their analysis is that directors typically have too little time for carrying out their duties. In this context, a larger board provides for greater task sharing and potentially better monitoring.

director experience, tenure, or equity ownership creates incentives for independent directors to more closely monitor firm management, then we expect to observe a negative relation between director attributes and the firm's cost of debt.

D. Research Focus

Our primary research focus is the impact of board composition or structure on the cost of debt financing. Since the cost of publicly-traded debt can be precisely measured, it provides a powerful and clean test of whether board composition influences firm performance on a “day-to-day” basis. We attempt to address three specific questions. First, is there a relation between board independence and the cost of debt financing? Second, is board size related to the cost of debt financing? Third, does director experience or tenure affect the costs of debt financing? After controlling for firm and security specific factors that influence the cost of debt, we argue that larger, independent boards reduce managerial opportunism thereby leading to lower debt yields. This study provides the first empirical analysis of the impact of board composition on the cost of debt financing using firm level data from 1993 through 1998.

II. Data Description

A. The Sample

For our sample, we collected information on firms that are in both the Lehman Brothers Fixed Income Database (LBFI) and the S&P 500 Industrial Index (as of December 31, 1992). The LBFI provides month-end security-specific information on bonds that are in the Lehman Brothers Indices. The goal of the database is to provide a representative sample of outstanding publicly traded debt. Information is provided on coupons, yields, maturities, credit ratings from Moody's and S&P, bid prices, durations, convexities, holding period returns, call and put provisions, and sinking funds. Lehman Brothers selects bonds for inclusion in the database based on firm size, liquidity, credit ratings, subordination, and maturity. The database contains non-provisional bonds

of differing maturities, differing credit ratings, and differing debt claims (senior and subordinated debt). Although the database does not contain the universe of traded debt, we have no reason to suspect any systematic bias within the sample. We exclude financial and utility firms from the sample because of the potential effect of regulations on debt yields.

We manually collect data from corporate proxy statements on board composition and other governance characteristics for the S&P 500 Industrial firms. To gather firm-specific financial data not already included in the Lehman Brothers Database, we use the Compustat Industrial Files. Combining the three datasets yields a sample of 1,052 firm-year observations on 252 firms for the period 1993 through 1998.¹¹

B. Measuring Board Composition and Yield Spreads

We categorize directors similar to Weisbach (1988), Byrd and Hickman (1992), and Brickley, Coles, and Terry (1994). Directors employed by the firm, retired from the firm, or immediate family members are insiders. Affiliate directors are directors with existing or potential business ties to the firm, but are not full time employees. Examples of affiliated directors are consultants, lawyers, financiers, and investment bankers. Independent directors are individuals whose only business relationship with the firm is their directorship.

Our primary measure of board independence is the number of independent directors divided by board size (fraction of independent directors). We also use two alternative proxies for the influence of independent directors on the board. First, we develop a binary variable that equals one when independent directors hold over 50 percent of the board seats and zero otherwise, denoting it as an Independent Dominated board. Second, we use the number of independent directors on the board. The actual number of independent directors may be important because of how committee assignments are allocated, relative differences in expertise, or because it increases the probability that

¹¹ A potential concern is survivalship bias. To minimize this concern we allow firms to exit and reenter the sample.

someone will ask the tough/right questions. In subsequent testing, we also examine the fraction of seats held by both insider and affiliated directors.

For consistency with prior research, our primary measure of board size is the natural log of the total number of directors serving on the board. In addition, because firm size exhibits a positive correlation with board size (Denis and Sarin (1999)), we also develop two other measures to assess the robustness of our results. Our first alternative measure is the ratio of the number of board members to the natural log of total assets. Our second alternative measure of board size uses binary variables that denote boards as either large (top quartile of board size) or small (bottom quartile of board size).

We also gather information on average board age, average board tenure, and the occupation of independent directors. Board age is the sum of all director ages divided by the number of directors and proxies for director business experience. Board tenure is the sum of the number of years that the directors serve on the board divided by the number of directors. This measure captures the ability of managers to influence directors; longer tenure potentially allows managers greater influence over directors' decisions. As in Brickley, Coles, and Terry (1994), we categorize independent directors into one of four occupations: executives from other firms, retired executives from other firms, academics, and other.

Our dependent variable, yield spread (Spread), is measured by subtracting the weighted-average yield to maturity on the firm's outstanding publicly traded debt from the yield to maturity on a Treasury security with a corresponding duration. The yield on a corporate debt security is defined as the discount rate that equates the present value of the future cash flows to the security price. The yields on Treasury securities are taken from the constant maturity series published by the Federal Reserve Bank of New York in its H15 release.¹²

¹² In cases with no equivalent Treasury maturity, the yield is computed using the Nelson and Siegel (1987) interpolation function.

C. Control Variable Measures

We incorporate control variables into the analysis on firm and security specific attributes. Firm specific measures include firm size (Size), leverage (Leverage), risk (Volatility), and blockholdings (Block Holdings). Security specific measures relate to our dependent variable (Spread) and include duration (Duration), credit ratings (Rating), age of the debt (Age), and high yield bond indicator (High Yield).

