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Corporate governance, chief executive officer compensation, and firm performance¹

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Abstract

We find that measures of board and ownership structure explain a significant amount of cross-sectional variation in CEO compensation, after controlling for standard economic determinants of pay. Moreover, the signs of the coefficients on the board and ownership structure variables suggest that CEOs earn greater compensation when governance structures are less effective. We also find that the predicted component of compensation arising from these characteristics of board and ownership structure has a statistically significant negative relation with subsequent firm operating and stock return performance. Overall, our results suggest that firms with weaker governance structures have greater agency problems; that CEOs at firms with greater agency problems receive greater compensation; and that firms with greater agency problems perform worse. © 1999 Elsevier Science S.A. All rights reserved.

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1. Introduction

The level of compensation and the extent of pay-for-performance for chief executive officers (CEOs) has been a topic of considerable controversy in the academic and business communities. Critics of CEO compensation practices argue that because the board of directors is influenced by the CEO, the board does not structure the CEO's compensation package to maximize value for outside shareholders. The purpose of this paper is to examine whether there is an association between the level of CEO compensation and the quality of firms' corporate governance, and whether firms with weaker governance structures have poorer future performance.

We find that both board-of-director characteristics and ownership structure have a substantive cross-sectional association with the level of CEO compensation, after controlling for standard economic determinants of the level of CEO compensation (e.g., proxies for the firm's demand for a high-quality CEO, contemporaneous firm performance, and firm risk). In particular, with respect to the board-of-director variables, we find that CEO compensation is higher when the CEO is also the board chair, the board is larger, there is a greater percentage of the board composed of outside directors, and the outside directors are appointed by the CEO or are considered 'gray' directors. CEO compensation is also higher when outside directors are older and serve on more than three other boards. With respect to ownership variables, we find that CEO compensation is a decreasing function of the CEO's ownership stake and the existence of an external blockholder who owns at least 5% of the equity. Although we find no association between the percentage ownership per outside director and CEO compensation, we find that the existence of a non-CEO internal board member who owns at least 5% of the shares is associated with lower CEO compensation.

Given these results, the variation in pay explained by the board and ownership structure variables represents either: (1) an indication that we inadequately specified a model for the equilibrium wage of the CEO (exclusive of the board and ownership structure variables), or (2) an outcome due to the existence of unresolved agency problems. In order to distinguish between these alternative explanations, we examine whether the predicted component of compensation arising from the board and ownership structure variables is correlated with future period firm operating and stock market performance. We find consistent evidence of a negative relation between the compensation predicted by the board and ownership structure variables and subsequent performance. This finding suggests that the weightings of the board and ownership variables in the compensation equation are related to the effectiveness of the firm's governance structure, rather than these variables proxying for the determinants of the CEO's equilibrium wage. As such, our results suggest that firms with weaker governance structures have greater agency problems; that CEOs at firms with

greater agency problems extract greater compensation; and that firms with greater agency problems perform worse.

The remainder of this paper is organized into six sections. In Section 2, we review the prior empirical literature on board and ownership structure, CEO compensation, and firm performance. The sample is described and variables are defined in Section 3. In Section 4, we document the association between the level of compensation and the board and ownership structure variables. The association between subsequent performance and the predicted component of compensation arising from the board and ownership structure is presented in Section 5. Section 6 contains sensitivity tests to determine the robustness of the results to alternative specifications. A summary and conclusion is provided in Section 7.

2. Literature review

The academic literature on corporate governance examines the efficacy of alternative ownership structures and alternative structures for the board of directors. While there is mounting evidence of the failure of certain governance structures to motivate managers to increase firm performance, the empirical evidence to date is mixed and gives little coherent evidence for the shape of an optimal governance structure.

There is a growing literature suggesting that U.S. boards of directors are ineffective. For example, Jensen (1993) argues that boards of directors are ineffective because board culture discourages conflict, the CEO determines the agenda and information given the board, there is little equity ownership by managers and nonmanagers on the typical board, boards are too large, and the CEO and the board chair are frequently the same person. Crystal (1991) argues that boards of directors are ineffective in setting appropriate levels of compensation because outside directors are essentially hired by the CEO and can be removed by the CEO. As such, board members may be unwilling to take positions adversarial to the CEO, especially concerning the CEO's compensation. Moreover, boards usually rely on the compensation consultants hired by the CEO, and this may lead to compensation contracts that have been optimized not for the firm, but for the CEO.

The relation between top executive compensation and board composition has been examined in many prior empirical papers, with mixed findings. For example, Lambert et al. (1993) and Boyd (1994) document a positive relation between CEO compensation and the percentage of the board composed of outside directors, whereas Finkelstein and Hambrick (1989) find that compensation is unrelated to the percentage of outside directors on the board. Other characteristics of the board have also been explored. Hallock (1997) finds that

CEO compensation is higher at firms with interlocked outside directors. Lambert et al. (1993) find that CEOs receive higher pay when they have appointed a greater proportion of the board.

Other empirical research examines whether certain board structures are associated with better firm value and performance. For example, Rosenstein and Wyatt (1990) provide evidence that shareholder wealth is affected by the proportion of outside directors by documenting a positive stock price reaction at the announcement of the appointment of an additional outside director. Byrd and Hickman (1992) find that bidding firms on which independent outside directors hold at least 50% of the seats have higher announcement-date abnormal returns than other bidders, except when the independent directors hold a very high proportion of board seats. In contrast, Yermack (1996) finds no association between the percentage of outside directors and firm performance. Thus, the evidence for the importance of outside directors is mixed. Yermack (1996) also provides evidence that firm value and performance is a decreasing function of board size, while Baysinger and Butler (1985), Hermalin and Weisbach (1991), and Bhagat and Black (1997) find no meaningful relation between various characteristics of board composition and firm performance.

In contrast to the analysis of board structure, there have been relatively few studies of the relation between ownership structure and the level of CEO compensation. Holderness and Sheehan (1988) provide evidence that managers who are majority shareholders (defined as individuals owning at least half but not all of the common stock) in publicly held corporations receive marginally higher salaries than other officers. However, Allen (1981) finds that the level of CEO compensation is a decreasing function of the equity held by the CEO (and his family), as well as the extent of equity holdings by board members not related to the CEO. Lambert et al. (1993) find that CEO compensation is lower when the CEO's ownership is higher and when there is an internal member on the board other than the CEO who owns at least 5% of the shares. Finally, using a sample of Canadian companies (30% of which have multiple classes of voting stock), Core (1997) finds that CEO compensation is increasing in insider control of share votes and decreasing in insider ownership of share value.

Other studies have examined the association between ownership structure and firm performance and value. Morck et al. (1988) demonstrate that firm value first rises with increases in inside ownership as the incentive alignment effect of share value dominates, then falls as the entrenchment effect of insider voting control becomes stronger. Shivdasani (1993) finds that hostile takeovers are more likely when target outside directors own less equity and serve on fewer boards, and when there are unaffiliated outside blockholders. Holthausen and Larcker (1996) indicate that performance subsequent to the initial public offering of a previous leveraged buyout is positively associated with the change

in the equity stake of both the significant non-management investors and the operating management of the firm. Yermack (1996) finds that firm value is significantly higher when officers and directors have greater ownership, although this ownership variable has an ambiguous relation with contemporaneous measures of accounting operating performance.

Overall, the impact of board and ownership structure on executive pay and firm performance is unclear given the mixed nature of the empirical results. In order to extend this literature, we examine the association between executive pay and a comprehensive set of board and ownership structure variables. Measuring the effectiveness of the governance system is difficult, and examination of just a few characteristics in isolation ignores the fact that other characteristics not measured may serve as complements or substitutes. More importantly, we estimate the association between subsequent firm performance and the predicted component of compensation arising from the board and ownership structure variables in order to validate our interpretation of the results of the compensation equation as a manifestation of an agency problem, as opposed to the more benign interpretation that the corporate governance variables are actually proxies for the quality of CEO demanded by firms.

3. Methodological approach, sample, and variable descriptions

3.1. Methodological approach

The null hypothesis of this paper is that observed board and ownership structures induce optimal CEO contracting and firm performance. Under this null hypothesis, the shareholders choose a CEO compensation contract, which specifies the level of compensation as a function of performance, in order to maximize firm value conditional on the firm's information environment and its demand for a high-quality CEO. Both the firm's governance structure and the CEO's compensation contract are choice variables that result from maximizing firm value given the firm's operating and information environment and the reservation wage for a CEO of a given quality. Assuming that observed board and ownership structures induce optimal CEO contracting, the economic determinants of the level of compensation (such as the size of the organization, contemporaneous firm performance, firm risk, and firm investment opportunity set) should completely describe the cross-sectional variation in the equilibrium level of CEO compensation. Under the null hypothesis, and assuming a properly specified model for the level of CEO compensation, only those variables that determine the firm's demand for a CEO of a given quality should have explanatory power. That is, no board structure or ownership variables would be

significant in such a model, because these variables are simply noisy measures of the same variables that determine CEO compensation.²

We use CEO compensation as a metric for assessing the effectiveness of corporate governance because it is a frequent and observable board decision, and has been the subject of much of the debate regarding the effectiveness of boards of directors. Given the amount of information available to the board on corporate strategy, CEO characteristics and levels of CEO compensation, structuring an optimal CEO pay package should be a relatively straightforward decision for an effective board.

The first test of our null hypothesis is based on including a set of board and ownership structure variables in the compensation regression, along with the hypothesized economic determinants of compensation. If the board and ownership structure variables are statistically significant, they provide evidence that either: (1) the CEO compensation model is misspecified, in that our selected economic determinants do not adequately capture the equilibrium level of CEO compensation and that the board and ownership structure variables proxy for the underlying economic determinants; or (2) the null hypothesis should be rejected in favor of the alternative hypothesis that certain board and ownership structures are conducive to CEO entrenchment. Under the alternative hypothesis, the board and ownership variables proxy for the effectiveness of the firm's governance structure in controlling agency problems.

One potential problem inherent in our first test of the null hypothesis is that if the CEO compensation model is misspecified, the board and ownership structure variables, rather than proxying for the effectiveness of the governance structure, could proxy for CEO quality, the complexity of the CEO's position, or the potential tradeoff the firm faces in monitoring the CEO versus providing performance incentives to the CEO. This problem can arise because of the functional form of our CEO compensation model, omitted economic determinants in our compensation model, or measurement error in the variables which proxy for the economic determinants. For example, if the CEO is also the board chair, this may indicate that the CEO's position is more complex, thus requiring greater compensation. Alternatively, if monitoring is difficult, the firm could choose a riskier pay package to motivate the manager, and risk-averse managers will require higher levels of compensation when they are paid via more risky compensation packages. Thus, if the board and ownership structure variables

² Following most prior empirical research in this area, we treat the board and ownership structures as exogenous, when economic theory would argue that these variables are endogenous. In addition, theory would suggest that board and ownership structure are simultaneously determined with compensation. To the extent that this is true in practice, our inferences may be affected by a simultaneous equations bias if the determinants of board and ownership structure are different from those for compensation.

proxy for monitoring effectiveness and the use of more risky pay packages, their coefficients will show greater compensation because managers are risk averse (Mehran, 1995).³

In order to address this issue, we conduct a second test to provide evidence for the validity of our interpretation that the observed associations between the level of compensation and the board and ownership structure variables are proxies for the effectiveness of the governance structure. Specifically, a second regression between subsequent performance (the dependent variable) and predicted excess compensation (the predicted component of compensation arising from the board and ownership structure variables) and other control variables is estimated. This regression, which is described in detail in Section 5, allows us to distinguish among the competing explanations for the estimated coefficients obtained on the board and ownership structure variables in the compensation equation.

3.2. *Sample*

The sample consists of 495 observations over a three-year period for 205 publicly traded U.S. firms. Our sample is composed of large firms operating in a variety of different industries: the median firm in our sample has corporate sales (expressed in 1984 dollars) of \$3101 million, and the sample includes 14 different two-digit standard industrial classification (SIC) codes, with some concentration in the food, chemical, and electrical industries. We only include observations for the 14 industries that have at least ten observations with complete data so that we can generate reasonable estimates for the industry-indicator variables in the regression models described below. These 14 industries comprise 85% of our original sample.

The compensation data were obtained from a major compensation consulting firm. These data were originally collected using a mail survey (with follow-up by telephone to check response accuracy) during mid-year 1982, 1983, and 1984. In this study, we use survey compensation data for the corporate chief executive officer (CEO). There are several advantages associated with this data set. The first advantage is that the data set pre-dates the controversy over corporate governance, thereby providing a sample that is unaffected by recent shareholder activism, and thus providing potentially more powerful tests of the importance of governance structures. Second, we have available a long time series of

³ Mehran (1995) finds that mix of pay is negatively correlated with CEO ownership and the existence of an outside blockholder and positively correlated with the percentage of the board that are outside directors, which is similar to our subsequent results. He interprets these results as evidence that boards with more outside directors use greater mix of pay when monitoring is more difficult and other incentives are not already in place through stock ownership.

subsequent performance for these sample firms. Finally, this survey data provide detailed information on the annual bonus and the individual grants and anticipated target payments for all long-term components of compensation. Thus, we have more detailed information on CEO compensation than was available in proxy statement disclosures during the 1980s, and this detail allows us to move beyond the more typical analysis of salary and cash compensation used in most prior research.

3.3. *Measurement of the level of CEO compensation*

The empirical analysis of CEO compensation is based on three different measures of compensation: total compensation, cash compensation, and salary. Cash compensation is the sum of salary and annual bonus, whereas salary simply measures the component of compensation that is fixed (or noncontingent) at the beginning of the year. Total compensation is the sum of salary, annual bonus, and our valuations for stock options, performance plans, phantom stock, and restricted stock. For example, 1984 total compensation consists of the individual's salary for 1984 (set at the beginning of 1984), the annual bonus paid in 1984 for performance in 1983, and long-term grants awarded through the beginning of 1984. Since the salary and bonus are typically paid during a single year, the valuation of these two components is straightforward. However, the valuation of the long-term components is more problematic. Stock options are valued at 25% of their exercise price.⁴ Grants of restricted stock are valued according to the price per share at the date of grant. Phantom stock grants are valued in the same way as restricted stock plans. Grants of performance shares are valued by multiplying the number of performance shares by the stock price at the grant date. Grants of performance units are valued according to the dollar value assigned to each unit at the grant date.⁵

Our choice of valuations for the components of long-term compensation may limit the interpretation of our results. The amount of compensation that will ultimately be received from long-term compensation plans is uncertain at the

⁴ Simulation results (e.g., Lambert et al., 1991; McConnell, 1993) suggest that more sophisticated option pricing models (based on the Black-Scholes or binomial formulas) typically produce values in this range. In addition, even if we used a potentially more sophisticated method for pricing the options, we would still have no comparable analytical model for valuing accounting-based long-term incentive plans (performance plans).