Firm size is the natural log of sum of the firm's debt and equity. That is

$$Size = Ln(Debt + Equity) \quad (1)$$

where Debt is the sum of the firm's publicly traded (market value) and non-traded (book value) debt, and Equity is the market capitalization of the firm. The market value of debt is computed by multiplying the face value of the outstanding debt by its trading debt price (as a fraction of par). The market value of equity is computed by multiplying the number of shares outstanding by the traded closing stock price.¹³

We measure leverage as the ratio of long-term debt (LT Debt) to total capital (Debt and Equity). That is

$$Leverage = \frac{LT\ Debt}{(Debt + Equity)} \quad (2)$$

where Debt is measured as the sum of the firm's publicly traded (market value) and non-traded (book value) debt, and Equity is the market value of equity multiplied by the number of shares outstanding.

Although leverage controls for variations in the firm's capital structure and may proxy for default risk, to reinforce our results, we also control for bankruptcy risk using a measure of stock return volatility. Volatility is the standard deviation of stock returns for the prior 60 months.

¹³ Our results are robust to alternative measures of firm size (log of total sales or total assets).

Finally, equity blockholdings represent the holdings of large shareholders who own 5% or more of the firm's outstanding equity. Because shareholders can benefit from a lower long-term cost of debt, blockholders potentially have incentives to protect bondholder interests.

Security specific variables include duration, credit ratings, and liquidity. We use duration to control for differences in maturity and coupon of the firm's outstanding debt. Duration refers to Macaulay duration, computed as the discounted time weighted cash flow of the security divided by its price. That is

$$Durat = \sum_{t=1}^K \frac{t \times CF_t}{P(1+Y)^t} \quad (3)$$

where CF_t is the security cash flows at time t , t is the number of periods until the cash flow, Y is the yield to maturity, and K is the number of cash flows. For our analysis, we compute Duration, or the weighted average duration of the outstanding debt, as a linear combination of the weighted duration of each bond for each firm.

Credit ratings are used to control for differences in default risk. This measure is computed as the average of both Moody's and S&P bond ratings and represents the average of the firm's credit rating at the date of the yield observation. Reeb, Mansi, and Allee (2001) suggest using the average of the Moody's and S&P ratings to proxy for the default risk premium.¹⁴ Bond ratings are computed using a conversion process in which AAA rated bonds are assigned a value of 22 and D rated bonds receive a value of one. For example, a firm with an A1 rating from Moody's and an A+ from S&P would receive an average score of 18. Table 1 provides the bond conversion numbers for both Moody's and S&P ratings.

[Insert Table 1 here]

A potential problem is that credit ratings may already incorporate the impact of board composition. To mitigate this concern we use an estimate of the debt credit rating without the board composition component. We achieve this by regressing board size and independence on

¹⁴ We repeated the analysis using the Moody's and S&P ratings separately and found similar results.

credit ratings. The error term from this regression incorporates the credit rating information without the influence or impact of board composition. We label the error term from this regression as Rating and use it as our primary measure of credit ratings in the multivariate analysis. In addition, credit ratings may exhibit non-linearities as many institutions are barred from holding securities below a certain grade. Therefore, we also include a binary variable (HighYield) to denote those firms with non-investment grade debt. We consider alternative approaches of incorporating credit ratings in section IIID.

The fixed income literature provides three proxies for bond liquidity: the age of the bond, the amount available for trade, and the bid-ask spread (e.g., Sarig and Warga (1989)). As in Elton and Green (1998) and Beim (1992), we use age of the bond as a measure of liquidity. Bond age (Age) is the number of years that a bond has been outstanding. This is a weighted-average difference between the settlement date and the original bond issue date. For example, a bond with an observation date of April 30, 1997, and an issue date of January 31, 1994, would have an age of 3.25 years.

D. Descriptive and Univariate Statistics

Table 2 provides descriptive information for our sample. Panel A shows means, medians, standard deviations, and minimum and maximum values for our key variables. Panel B provides an industry breakdown of the firms in our sample. Finally, panel C presents a correlation matrix between bond yields and board characteristics.

The yield spread for the publicly-traded debt in our sample is 136 basis points over its duration equivalent Treasury Security. The standard deviation of the yield spread is 110 basis points, with a maximum and minimum value of 1,067 and two basis points, respectively. The average bond in our sample has a duration of 6.3 years, has been outstanding 3.9 years, and has a Moody's credit rating of A3.

The sample has an average board size of 12.1 directors, of which 3.3 are inside directors (27 percent), 6.9 are independent directors (57 percent), and the remaining two are affiliate directors (15 percent). Board independence varies widely across our sample from zero to 92.9 percent. Average director age on the boards is 60.3 years and average tenure is 9.2 years. There is also substantial variability in board size, ranging from a minimum of six directors to a maximum of 24 directors.

Firm size, the natural log of total capital (in millions), has a mean of \$8.88, a standard deviation of \$1.28, and a maximum and a minimum size of \$12.78 and \$4.40, respectively. The average firm has a capital structure that consists of 21 percent long-term debt.