⁵ In our valuation, we are assuming that firms set performance targets equal to expected performance. In other words, if a performance share plan will pay out one share of stock if target performance is met, we assume that the expected value of this plan is the share price on the date of grant. This assumption is consistent with the institutional procedures by which incentive targets seem to be set (Holthausen et al., 1995). Merchant and Manzoni (1989) provide some field study evidence that supports this assumption for the annual bonus.

time the compensation is awarded, although firms make grants with the intention of delivering a target amount of compensation for a target level of performance. However, as demonstrated below, our results are very similar regardless of whether we use total compensation, cash compensation or salary, which suggests that the exact valuation procedure used for the long-term components does not induce our results.

Table 1 presents descriptive statistics (after pooling the observations across the three survey years) for the three compensation components and their hypothesized determinants. Compensation and sales have been transformed into 1984 dollars using the relevant consumer price index. These CEOs' median cash compensation is equal to \$578,205 and the median total compensation is equal to \$800,000.

3.4. Economic determinants of the level of CEO compensation

Consistent with prior theory and empirical work (Rosen, 1982 and Smith and Watts, 1992), we expect that larger firms with greater growth opportunities and more complex operations will demand higher-quality managers with higher equilibrium wages. We proxy for firm size and complexity with firm sales. We proxy for the firm's investment opportunity set with the firm's year-end market-to-book ratio averaged over the previous five years. Finally, we include fourteen industry-indicator variables as controls for industry differences in the demand for managerial talent.⁶

The results of standard agency models suggest that the level of pay is an increasing function of firm performance. Firm performance is measured using the accounting return on assets (computed as the ratio of earnings before interest and taxes to total assets) and the annual stock market return on the common stock. Firm risk, both as a measure of the firm's information environment and the risk of its operating environment, is also a potentially important determinant of the level of CEO compensation. Consistent with other empirical research on compensation (e.g., Smith and Watts, 1992; Core, 1997), we include measures of firm risk as control variables for the level of compensation. Theoretical models (e.g., Banker and Datar, 1989) suggest that compensation risk (and the level of expected compensation) may either increase or decrease with firm risk. Cyert et al. (1997) find that CEO compensation is higher at firms with greater stock return volatility. The relevant proxies for firm risk are total

⁶ Based on our null hypothesis that the firm will not in equilibrium reward unnecessary human capital investment by the CEO, we concentrate on identifying proxies for the firm's demand for a high-quality CEO. Prior empirical research has demonstrated that variables such as education level, firm tenure and job tenure (proxies for human capital investment) have little explanatory power for CEO compensation.

Table 1

Descriptive statistics for CEO compensation and its hypothesized determinants

The sample consists of 495 annual observations of 205 firms between 1982 and 1984. The compensation data were obtained from the confidential files of a major compensation consultant. Compensation amounts and sales are expressed in 1984 dollars.

Panel A: CEO compensation

Total compensation is the sum of salary, annual bonus, and our valuations for stock options, performance plans, phantom stock, and restricted stock. For example, 1983 total compensation consists of the individual's salary for 1984 (set at the beginning of 1984), the annual bonus paid in 1984 for performance in 1983, and the long-term grants awarded through the beginning of 1984. Cash compensation is the sum of salary and annual bonus.

	Mean	Median	Std Dev.
Salary	\$433,491	\$420,709	\$126,861
Total cash compensation	614,860	578,205	238,087
Total compensation	935,027	800,000	544,407

Panel B: Economic determinants

Sales are for the year prior (i.e., 1983) to the year in which compensation is awarded (i.e., 1984). Investment opportunities are defined as the firm's year-end market-to-book ratio averaged over the five years ended the year prior to the year in which CEO compensation was paid. Return on assets is the percentage corporate return on assets or the ratio of earnings before interest and taxes to total assets for the prior year. Stock return is the percentage stock market return for the prior year. The standard deviation of ROA is the standard deviation of annual percentage corporate return on assets for the prior five years. The standard deviation of RET is the standard deviation of annual percentage stock market return for the prior five years.

	Mean	Median	Std Dev.
Sales (millions of dollars)	\$6,523	\$3,101	\$13,090
Investment opportunities	1.365	1.170	0.674
Return on assets (ROA)	10.654	10.587	7.101
Stock return (RET)	18.881	14.886	37.819
Standard deviation of ROA	3.129	2.530	2.411
Standard deviation of RET	31.812	26.363	21.890

Panel C: Board composition

CEO is board chair is an indicator variable equal to one if the CEO is also chairman of the board, and zero otherwise. Board size is the total number of directors on the board. Inside directors is the percentage of the board who are managers, retired managers, or are relatives of current managers. Outside directors appointed by CEO is the number of outside directors on the board appointed by the CEO as a percentage of board size. Gray outside directors is the number of outside directors who are gray (a director is gray if he or his employer received payments from the company in excess of his board pay) as a percentage of board size. Interlocked outside directors is the number of outside directors who are interlocked (a director is interlocked if an inside officer of the firm serves on the board of that outside director's company) as a percentage of board size. Outside directors over age 69 is the percentage of the outside directors who are over age 69. Busy outside directors is the

Table 1. Continued.

	Mean	Median	Std Dev.
percentage of outside directors who serve on three or more other boards (six or more for retired outside directors).			
CEO is board chair (indicator variable)	0.756	1.000	0.430
Board size	13	13	3
Inside directors (% of board size)	32.897	31.250	13.371
Outside directors appointed by CEO (% of board size)	33.163	30.000	22.951
Gray outside directors (% of board size)	6.862	0.000	9.264
Interlocked outside directors (% of board size)	3.274	0.000	4.838
Outside directors over age 69 (% of outside directors)	8.314	0.000	13.108
Busy outside directors (% of outside directors)	45.169	45.455	21.067

Panel D: Ownership structure

CEO percentage stock ownership is the percentage of outstanding shares owned by the CEO. Non-CEO insider owns 5% is an indicator variable equal to one if the firm has an internal board member (other than the CEO) who owns at least 5% of the outstanding shares, and zero otherwise. Percentage stock ownership per outside director is the total percentage of outstanding shares owned by outside directors divided by the number of outside directors. Outside blockholder owns 5% is an indicator variable equal to one if the firm has an external blockholder who owns at least 5% of the outstanding shares, and zero otherwise.

	Mean	Median	Std Dev.
CEO percentage stock ownership	1.523	0.086	6.104
Non-CEO insider owns 5% (indicator variable)	0.125	0.000	0.331
Percentage stock ownership per outside director	0.136	0.005	0.809
Outside blockholder owns 5% (indicator variable)	0.471	0.000	0.500

variance measures, and we compute the standard deviation of return on assets and the standard deviation of common stock returns over the prior five years.⁷

⁷ In the results reported in Section 4, we do not control for the mix of pay (compensation risk). While compensation might be expected to increase with compensation risk for a risk-averse manager, there is also the possibility that higher levels of CEO pay, arising from ineffective governance mechanisms, primarily manifest themselves in contingent compensation because it is more difficult for shareholders to monitor long-term pay (especially given the proxy disclosures in the 1980s). In Section 6, we demonstrate that our results are not substantively affected by including pay mix in the model as an economic determinant.