Panel B of Table 2 provides a breakdown of the number of firm-year observations based on Standard Industry Classification (SIC) codes. Industries in the sample include: agriculture, forestry and fishing, construction, manufacturing, transportation, wholesale trade, retail trade, and services.

Panel C of Table 2 provides correlation coefficients between yield spreads and board characteristics. In general, the board composition variables exhibit a negative relation to debt yields with the single exception of board tenure. This analysis indicates that firms with large, independent boards are more likely to have lower debt costs, which is consistent with the hypothesis that independent directors provide superior managerial monitoring. However, because firm size affects board independence, board size, and debt yields, we use a multivariate framework to further explore our hypotheses.

[Insert Table 2 about here]

III. Multivariate Testing Results

A. Bond Yield Spread and Board Composition

In the primary specification, we test the cross-sectional relation between board composition variables and the cost of debt financing, and various control measures. That is

$$\begin{aligned}
 Spread_{i,t} = & A_0 + A_1 (Fraction\ Independent_{i,t}) + A_2 (Log\ Board\ Size_{i,t}) + A_3 (Firm\ Size_{i,t}) + \\
 & A_4 (Leverage_{i,t}) + A_5 (Duration_{i,t}) + A_6 (Bond\ Age_{i,t}) + A_7 (Rating_{i,t}) + A_8 (Block_{i,t}) + \\
 & A_8 (HighYield_{i,t}) + A_9 (Volatility_{i,t}) + A_{11} (Time_Dum_{i,t}) + A_{12} (Ind_Dum_{i,t}) + \varepsilon_{i,t} \quad (4)
 \end{aligned}$$

where Spread is the weighted average debt yield to maturity in excess of the duration equivalent Treasury yield. Our primary interest lies in the coefficient estimates on board independence (A_1) and board size (A_2). Negative estimates are consistent with the hypotheses that independent directors and board size are associated with a lower cost of debt financing.

Our firm specific control variables include: firm size, leverage, blockholdings, and volatility. We expect firm size to be negatively related to yield spread as larger firms enjoy economies of scale and greater stability than smaller firms, and therefore lower cost of debt financing. Firm leverage should be positively related to yield spreads, as firms with high debt usage are associated with higher bankruptcy costs, causing an increase in the required rate of return to the bondholders. We expect stock return volatility to exhibit a positive relation to yield spreads, as price fluctuations are associated with higher risk and higher yield spreads.

The remaining control variables, duration, age, rating, and high yield indicator are debt specific. The fixed income literature suggest that duration should be increasing in maturity, but decreasing in coupon and yield to maturity. Since the interaction of all these variables may produce a negative or positive sign, we have no expectation on the sign of the relation between duration and yield spreads. Also, as the yield spread is computed using the duration-equivalent Treasury security, the construction of the dependent variable may mitigate this concern. Age of the firm's outstanding debt should be positively related to yield spread, as liquid less seasoned securities demand higher prices and lower yields. The term Ratings should be negatively related to the yield spread as firms with lower ratings have a higher cost of debt financing. A high yield indicator is added to account for those firms with debt below investment grade status. We expect these firms to be positively associated with yield spreads as lower quality firms demand higher yields and higher spreads. Finally, we include year and industry dummy variables to control for possible time and industry effects. Column 1 of Table 3 provides the predicted sign for each of the coefficient estimates.

[Insert Table 3 about here]

Column 2 of Table 3 provides the primary regression results using Equation (4). The t -values are corrected for heteroskedasticity using White (1980) standard errors.¹⁵ Our results indicate that greater board independence is associated with a lower cost of debt financing. The coefficient estimate on independent directors is -71.8 with a t -statistic of -4.3 , consistent with the concept that board independence provides greater managerial oversight. Economically, the coefficient indicates that debt costs are 35.9 basis points higher for firms with only 25 percent independent directors relative to firms with 75 percent independent directors. The 35.9 basis points differential is equivalent to the spread between AA and A rated bonds (based on the S&P ratings from the LBFI database) and as such represents an important competitive advantage for firms with independent boards.

The coefficient estimate on the natural log of board size is -130.4 with a t -statistic of 7.6, indicating that firms with larger boards enjoy a lower cost of debt financing. The differential in bond yields for firms with 12 directors versus firms with eight directors is -53.8 basis points. These results are also economically significant and are consistent with the hypothesis that larger boards improve managerial monitoring.

In terms of the control variables, the coefficient estimates for rating and firm size are negative and significant at the one percent level, while the leverage coefficient estimate is positive but not significantly different from zero.¹⁶ However, credit ratings potentially incorporate differences in capital structure suggesting that leverage will be unrelated to debt spreads. The coefficients on duration, age, and volatility are positive and significant at the one percent level. The variable blockholdings is insignificant suggesting that large blockholders (e.g., mutual funds, insurance companies, and investment bankers, etc.) do not have an effect on the cost of debt financing. Finally, the high yield bond indicator is positive and significant suggesting that

¹⁵ We control for serial correlation by subtracting the Treasury security yield from the firm yield and by including yearly dummy variables. Repeating the analysis using a year-by-year approach also leads to similar results.

¹⁶ Excluding credit ratings and performing the regression lead to a significant and positive effect of leverage. This suggests that leverage effects on yield to maturity may be captured in the credit rating.

investment and non-investment grade debt are positively associated with yield spreads, but that non-investment grade debt requires a higher rate of return and a therefore higher spread.

B. Alternative Specifications for Board Composition Variables

To further test the relation between board composition and the cost of debt financing, we consider alternative measures of board independence and board size. Column 3 of table 3 presents the results on board independence using a binary variable that equals one for independent dominated boards (fraction of independent directors greater than 50 percent) and zero otherwise. Again, we find strong evidence that firms with independent boards experience a lower cost of debt financing (about 20 basis points). Column 4 of Table 3 presents the results using the number of independent directors on the board to measure board independence. These results suggest that each additional independent director is associated with about a 5.9 basis point reduction in the cost of debt financing.

Because board size and firm size are positively correlated, we also use alternative measures of board size in columns 5 and 6 of Table 3 to correct for any firm size effects. Using the number of directors divided by firm size, we again find that larger boards are associated with lower bond yields. Finally, column 6 of Table 3 shows regression results using two indicator variables for board size; big boards and small boards. Big board equals one when board size falls in the largest quartile of the board of director sample and zero otherwise. Small board equals one when board size falls in the smallest quartile of our board of director sample. Consistent with our prior results, we find the differential in debt costs for firms with big and small board is -59.9 basis points; larger boards appear to lower the cost of debt financing. Overall, our analysis indicates that board composition is associated with a significant reduction in the cost of debt financing.

C. Board Member Characteristics

Column 2 of Table 4 provides the results of regressing board age, board tenure, and officer and director holdings on yield spread. Board age is the average age of all directors and proxies for business experience. Board tenure is the average number of years that directors serve on the board and proxies for the ability of managers to influence director opinion - with longer director tenure, managers potentially capture director decision-making. Officers and director equity ownership measures directors' immediate economic interests in the firm. The coefficient estimates for board age, and officer and director holdings are not statistically significant, suggesting that directors' business experience and immediate economic interests have little discernible impact on the cost of debt financing. However, board tenure is positive and significant; indicating that as director tenure increases, managers are potentially more able to influence or sway board opinion. The magnitude of the coefficient estimate is relatively small, suggesting that an increase in average board tenure from seven to eight years, increases debt costs by 2.5 basis points.

We also examine whether specific occupational characteristics of independent directors are associated with different costs of debt. Executives of other companies may have different incentives to monitor (or not to monitor) compared to other board members or have incentives to vote with management in the hopes of justifying their own actions. We classify independent directors into four groups: independent directors who are executives from other firms, retired executives from other firms, academics, and other. Other includes clergy, government officials, and charity and community workers. Column 3 of Table 4 provides the regression results. Interestingly, we find that each director type is associated with a lower cost of debt financing.¹⁷ From a bondholder's perspective, there appears to be little difference in monitoring among academics, executives, retired executives, or other job categorizations. In general, our analysis suggests that bondholders' primary concern is independent director monitoring rather than the specific expertise of the directors.

[Insert Table 4 about here]

Finally, we directly examine the impact of inside and affiliated directors on yield spreads. Our variable for inside (affiliated) directors is the number of inside (affiliated) directors serving on the board. As one might expect, we find that inside directors exhibit a significantly positive relation to bond yield spread, suggesting bondholders' concern over insider-stacked boards. Interestingly, we also find that affiliated directors have an unfavorable impact on bond yields. The coefficient estimate suggests that bond yields are 17.3 basis points greater for firms with 40 percent affiliated directors compared to firms with 20 percent affiliated directors. In summary, our results are consistent with notion that independent directors provide superior monitoring, while both inside and affiliated directors are viewed more negatively. One implication is that simple classifications of boards into insiders and outsiders (affiliated plus independent) is problematic and mixes two very different groups.

D. Endogeneity

As in most empirical work, our analysis could suffer from endogeneity problems. The issue is whether board composition improves managerial monitoring thereby leading to lower yields or instead, whether bond yields influence board structure in some way. We use two approaches to address this concern. First, to the extent that board structure could be a function of bond yields, we use instrumental variable regressions to estimate the relation between board structure and bond yields. Specifically, we use instrumental variables for board independence (based on the natural log of total assets, blockholdings, board tenure, and diversification) and board size (based on the natural log of total assets, firm age, board tenure, and diversification). The results of this analysis are reported in column 1 of Table 5 and are consistent with the results in Tables 3 and 4. That is the cost of debt is negatively (significant at the five percent level) related to both board independence and board size.

¹⁷ We find similar results using the fractions of academic, retired, executive, and other to total directors.