Definitions and descriptive statistics for the variables used to measure sales, investment opportunities, firm performance, and firm risk are provided in Table 1. The data used to compute these variables were obtained from the *Compustat* files. Variables proxying for the economic determinants of compensation were measured as of the end of the fiscal year during which compensation amounts were earned. For example, compensation data obtained from the 1984 survey are matched with sales, investment opportunities, firm performance, and firm risk data for the 1983 fiscal year, the period for which the bonus is earned. Moreover, we assume that salary level and expected long-term compensation for 1984 is set with regard to observed performance in 1983 and firm characteristics as of the end of 1983.

3.5. *Board of director and ownership variables*

We proxy for the effectiveness of monitoring by the board of directors by using eight measures that characterize the composition of the board. For example, activist shareholders have argued for the separation of the board chair and CEO, and a number of empirical studies suggest that agency problems are higher when the CEO is also the board chair (e.g., Yermack, 1996). We define the dual Chair/CEO as an indicator variable, which is equal to one if the board chair is also the CEO, and zero otherwise. The size of the board of directors is expected to be associated with less effective board monitoring, based on the argument that larger boards are less effective and more susceptible to the influence of the CEO (Jensen, 1993; Yermack 1996).

Shareholder activists consistently urge that more of the board should consist of independent, outside directors. Pfeffer (1981) argues that internal board members are more loyal to management, and thus the CEO can exert relatively more influence over internal (as opposed to outside) board members. However, as discussed above, there is mixed evidence as to whether boards are more effective when they consist of fewer inside directors, and accordingly we make no prediction for the sign of the coefficient of this variable. We define inside directors as the percentage of the total directors who are insiders (i.e., directors who are managers, retired managers, or family members of present or past management).

We expect that outside directors who have been appointed by the CEO, who are ‘gray’, or who are interlocked are less independent of the CEO and less effective monitors. Outside directors are assumed to have been appointed by the CEO if they joined the board after the CEO took office. An outside director is defined to be ‘gray’ if he or his employer received payments from the company in excess of his board pay (as disclosed in the proxy statement). Examples of gray directors are an attorney who is a partner in a law firm that provides services to the firm, or the CEO of a company that sells products to the firm. We define an outside director to be ‘interlocked’ if an inside director of the firm serves on the board of that outside director’s firm. An interlocked director may be less

independent because an insider has influence over the interlocked director's own board. The proxy disclosure rules enacted by the Securities and Exchange Commission in 1992 require disclosure of director interlocks, and the National Association of Corporate Directors (NACD, 1996) Blue Ribbon Commission guidelines urge that firms avoid gray directors and interlocked directors. We scale all three of these measures of the independence of the outside directors by the total number of directors on the board.

Recent discussion suggests that outside directors may become less effective as they grow older or serve on 'too many' boards. Reform advocates suggest mandatory retirement ages and urge term limits for directors (e.g., NACD, 1996). Since many company boards require mandatory retirement at age 70 for directors, our measure for this variable is the percentage of the outside directors who are 70 or older. Finally, some reform advocates suggest that many directors serve on too many boards to attend to their duties adequately. Consistent with recent NACD guidelines (1996), we define an outside director to be 'busy' if he serves on three or more other corporate boards (six or more other boards if the director is retired). We measure busy outside directors as a percentage of outside directors. Other researchers such as Shivdasani (1993) have employed the average number of additional directorships as a measure of director quality and found a negative association with agency problems. By concentrating on an excess number of directorships, we create a variable over the range where we expect that increases in the number of directorships do not measure increases in director quality, but instead measure reductions in the director's ability to attend to his duties.

We employ four measures for the ownership structure of the firm. CEO ownership is measured as the percentage of outstanding shares owned by the corporate CEO and his immediate family. Second, similar to Allen (1981), we also determine whether there exists a non-CEO internal board member (who is also not a member of the CEO's family) that owns at least 5% of the outstanding shares. In general, CEO entrenchment should be reduced if another internal board member has substantial equity holdings in the firm. As measures for outside ownership influences, we compute the percentage ownership per outside director and the existence of an external party (or blockholder) that owns at least 5% of the outstanding shares. We expect that CEO entrenchment is a decreasing function of the holdings of outside directors and the existence of an outside party with substantial equity holdings in the firm (e.g., Allen, 1981; Tosi and Gomez-Mejia, 1989; Finkelstein and Hambrick, 1989).

The ownership and board-of-director variables were collected from the 1984 proxy statements filed by the sample firms. These proxy statements provide data on ownership structure and composition of the board of directors as of the end of 1983 (or the middle of the survey time period). The descriptive statistics for these variables are presented in Table 1. The CEO is also board chair in about 76% of the companies. The average board consists of 13 directors, of which approximately 33% are insiders, 7% are gray, and 3% are interlocked. That

approximately 40% of the directors are either inside or gray implies that the remaining 60% of the directors are ‘independent’, which is consistent with Shivdasani (1993) and Bhagat and Black (1997). Consistent with Wade et al. (1990), outside directors appointed by the CEO comprise 33% of the average board. We find that on average 8% of the outside directors are age 70 or older and 45% are busy.

Consistent with prior work, we find that the distribution of stock ownership by the CEO is skewed, with the mean (median) CEO owning approximately 1.5% (0.09%) of the outstanding equity. The percentage ownership per outside director has a mean (median) of approximately 0.136% (0.005%) of the outstanding equity. This translates into stock ownership (in 1984 dollars) by the mean (median) outside director of approximately \$1.8 million (\$57,545), which for the median director is approximately three years of directors’ fees. Finally, 47.1% of the firms have an external party and 12.5% have an internal board member (other than the CEO) that owns at least 5% of the outstanding stock. The correlations between the board and ownership structure variables are generally small in absolute value, with the largest correlation equal to 0.31 (between whether the CEO is also board chair and the number of outside directors the CEO has appointed).

4. Results – the level of CEO compensation

The association between the level of CEO compensation and the firm’s demand for a high-quality CEO, prior firm performance, firm risk, and the board and ownership structure, is examined using a cross-sectional multiple regression. The regression equation includes as a dependent variable one of the three measures of CEO compensation (either total compensation, cash compensation or salary) and includes as independent variables the variables defined in Table 1 as proxies for the economic determinants of CEO compensation, the board structure variables, and the ownership structure variables. The regression model also contains two indicator variables that control for the year in which compensation was paid and fourteen indicator variables that control for (two-digit) industry membership.⁸

The regressions of CEO pay on its economic determinants, industry and year controls, and board and ownership structure are presented in Table 2. The

⁸ The regression analysis makes several important assumptions. First, the regression coefficients are assumed to be the same across firms and over time. However, we partially control for potential industry and time period differences by incorporating indicator variables to capture mean shifts for the dependent variable. In addition, the error terms are assumed to be independent. Since we have approximately two observations per firm, it is conceivable that our *t*-statistics are overstated. Section 6 indicates that our results are not sensitive to the independence issue.

dependent variable in the first column is based on total compensation, whereas the dependent variables in the second and third columns are cash compensation and salary, respectively. The coefficients for the year and industry-indicator variables are not reported in the tables as they are not of direct interest for this study.

The regression results presented in the first column of Table 2 demonstrate that the level of total CEO compensation is cross sectionally related to firm size, investment opportunities, prior performance, and firm risk. Larger firms and firms with higher investment opportunities (as proxied by the market-to-book ratio) pay higher CEO compensation, which we interpret as reflecting their demand for higher-quality managerial talent. The coefficient on return on assets (ROA) is not significant, whereas the coefficient on the stock return variable (RET) exhibits a positive and significant association with compensation.⁹ The coefficients for the two risk proxies, the standard deviation of ROA and RET, are negative, and the standard deviation for ROA is statistically significant.