Second, following Klein (1998) we also control for simultaneity by incorporating the yield spread from the prior period (first lag) into the regression. These results are reported in column 2 of Table 5. Consistent with the previous results, we find that board independence and board size are both related to a lower cost of debt. We also tried additional control variables, such as intangible assets, CEO pay-mix, and corporate diversification in Equation (4). The results of adding these control variables confirms our initial findings that board composition is associated with a lower cost of debt.

E. Robustness Testing

An assumption of our analysis is that the specifications and proxies adequately measure the appropriate attributes. As such, we further examine non-linearities in board composition and credit ratings, outliers and influential observations, and macro-economic interest rate shocks. We find that our results are also robust to various alternative specifications.

First, we included the square of board size to examine the issue of non-linearities in our board size analysis. We find the square term (of board size) is insignificantly different from zero, while board size continues to be significant. While our results unambiguously indicate that larger boards are better, a potential caveat is that the largest board in our sample consists of 24 directors. To further examine the issue of non-linearities in board independence and board size we also use piecewise regressions. Specifically, we repeat the analysis using binary variables to indicate the second through fifth quintiles for both board independence and board size. Figure 1 shows the results of this analysis, again indicating that large, independent boards are associated with a lower cost of debt financing.

We also allow for a nonlinear relation between bond yield spreads and credit ratings. Specifically, we use a piecewise linear regression with 22 breakpoints and 21 dummy variables to proxy for credit ratings.¹⁸ The results of these regressions are consistent with the primary

¹⁸ We also tried a non-linear specification using the square of the firm's credit rating. This approach also led to similar

specification and indicate that the linear credit specification (Rating) is the most robust. Another alternative is to model credit ratings, using firm specific characteristics, and then forecast the credit rating component without the board composition variable. Using this procedure, we also find similar results.

In further tests, we consider an alternative method of measuring bond liquidity. Our primary specification utilizes age as a proxy for liquidity. However, a non-linear specification may be more appropriate, as bond liquidity decays exponentially with age (Beim (1992)). Therefore, we replace age with the natural log of age. We also measure liquidity using a binary variable to denote bonds less than three years old, as it has been found that bonds lose a third of their liquidity in the first three years of their issuance (Beim (1992)). Regressions using these two alternate measures are consistent with our primary regression, suggesting that board composition is associated with lower cost of debt.

We also repeat our analysis using the coverage ratio as a proxy for firm liquidity to mitigate any bankruptcy effects. The coverage ratio coefficient estimate is insignificant and the results are consistent with those reported. We further consider allowing for a nonlinear relation between the yield spread and firm leverage. Specifically, we incorporate the square of leverage as another potential control variable and find a negative relation between the cost of debt and board composition.

To test the sensitivity of our results in the presence of outliers and influential observations, we eliminate observations denoted as outliers and/or influential observations using the R-Student statistic and the DFFITS statistic.¹⁹ These tests examine a sample to determine if any observations have a dramatic effect on the fitted least-squares function. The results were similar to those reported in Tables 3 and 4 and do not change substantively when truncated for outliers at the largest one percent, three percent, and five percent levels at each tail of the distribution for each variable in

results. In addition we repeated the analysis after excluding observations with non-investment grade debt as these may introduce non-linearities into the tests. We find similar results to those reported in Tables 3 and 4.

¹⁹ Observations with an R-Student greater than three or a DFFITS greater than one are considered outliers or influential

the model. Further, as firm year observations may intensify the outlier bias, we repeated the analysis using pooled regressions, which also led to similar results.

Finally, realizing that the relation between board composition and yield spread may not be stable over time, especially during the 1994 period when the Federal Reserve raised interest rates seven times in succession, we use a dummy variable to denote the pre-1995 period along with period subset regressions. The results corroborate those reported. Although the credit ratings are debt specific measures, we also control for debt structure by including the proportion of senior debt to total debt in our analysis. Once again we find a negative relation between board composition and the cost of debt financing.

IV. Conclusion

Boards of directors are responsible for monitoring, evaluating, and disciplining firm management. Prior literature suggests that board structure or composition is an important element in the board's ability to carry out its responsibility. Independent boards protect and enhance shareholder interests while employee-filled boards pursue managerial interests. Empirical studies however fail to find any relation between board independence and firm performance (Hermalin and Weisbach (2001)).

We examine the relation between board structure and firm performance from a creditors' or bondholders' perspective. Blair and Stout (2001) note that several groups benefit from board monitoring; suggesting bondholder wealth is better protected by independent boards. In addition, while Jensen (1993) argues that large boards are ineffective in their decision-making abilities, Yermack (1996) suggest that larger boards may provide superior monitoring because they are able to commit more time and resources to their duties. Based on these concepts, we expect firms with large, independent boards of directors to experience a lower cost of debt financing.

observations, respectively.