The eight variables related to the structure of the board of directors are generally significant at conventional levels. The significant coefficient on the indicator variable for dual CEO/Board chair indicates that a CEO who also serves as board chair receives additional compensation of \$152,577. Board size is significantly positive, and implies that a one member increase in the size of the board is associated with a \$30,601 increase in total CEO compensation. Contrary to many recent governance prescriptions, total compensation has a significant negative association with the percentage of inside directors on the board.¹⁰ The magnitude of this coefficient suggests that a 1% increase in the percentage of the board which is internal translates into a \$5639 decrease in CEO compensation.¹¹

⁹ It is important to realize that the long-term components of compensation are valued using the expected payoffs from various awards at the time they are granted. As valued, these components do not have a mechanical correlation with stock market performance.

¹⁰ In order to consider potential nonlinearities, we also estimated regression models for total compensation with spline variables measuring percentages of inside directors greater than either the average (33%) or greater than the 3rd quartile (42%). The main effect on the proportion of inside directors remained significantly negative but the coefficients on the spline variables were not significant. Thus, for this sample, there is no evidence that even a large percentage of inside directors results in increased CEO pay.

¹¹ Our use of the terminology '1%' in Section 4 refers to a 1% change in the variable (e.g., 30% to 31%). This terminology is *not* meant to imply a percentage change in the variable. The coefficients on the variables that are expressed as percentages (of either board size or outside directors) appear small relative to median total CEO compensation of \$800,000. However, for a variable defined as a percentage of board size (percentage of outside directors), a change in the classification of one director results in a 7.7% (11.1%) change in the variable for the median board. Thus, if one wanted to estimate the predicted effect on CEO compensation of a change in the classification of one director for the median board associated with one of these variables which are stated as a percentage of board size or outside directors, the reported coefficient for these variables should be multiplied by 7.7 or 11.1 in order to make comparable statements about the compensation effects of a change in board structure.

Table 2

Regressions of CEO compensation on its economic determinants, industry and year controls, and board and ownership structure variables

The sample consists of 495 annual observations on 205 firms between 1982 and 1984. The compensation data were obtained from the confidential files of a major compensation consultant. Total compensation is the sum of salary, annual bonus, and our valuations for stock options, performance plans, phantom stock, and restricted stock. Cash compensation is the sum of salary and annual bonus. *Economic determinants:* Sales are for the year prior (i.e., 1983) to the year in which compensation is awarded (i.e., 1984). Investment opportunities are defined as the firm's year-end market-to-book ratio averaged over the five years ended the year prior to the year in which CEO compensation was paid. Return on assets is the percentage corporate return on assets or the ratio of earnings before interest and taxes to total assets for the prior year. Stock return is the percentage stock market return for the prior year. The standard deviation of ROA is the standard deviation of annual percentage corporate return on assets for the prior five years. The standard deviation of RET is the standard deviation of annual percentage stock market return for the prior five years. *Board Structure:* CEO is board chair is an indicator variable equal to one if the CEO is also chairman of the board, and zero otherwise. Board size is the total number of directors on the board. Inside directors is the percentage of the board who are managers, retired managers, or are relatives of current managers. Outside directors appointed by CEO is the number of outside directors on the board appointed by the CEO as a percentage of board size. Gray outside directors is the number of outside directors who are gray (a director is gray if he or his employer received payments from the company in excess of his board pay) as a percentage of board size. Interlocked outside directors is the number of outside directors who are interlocked (a director is interlocked if an inside officer of the firm serves on the board of that outside director's company) as a percentage of board size. Outside directors over age 69 is the percentage of the outside directors who are over age 69. Busy outside directors is the percentage of outside directors who serve on three or more other boards (six or more for retired outside directors). *Ownership Structure:* CEO percentage stock ownership is the percentage of outstanding shares owned by the CEO. Non-CEO insider owns 5% is an indicator variable equal to one if the firm has an internal board member (other than the CEO) who owns at least 5% of the outstanding shares, and zero otherwise. Percentage stock ownership per outside director is the total percentage of outstanding shares owned by outside directors divided by the number of outside directors. Outside blockholder owns 5% is an indicator variable equal to one if the firm has an external blockholder who owns at least 5% of the outstanding shares, and zero otherwise. *t*-statistics (in parentheses) are based on OLS standard errors.

	Predicted sign	CEO compensation variable		
		Total	Cash	Salary
<i>Economic determinants</i>				
Sales	+	12,598 (6.07)	8,554 (12.13)	4,380 (10.43)
Investment opportunities	+	101,391 (2.43)	34,801 (2.45)	20,256 (2.39)
Return on assets (ROA)	+	4,108 (0.98)	1,525 (1.07)	- 1,388 (- 1.63)
Stock return (RET)	+	1,454 (2.34)	621 (2.94)	333 (2.65)

Table 2. Continued.

	Predicted sign	CEO compensation variable		
		Total	Cash	Salary
Standard deviation of ROA	?	– 41,857 (– 3.75)	– 26,022 (– 6.86)	– 4,279 (– 1.89)
Standard deviation of RET	?	– 967 (– 0.83)	– 675 (– 1.71)	– 773 (– 3.30)
<i>Board structure</i>				
CEO is board chair	+	152,577 (2.86)	89,495 (4.94)	38,393 (3.56)
Board size	+	30,601 (3.51)	10,523 (3.55)	4,407 (2.50)
Inside directors	?	– 5,639 (– 3.22)	– 2,020 (– 3.39)	– 382 (– 1.08)
Outside directors appointed by CEO	+	4,137 (4.14)	1,353 (3.99)	830 (4.11)
Gray outside directors	+	7,356 (3.19)	2,422 (3.09)	– 52 (– 0.11)
Interlocked outside directors	+	4,358 (0.99)	2,232 (1.49)	15 (0.02)
Outside directors over age 69	+	4,136 (2.42)	1,868 (3.22)	1,961 (5.68)
Busy outside directors	+	2,016 (1.80)	1,315 (3.46)	966 (4.26)
<i>Ownership structure</i>				
CEO percentage stock ownership	–	– 8,027 (– 2.21)	– 2,937 (– 2.38)	– 1,648 (– 2.24)
Non-CEO insider owns 5%	–	– 142,389 (– 2.18)	– 1,250 (– 0.06)	4,539 (0.34)
Percentage stock ownership per outside director	–	– 21,183 (– 0.81)	814 (0.09)	4,365 (0.83)
Outside blockholder owns 5%	–	– 86,100 (– 1.98)	– 69,901 (– 4.72)	– 46,333 (– 5.26)
Adj- R^2		37.2%	62.1%	52.6%
F		9.85	25.50	17.60
Incremental Adj- R^2 from board and ownership structure variables		14.6%	12.9%	13.3%
F		10.13	14.40	12.05

Each of the three variables that measure the lack of independence of the outside directors (outside directors appointed by the CEO, gray outside directors, and interlocked outside directors) has a positive coefficient, implying that less independent outside directors are associated with greater CEO compensation. The significant coefficients on outside directors appointed by the CEO and gray outside directors indicate that a 1% increase in the variable leads to a \$4137 and \$7356 increase in CEO compensation, respectively. These results are similar to the conclusions of Wade et al. (1990) concerning the ability of the CEO to influence compensation decisions through his ability to influence outside directors. The lack of significance of the coefficient on interlocked outside directors is consistent with the findings of Hallock (1997) on CEO total compensation.