Using a data panel of 252 firms from 1993 to 1998, we find that board independence is associated with a significantly lower cost of debt financing. Our analysis indicates that firms with independent boards (75 percent independent) have a cost of debt financing that is 35.9 basis points lower than firms with an inside board (25 percent independent). Our analysis also indicates that board size exhibits a negative relation to debt costs suggesting that larger boards provide greater managerial monitoring. The results indicate that firms with boards of 12 directors experience a 53.8 basis point lower cost of debt than firms with boards of eight directors. The results are statistically and economically significant, and robust to a variety of board size measures

Finally, we investigate the relation between independent director attributes and debt yields. Our results indicate that employment characteristics (executive, retired, academic, etc.), while all significantly related to lower debt costs, are not statistically different from one another. The investigation also suggests that director equity-ownership does not exhibit a significant relation to the cost of debt financing. Finally, we document that both inside and affiliated directors are associated with higher debt costs. We interpret this to suggest that simple regulatory classifications of insiders versus outsiders (affiliated plus independents) are misleading and potentially overstate the degree of board autonomy.

Although the board of directors has an explicit responsibility to monitor managers on the behalf of shareholders, we find compelling evidence that board monitoring substantially impacts the cost of debt financing. The results suggest that firms with large independent boards are associated with a lower cost of debt financing. Overall, our evidence is consistent with the argument advocated by Jensen and Meckling (1976) that shareholders bear the agency cost of debt and thus have powerful incentives to employ mechanisms that lower the cost of debt financing.

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Figure 1
Quintiles of Board Independence and Board Size
 (Results shown for 2nd through 5th quintile, relative to 1st Quintile)

This graph shows the results of performing a piecewise linear regression. Specifically, we use binary variables to indicate the second through fifth quintiles of both board independence and board size. We use the following specification:

$$Spread_{i,t} = C_0 + C_1 (DFI2_{i,t}) + C_2 (DFI3_{i,t}) + C_3 (DFI4_{i,t}) + C_4 (DFI5_{i,t}) + C_5 (DBS2_{i,t}) + C_6 (DBS3_{i,t}) + C_7 (DBS4_{i,t}) + C_8 (DBS5_{i,t}) + Control\ Variables$$

Where DFI2 – DFI5 are dummy variables for the second through fifth quintiles of the fraction of independent directors, DBS2 – DBS5 are dummy variables for the second through fifth quintiles of board size. The control variables are listed in Equation (4) and include firm size, leverage, duration, bond age, adjusted credit rating, volatility, and both time and industry dummy variables.



Table 1
Bond Rating Conversions

This table provides the bond rating categories for both Moody's and S&P ratings. Bond ratings are computed using a conversion process in which AAA rated bonds are assigned a value of 22 and D rated bonds receive a value of 1.

Conversion Number	Moody's Ratings	S&P Ratings
22	Aaa	AAA
21	Aa1	AA+
20	Aa2	AA
19	Aa3	AA-
18	A1	A+
17	A2	A
16	A3	A-
15	Baa1	BBB+
14	Baa2	BBB
13	Baa3	BBB-
12	Ba1	BB+
11	Ba2	BB
10	Ba3	BB-
9	B1	B+
8	B2	B
7	B3	B-
6	Caa1	CCC+
5	Caa2	CCC
4	Caa3	CCC-
3	Ca	CC
2	C	C
1	D	D

Table 2
Sample Description

Panel A: Descriptive Statistics for Variable Measures

This table provides summary statistics for the data employed in our analysis. The data set is comprised of 1,052 firm-year observations for the period 1993 through 1998. The yield spread (Spread) is the difference between the weighted average yield to maturity on the firm's debt less its duration equivalent Treasury rate. The board composition variables include Independent directors, Insider Directors, Board Size, Board Tenure, Board Age, and Occupation. Fraction independent is the ratio of independent directors to total directors; Inside directors represent the number of insiders on the board of directors; Board size is the number of directors on the board; Board tenure is the average length of time a director has been on the board; Board age is the average age of the board of directors. The variables academic, retired, executive, and other represent the last occupation of each independent director on the board. Firm and security specific variables include: Firm Size, Leverage, Volatility, Duration, Credit Ratings, and Age. Firm size is the natural log of total assets; Leverage is the ratio of long-term debt to total capital; Volatility is the stock return variability for each firm for the past five years; Duration is the Macaulay duration and proxies for effective maturity; Credit ratings is the average of Moodys and S&P ratings, and Age is the difference between the bond issue date and quote date in years.

Variables	Mean	Median	Standard Deviation	Maximum	Minimum
Spread (bps)	135.961	102.701	109.454	1067.866	2.239
<i>Board Composition Variables</i>					
Number Independent Directors	6.903	7.000	2.417	16.000	0.000
Fraction Independent	0.573	0.583	0.173	0.929	0.000
Number Inside Directors	3.295	3.000	1.877	12.000	1.000
Fraction Inside	0.272	0.250	0.135	0.714	0.063
Board Size	12.056	12.000	2.524	24.000	6.000
Board Tenure	9.177	8.850	3.080	24.860	0.330
Board Age	60.269	60.270	2.651	67.780	49.570
Independent Board Member Occupation					
Number Academic	0.918	1.000	0.988	6.000	0.000
Number Retired	1.742	2.000	1.440	7.000	0.000
Number Executive	3.851	4.000	1.953	10.000	0.000
Number Other	0.365	0.000	0.645	6.000	0.000
<i>Firm and Security Specific Variables</i>					
Firm Size	8.877	8.705	1.28	12.782	4.398
Firm Leverage	0.219	0.203	0.133	0.943	0.000
Duration (years)	6.287	6.276	2.454	13.621	0.083
Credit Ratings	15.979	16.000	3.209	22.143	1.000
Bond Age (years)	3.917	3.511	2.689	25.655	0.033
Volatility	0.259	0.236	0.078	0.173	0.128

Table 2 - Continued
Sample Statistics

Panel B: Industry Data

This panel gives the number of firm-year observations for each industry group in the sample.

SIC Code	Titles of Industries	Number of Firm-Year Observations
1	Mining	41
2	Construction	359
3	Manufacturing	322
4	Transportation	62
5	Wholesale Trade	138
6	Retail Trade	82
7	Agricultural Services	42
8	Forestry	6

Panel C: Correlation Matrix

This table provides correlation data for the yield spread (spread), board composition (independent directors, board size, board tenure, and board age) variables, and firm size. Spread is the difference between the weighted average yield to maturity on the firm's debt less its duration equivalent Treasury rate. Fraction Independent is the ratio of independent directors to total directors; Board Size is the number of directors on the board; Board Tenure is the average length of time a director has been on the board; and Board Age is the average age of board of directors. Firm Size is the natural log of total assets.

	Yield Spread	Fraction Independent	Board Size	Firm Size	Board Tenure
Yield Spread	1.000				
Fraction Independent	-0.119	1.000			
Board Size	-0.261	-0.001	1.000		
Firm Size	-0.355	0.149	0.372	1.000	
Board Tenure	0.039	-0.339	0.184	-0.155	1.000
Board Age	-0.003	-0.037	0.062	0.051	0.363

Table 3
Yield Spread and Board Composition (n= 1,052)

This table provides the estimated coefficients from regressing yield spreads on board composition variables (the fraction of independent directors and the natural log of board size) and various firm and security specific controls.

$$\begin{aligned} Spread_{i,t} = & A_0 + A_1 (Fraction\ Independent_{i,t}) + A_2 (Log\ Board\ Size_{i,t}) + A_3 (Firm\ Size_{i,t}) + A_4 (Leverage_{i,t}) \\ & + A_5 (Duration_{i,t}) + A_6 (Bond\ Age_{i,t}) + A_7 (Rating_{i,t}) + A_8 (Block_{i,t}) + A_8 (HighYield_{i,t}) \\ & + A_9 (Volatility_{i,t}) + A_{11} (Time_Dum_{i,t}) + A_{12} (Ind_Dum_{i,t}) + \epsilon_{i,t} \end{aligned}$$

Column 2 reports the results for the primary specification. Fraction Independent is the ratio of outside or independent directors to total directors. Board size is the natural log of the number of directors on the board. Firm size is the natural log of total capital. Leverage is the ratio of long-term debt to total capital. Duration is the Macaulay duration and proxies for effective maturity. Age is the difference between the bond issue date and quote date in years. Rating is the board composition adjusted credit rating based on Moodys and S&P ratings. Volatility is the stock return variability for each firm for the past 60 months. The time period and industry dummy variable results are not reported. In columns 3 through 6, we use different measures of independent director influence and board size variables for robustness.

Variables	Sign	Dependent Variable = Yield Spread					
		(1)	(2)	(3)	(4)	(5)	(6)
Intercept			380.545*	235.157*	218.433*	289.211*	67.181**
			(6.217)	(5.409)	(5.137)	(5.696)	(1.832)
Fraction Independent	?		-71.776*			-69.378*	-54.555*
			(-4.277)			(-4.269)	(-3.389)
Independent Dominated	?			-19.980*			
				(-3.686)			
Number of Independents	?				-5.872*		
					(-4.358)		
Board/Firm Size Ratio	?			-75.142*	-57.561*	-84.378*	
				(-7.144)	(-5.787)	(-7.178)	
Log (Board Size)	?		-130.402*				
			(-7.639)				
Big Boards	?						-34.978*
							(-5.825)
Small Boards	?						24.880*
							(2.891)
Firm Size	-		-9.555*	-22.332*	-18.997*	-23.142*	-13.065*
			(-4.085)	(-8.767)	(-8.159)	(-8.806)	(-5.324)
Leverage	-		0.360	0.533**	0.412	0.395	0.522**
			(1.387)	(2.206)	(1.619)	(1.528)	(2.071)
Duration	?		4.113*	4.393*	4.269*	4.259*	4.613*
			(5.087)	(5.438)	(5.258)	(5.280)	(5.789)
Bond Age	+		7.837*	8.059*	7.943*	7.913*	8.034*
			(6.515)	(6.843)	(6.721)	(6.670)	(6.773)
Rating	+		-8.863*	-7.124*	-8.191*	-8.238*	-5.691*
			(-7.235)	(-7.088)	(-7.138)	(-7.126)	(-6.065)
Block Holdings	+		5.834	15.174	9.666	8.282	8.599
			(0.401)	(1.029)	(0.662)	(0.567)	(0.585)
High Yield	+		119.242*	127.567*	123.375*	122.840*	135.891*
			(8.987)	(9.736)	(9.279)	(9.173)	(9.942)
Volatility	+		207.974*	235.583*	226.151*	226.670*	249.046*
			(4.091)	(4.745)	(4.479)	(4.476)	(5.084)
Adjusted R Squared			0.642	0.635	0.637	0.636	0.632

*, **, *** denote significance at the one percent, five percent, and ten percent levels, respectively. The t-values given in parenthesis below each estimate are corrected for heteroskedasticity.