Finally, each of the two variables that proxy for outside director effectiveness, the percentage of outside directors who are over age 69 and the percentage of outside directors who are 'busy', has a significantly positive coefficient, with a 1% increase in the variable leading to a \$4136 and \$2016 increase in CEO compensation, respectively. These results are consistent with the reform advocates' arguments for mandatory retirement ages or term limits, and with the argument that directors are less effective when they serve on too many other boards.

Taken together, the signs of the coefficients on CEO duality, board size, gray outside directors, interlocked outside directors, outside directors appointed by the CEO, outside directors over age 69, and busy outside directors are consistent with the interpretation that when corporate governance is weak, the CEO is able to extract additional compensation from the firm. The negative coefficient on the percentage of inside directors is consistent with the mixed empirical evidence on the monitoring value of additional outside directors, and provides no support for the common contention that outside directors are better monitors of management than internal directors.

The four variables capturing ownership structure are also generally statistically significant at conventional levels. Consistent with Allen (1981) and Cyert et al. (1997), CEO equity ownership and the presence of another executive on the board who owns at least 5% of the outstanding equity each have significantly negative coefficients. A 1% increase in CEO equity ownership translates into a \$8027 reduction in CEO compensation, and while this is statistically significant, its economic significance is minor. The presence of another executive on the board who owns at least 5% of the outstanding equity is associated with a \$142,389 reduction in CEO compensation. Similar to Finkelstein and Hambrick (1989), there is an insignificant association between CEO compensation and the percentage ownership per outside director. Finally, there is a significantly negative association between the existence of an external party or blockholder that owns at least 5% of the outstanding shares and CEO compensation. The point estimate indicates that the presence of this external

blockholder leads to a decline of \$86,100 in total compensation. Considered together, the signs of the coefficients on the ownership structure variables are also consistent with the interpretation that less effective governance structures are associated with increases in CEO compensation.

In terms of explanatory power, the regression model in the first column of Table 2 indicates that total CEO compensation has a significant association with the firm's demand for a high-quality CEO, prior performance, risk, and the structure of the board of directors and share ownership (adjusted- $R^2 = 37.2\%$, $F = 9.85$, $p < 0.001$). Estimating the regression without the board structure and ownership variables provides insight into the incremental explanatory power of these variables. Including the board and ownership structure variables increases the adjusted- R^2 of the regression from 22.6% to 37.2%. The incremental R^2 of 14.6% yields an F -statistic of 10.13 ($p < 0.001$), which indicates that the board structure and ownership variables collectively add significant explanatory power to the model for CEO total compensation. Combined with the fact that the board and ownership structure variables generally have signs consistent with an interpretation of CEO entrenchment, the observation that these variables collectively add a significant amount of explanatory power to the model for CEO compensation provides evidence against our null hypothesis of effective governance.

As consistency checks on our total compensation results, we also use cash compensation and base salary as measures of compensation in regression models in Table 2. The second column of Table 2 presents the results when cash compensation (salary plus cash bonus) is used as the dependent variable. These results are virtually identical to those using total compensation, with the exceptions that the variable measuring the presence of a non-CEO insider who owns at least 5% of the equity loses significance, and that the variable measuring the percentage ownership per outside director changes sign, but remains insignificant. As expected, the magnitudes of the coefficients are smaller in absolute value because cash compensation is smaller than total compensation. The adjusted- R^2 of this regression is 62.1%, the incremental adjusted- R^2 from including the board and ownership variables is 12.9%, and the test for the significance of the incremental R^2 yields an F -statistic of 14.40 ($p < 0.001$).

The third column of Table 2 presents the results when salary is used as the dependent variable. The coefficient on return on assets changes sign and becomes negative. Relative to the regression of cash compensation, we observe that the variable inside directors loses significance, the variable gray outside directors changes sign and becomes insignificant, and the variable indicating the presence of a non-CEO insider who owns at least 5% of the equity changes sign, but remains insignificant. The adjusted- R^2 of the regression is 52.6%, the incremental adjusted- R^2 from including the board and ownership structure variables is 13.3%, and the F -statistic for the incremental

R^2 associated with the board and ownership structure variables is 12.05 ($p < 0.001$).¹²

5. Excess CEO compensation and subsequent firm performance

One interpretation of the results in Section 4 is that certain board and ownership structures enable managers to exercise influence over the board and extract rents from the firm, including compensation in excess of their equilibrium (economic) wage rate. Alternatively, the board and ownership structure variables may proxy for some dimension of the firm's demand for a high-quality CEO not captured by the other economic determinants. For example, the significant positive coefficient on the board chair variable may indicate that this individual has a more complex job and merits a higher equilibrium wage. Finally, the coefficients on the board and ownership structure variables are also consistent with a tradeoff between monitoring quality and the extent of incentive (riskier) pay. Since increases in compensation risk should translate into greater levels of compensation for risk-averse managers, in equilibrium, we might expect increases in the level of compensation as monitoring quality falls. In this section and in Section 6, we attempt to distinguish between these alternative interpretations of the results in Table 2.

5.1. Methodology

The regressions reported in Section 4 include a set of variables representing the economic determinants of the level of compensation which are intended to completely capture the cross-sectional variation in the equilibrium level of CEO compensation in the absence of any agency problems. The estimated coefficients from the CEO compensation regressions in conjunction with each firm's board and ownership structure variables allow us to estimate the predicted component of compensation for each CEO that is related to the board and ownership structure variables. That is, we compute the following linear combination for each CEO:

$$\begin{aligned} \text{Predicted excess compensation}_i = & \sum \hat{\beta}_i \text{ board structure}_i \\ & + \sum \hat{\gamma}_i \text{ ownership structure}_i, \end{aligned} \quad (1)$$

where the estimated coefficients on the board and ownership structure variables ($\hat{\beta}_i$'s and $\hat{\gamma}_i$'s) are those reported in Table 2. We refer to this linear combination

¹² The similarity of results across the three regressions in Table 3 is not surprising given the high and significant cross-sectional correlations among the dependent variables ($p < 0.001$ for all). Specifically, total compensation has a correlation of 0.59 with salary and 0.73 with cash compensation, and cash compensation has a 0.81 correlation with salary.

as ‘predicted excess compensation’ because it represents the predicted component of compensation arising from the board and ownership structure variables in excess of our controls for the standard economic determinants of compensation. Since we examine the ability of predicted excess compensation to explain cross-sectional variation in scaled return measures (return on assets and stock returns), it is necessary to deflate predicted excess compensation for scale differences across observations. We do this by redefining predicted excess compensation as the ratio of the amount computed in Eq. (1) to total compensation.¹³

In order to determine whether the observed associations between the level of compensation and the board and ownership structure variables are proxies for the effectiveness of the governance structure or are due to a misspecified model of the economic determinants of the level of CEO compensation, we estimate the association between our measure of predicted excess compensation and subsequent firm financial performance.¹⁴ If the association between compensation and board and ownership structure reflects the degree of managerial entrenchment, we expect to observe a negative association between our measure of predicted excess compensation and subsequent performance. We expect no association (or perhaps a positive association) between predicted excess compensation and subsequent performance if the compensation and board and ownership structure reflects some dimension of the firm’s demand for a high-quality CEO. Thus, whether there is a negative association between the predicted excess compensation due to board and ownership structures and subsequent firm performance is a test of the hypothesis that the coefficients on

¹³ We also considered alternative deflators such as predicted total compensation. A potential advantage of this measure is that it eliminates the idiosyncratic noise in the compensation decision from the denominator. Using this measure, predicted excess compensation is somewhat more highly associated with subsequent operating performance and somewhat less highly correlated with subsequent stock returns.

¹⁴ One advantage of using predicted excess compensation in the performance regression is that the compensation regression provides a single variable formed by the weighted linear composite of the board and ownership variables, where the weights are derived from the covariance between the level of compensation and each of the board and ownership structure variables after controlling for the economic determinants of compensation. This linear composite is likely to have considerably less measurement error than the individual board and ownership structure variables that comprise it. Moreover, with our approach, we only need to examine the sign and statistical significance of the coefficient on this single variable in the performance regression in order to examine the validity of our interpretation of the compensation regression results. An alternative approach would be to regress subsequent firm performance on the individual board and ownership structure variables. We could then examine each of the coefficients for evidence of managerial entrenchment. The weakness of this approach is that it does not incorporate any of the information gained from the compensation regression, and accordingly provides a weaker test of our hypothesis.

the board and ownership structure variables estimated in the CEO compensation model are indicative of the effectiveness of corporate governance.¹⁵

In the first set of tests, we examine the relation between predicted excess compensation and subsequent accounting operating performance. The specific regression used in our hypothesis test is

$$ROA_i = \delta_0 + \delta_1 \text{ Predicted excess compensation}_i + \delta_2 \text{ Std dev of ROA}_i \\ + \delta_3 \text{ Sales}_i + \theta \text{ Year controls}_i + \lambda \text{ Industry controls}_i + \varepsilon_i, \quad (2)$$

where the performance measure is the average return on assets for the subsequent year, three years, or five years after compensation is awarded, the standard deviation of ROA is the standard deviation of return on assets for the five years prior to when compensation is awarded, predicted excess compensation is the scaled measure defined above, and all of the other variables are as previously defined.¹⁶

The predictions concerning the correlation between our measure of predicted excess compensation and subsequent performance are straightforward for measures of accounting operating performance. However, under the alternative hypothesis of managerial entrenchment, there need be no correlation with stock market performance if the market fully impounds the firm's agency problems in the level of the stock price at the beginning of the period. The specific regression used in our hypothesis test is

$$\text{Stock return}_i = \alpha_0 + \alpha_1 \text{ Predicted excess compensation}_i \\ + \alpha_2 \text{ Std dev of stock return}_i + \alpha_3 \ln(\text{Market value equity})_i \\ + \alpha_4 \text{ Market-to-book}_i + \theta \text{ Year controls}_i \\ + \lambda \text{ Industry controls}_i + \varepsilon_i, \quad (3)$$

where stock return is the average common stock return for the subsequent fiscal year, three fiscal years, or five fiscal years after compensation is awarded, and the standard deviation of stock return is the annual standard deviation of return on the common stock for the five years prior to when compensation is awarded.

¹⁵The results in this section are based on the regression analysis of total compensation. The results were virtually identical with cash compensation and salary, and thus we do not report these regressions in the text.

¹⁶In order to illustrate the timing for variable measurement, assume that we were using compensation data from the 1984 survey to construct excess compensation. The compensation data would provide information on the salary for 1984, bonus paid in 1984 for 1983 performance and the expected value of long-term components of compensation awarded at the beginning of 1984 or the end of 1983. Return on assets would be computed for either 1984, 1984 to 1986 or 1984 to 1988, sales would be for 1983, and the standard deviation of return on assets would be measured over the five years ending 1983.

The market value of equity and the market-to-book ratio are measured as of the end of the fiscal year prior to when compensation is awarded, and all of the other variables are as previously defined.

We chose not to calculate measures of excess returns, such as market-adjusted returns or excess returns from the CAPM, because of the problems discussed in Barber and Lyon (1997) and Kothari and Warner (1997), and because we are concerned here with estimating the covariance between predicted excess compensation and subsequent performance, as opposed to the abnormal returns associated with some event. As such, it is best to control for expected returns in-sample where we can adequately measure the differences in governance structures. The inclusion of the industry-indicator variables controls for idiosyncratic returns within each industry group over the relevant period, and the inclusion of time-indicator variables allows us to measure returns relative to the average return in the sample over the same time period.¹⁷ We also include the market value of equity, standard deviation of return, and the market-to-book ratio as independent variables because prior studies have indicated that risk, size, and market-to-book are potentially important determinants of firm performance.¹⁸ Including these as independent variables, as opposed to relying on typical excess return measures, allows us to conduct in-sample tests where we explicitly control for differences in governance structure quality.

5.2. Results

Table 3 presents the estimation results for the model described by Eq. (2) (subsequent performance measured via average return on assets), and Table 4 presents results for the model described by Eq. (3) (subsequent performance measured via average stock return). The results in Tables 3 and 4 indicate that excess compensation has a significant negative association with subsequent firm operating performance and subsequent firm stock returns. Table 3 indicates that a 40% increase in excess compensation (the standard deviation of excess compensation is approximately 40%) is associated with a decrease in annual return on assets of approximately 1% per year (the coefficient implies a per-year loss in ROA of -1.36% , -1.19% , and -0.97% , for one-year, three-year, and

¹⁷The results presented include only industry-indicator and year-indicator variables, and thus returns are not being measured over precisely the same period for each firm because of different fiscal year-ends. We also estimated, but do not report, the same regressions using a different time-indicator variable for each month-year combination, which precisely controls for the average return in the sample among firms with the same fiscal year-end. The results are not affected by this alternative.

¹⁸If governance structure quality is priced by investors, then the market value of equity and the market-to-book ratio will be affected by the governance structure. Our results are not sensitive to excluding the market value of equity and the market-to-book ratio as independent variables.

Table 3

Regressions of subsequent operating performance on predicted excess CEO compensation, the standard deviation of ROA, sales, and industry and year controls

The sample consists of the subsample (of the original sample of 205 firms between 1982 and 1984) for which subsequent performance data is available in the years after CEO compensation was earned. Predicted excess compensation is the amount of compensation attributable to the board and ownership structure variables (estimated with the coefficients from the total compensation regression in Table 2), scaled by total compensation. The standard deviation of ROA is the standard deviation of annual percentage corporate return on assets for the five years ending with the year prior (i.e., 1983) to the year in which compensation is awarded (i.e., 1984). Sales are for the year prior to the year in which compensation is awarded. *t*-statistics are based on White standard errors when the White (1980) test is significant (*p*-value < 0.05), and on OLS standard errors otherwise.

	Average ROA for period:		
	One-year	Three-year	Five-year
Predicted excess compensation	– 3.403 (– 4.84)	– 2.968 (– 4.24)	– 2.427 (– 3.69)
Standard deviation of ROA	– 0.217 (– 1.55)	– 0.241 (– 1.53)	– 0.206 (– 1.52)
Sales	0.000014 (0.60)	0.000049 (2.31)	0.000053 (2.79)
Adj- <i>R</i> ²	25.2%	29.6%	33.9%
<i>F</i>	10.18	11.81	13.32
Number of regressors	19	19	19
<i>N</i>	492	463	434

five-year ROA, respectively).¹⁹ Since the average ROA in the sample is approximately 10%, this implies a loss of approximately 10% of the sample average ROA. Since the coefficient on predicted excess compensation attenuates toward zero with longer prediction intervals, it implies that the negative effect on ROA is diminished somewhat at longer horizons. In particular, a 40% increase in excess compensation is associated with a cumulative loss in ROA of 1.36%, 3.56%, and 4.85% for one-year, three-year, and five-year holding periods. The sample average cumulative ROA for these periods is 10.3%, 29.7%, and 49.0%, respectively. In other tests not reported in tables, the decline in performance in years four and five is still statistically significant.