Table 4
Yield Spread and Other Board Characteristics

This Table provides the estimated coefficients from regressing corporate yield spreads on the fraction of independent directors, board size scaled by log of total assets, several other board characteristics, and various control variables. (n= 1,052)

Variable	Sign	Dependent Variable = Yield Spread			
		(1)	(2)	(3)	(4)
Intercept			306.463*	226.595*	207.819*
			(3.963)	(5.325)	(4.681)
Fraction Independent	?		-64.482*		
			(-4.025)		
Board/Firm Size Ratio	?		-83.903*	-58.672*	-81.732*
			(-6.750)	(-5.781)	(-6.652)
Firm Size	-		-22.215*	-19.190*	-22.780
			(-8.617)	(-7.923)	(-8.956)
Leverage	+		0.395	0.333	0.418
			(1.520)	(1.359)	(1.632)
Duration	?		4.411*	4.178*	4.313*
			(5.524)	(4.873)	(5.351)
Bond Age	+		7.849*	7.843*	8.978*
			(6.574)	(6.872)	(6.784)
Rating	-		-8.191*	-7.830*	-7.983*
			(-6.765)	(-7.115)	(-6.969)
Block Holdings	+		9.527	12.923	14.382
			(0.597)	(0.849)	(0.897)
High Yield	+		125.989*	121.096*	124.022*
			(9.283)	(9.001)	(9.049)
Volatility	+		232.404*	236.220*	225.838*
			(4.523)	(4.622)	(4.465)
Board Age	?		-0.888		
			(-0.915)		
Board Tenure	?		2.465**		
			(2.336)		
Officer & Director Holdings	?		-31.442		
			(-1.529)		
Academic	?			-7.324*	
				(-3.223)	
Retired	?			-4.224**	
				(-2.489)	
Executive	?			-5.389*	
				(-3.632)	
Other	?			-6.401***	
				(-1.673)	
Fraction of Affiliated Directors	?				86.326*
					(3.477)
Fraction of Inside Directors	?				52.821**
					(2.432)
Adjusted R Square			0.639	.629	.637

*, **, *** denote significance at the one percent, five percent, and ten percent levels, respectively. The t-values given in parenthesis below each estimate are corrected for heteroskedasticity.

Table 5
Yield Spread and Board Composition: Endogeneity

This table provides the estimated coefficients from regressing yield spreads (Spread) on board composition variables (controlling for endogeneity) and various firm and security specific controls.

$$Spread_{i,t} = B_0 + B_1 (Board\ Independence_{i,t}) + B_2 (Log\ Board\ Size_{i,t}) + Control\ Variables$$

In column 1 we use instrumental variables for both board independence (natural log of total assets, blockholdings, board tenure, and diversification) and board size (natural log of total assets, firm age, board tenure, and diversification). In column 2, following Klein (1998), we incorporate the lagged dependent variable to control for endogeneity. In both regressions we use several control variables. Firm size is the natural log of total capital. Leverage is the ratio of long-term debt to total capital. Duration is the Macaulay duration and proxies for effective maturity. Age is the difference between the bond issue date and quote date in years. Rating is the board composition adjusted credit rating based on Moodys and S&P ratings. Volatility is the stock return variability for each firm for the past 60 months. The time period and industry dummy variable results are not reported.

Variables	Dependent Variable = Yield Spread	
	(1)	(2)
Intercept	603.663* (2.887)	218.959* (3.685)
<i>IV for Board Independence</i>	-157.200** (-2.226)	
<i>IV for Log of Board Size</i>	-228.347** (-2.329)	
Fraction Independent		-50.011* (-3.402)
Log (Board Size)		-73.662* (-4.146)
Firm Size	-2.079 (-0.341)	-5.080** (-2.538)
Leverage	0.705* (2.839)	0.269 (1.289)
Duration	4.828* (5.758)	3.235* (3.820)
Bond Age	8.080* (6.378)	5.202* (4.120)
Rating	-5.929* (-2.677)	-4.690* (-3.921)
Block Holdings	-56.263*** (-1.935)	2.004 (0.164)
High Yield	143.719* (10.231)	56.708* (3.710)
Volatility	277.603* (5.078)	118.361* (2.599)
Lag of Spread		0.414* (5.639)
Adjusted R Squared	0.605	0.710

*, **, *** denote significance at the one percent, five percent, and ten percent levels, respectively. The t-values given in parenthesis below each estimate are corrected for heteroskedasticity.