¹⁹ We also estimated the accounting operating performance regression including the market-to-book ratio as a control variable, as the market-to-book ratio has been used as a proxy for risk and for the firm's investment opportunity set. In regressions not reported, the market-to-book ratio is significantly positive and the predicted excess compensation remains significantly negative.

Table 4

Regressions of subsequent stock return on predicted excess CEO compensation, the standard deviation of RET, $\ln(\text{Market value of equity})$, the market-to-book ratio, and industry and year controls

The sample consists of the subsample (of the original sample of 205 firms between 1982 and 1984) for which subsequent performance data is available in the years after CEO compensation was earned. Predicted excess compensation is the amount of compensation attributable to the board and ownership structure variables (estimated with the coefficients from the total compensation regression in Table 2), scaled by total compensation. The standard deviation of RET is the standard deviation of annual percentage stock market return for the five years ending with the year prior (i.e., 1983) to the year in which compensation is awarded (i.e., 1984). $\ln(\text{Market value of equity})$ and the market-to-book ratio are calculated based on the market value and book value of the firm's equity at the end of the year prior to which compensation is awarded. *t*-statistics are based on OLS standard errors.

	Average return for period		
	One-year	Three-year	Five-year
Predicted excess compensation	− 12.432 (− 3.73)	− 7.059 (− 3.47)	− 4.438 (− 2.54)
Standard Deviation of RET	− 0.205 (− 2.70)	− 0.226 (− 4.98)	− 0.194 (− 5.00)
$\ln(\text{Market value of equity})$	− 3.666 (− 2.95)	− 0.656 (− 0.87)	− 0.464 (− 0.72)
Market-to-book ratio	− 9.446 (− 4.55)	− 4.489 (− 3.59)	− 3.037 (− 2.79)
Adj- R^2	30.6%	28.2%	31.9%
<i>F</i>	12.39	10.50	11.29
Number of regressors	20	20	20
<i>N</i>	491	460	418

The coefficients on excess compensation in Table 4 indicate that a 40% increase in excess compensation is associated with a decrease in annual stock returns per year of -4.97% , -2.82% , and -1.78% , for one-year, three-year, and five-year stock returns, respectively. Since the average common stock return in the sample is approximately 15% per year, this implies a loss of approximately 33% of the sample average return for the first year and 20% for the first three years. The coefficient estimates and other tests not reported in the tables indicate that predicted excess compensation has no ability to explain returns in either the fourth or fifth subsequent year, as all of the decline occurs by the end of the third year. A 40% increase in excess compensation is associated with a cumulative loss in the returns to common stock of 4.97%, 8.47%, and 8.88% for one-year, three-year, and five-year holding periods. The sample average cumulative stock return for these periods is 15.9%, 48.6%, and 81.5%, respectively.

Overall, the predictable component of compensation due to board and ownership structure variables exhibits a significant negative association with subsequent firm operating and stock market performance.²⁰ More importantly, these results suggest that the board and ownership variables proxy for managerial entrenchment (or the absence of active monitoring by the board of directors), as opposed to the alternative interpretation that these variables are simply measures for a firm's demand for a high-quality CEO.

6. Sensitivity tests

In this section, we test the sensitivity of the results to a number of alternative specifications: (1) inclusion of mix of compensation as an economic determinant of CEO pay; (2) averaging individual firm observations; and (3) using log-transformed CEO compensation and sales. The results of these sensitivity tests are reported in Tables 5 and 6, where, for the purposes of comparison, the key results from Tables 2–4 are repeated in the first column. Table 5 reports the results of the alternative specifications on the compensation equation. The table reports only the coefficients and *t*-statistics on the board and ownership structure variables since that is the focus of the compensation regressions. Table 6 reports the results of the alternative specifications on the performance equations, where only the coefficient on predicted excess compensation is reported because that is the key element of the performance equations.

6.1. *Mix of pay as an economic determinant of compensation*

The mix of pay is included as an economic determinant to provide insight into whether controlling for compensation risk in regressions of the level of pay significantly affects our results. If firms provide more incentives to the CEO through pay risk when monitoring is more difficult, and if our board-of-director and ownership variables proxy for low monitoring quality, it is conceivable that the increase in pay level associated with these variables results from an increase in compensation risk. However, this would not explain why the predicted excess compensation arising from board and ownership structure variables is

²⁰If firms experience mean reversion in their accounting operating performance (a well-documented phenomenon for firms with extremes of good or bad performance), the negative correlation between predicted excess compensation and subsequent performance could simply be driven by mean reversion in operating performance. We examined the correlation between predicted excess compensation and contemporaneous ROA and found them to be negatively correlated, indicating that we are not simply detecting mean reversion. However, the negative correlation suggests that we are detecting persistent poor operating performance by firms with low-quality governance structures.

negatively correlated with subsequent performance. Nevertheless, in order to see how sensitive our results are to this issue, we include the mix of pay (defined as the difference between total compensation and salary, divided by total compensation) as an economic determinant of pay.

The second column of Table 5 contains the regression coefficient estimates on the board and ownership structure variables when mix of pay is included in the compensation regression. The results indicate that most of the board and ownership structure variables continue to remain significant; however, the chair/CEO variable, busy directors, CEO ownership and non-CEO insider ownership are no longer statistically significant. The results in the second column of Table 6 indicate that the predicted excess compensation arising from the board and ownership structure variables has a significant negative association with subsequent accounting performance and stock returns, even after controlling for compensation risk (mix of pay) as an economic determinant of compensation.²¹

By including mix of pay as an economic determinant, we are implicitly assuming that it is set by the board in order to maximize firm value. However, if there are unresolved agency problems embedded in the board and ownership structure, we would expect that mix of pay would reflect the same governance structure weaknesses as the level of compensation, since excess compensation could be partially disguised by using more long-term compensation.²² The value of long-term grants (e.g., options, performance units, etc.) was not readily obvious to shareholders in the early 1980s given the disclosure rules in force at the time. Thus, poor governance could be associated with an increase in mix of pay. In order to examine this issue further, we used mix of pay as the dependent variable in the compensation regression and then examined the association between predicted excess mix arising from the board and ownership structure variables with subsequent performance. These results are contained in the last column of Tables 5 and 6.

Table 5 indicates that mix of pay and level of pay are related to the board and ownership structure variables in a very similar manner; only the proportion of

²¹ We also treated CEO chair as an economic determinant because if the CEO is also board chair, it may mean that the job is more complex and that the CEO is of higher quality than a non-chair CEO. Results not reported in the tables indicate that even when the variable 'CEO is board chair' is treated as an economic determinant, the predicted excess compensation arising from the remaining board and ownership structure variables is significantly negatively associated with future performance.

²² Notice that if the same governance structure weakness reflects itself in the mix of pay as well as the level of compensation, we would expect that the addition of the mix of pay as an independent variable would cause potential multicollinearity problems and reduce the significance of the board and ownership structure variables, which is consistent with the results reported in Table 5 when pay mix is included as an economic determinant.

Table 5
Sensitivity analysis of CEO total compensation model to alternative specifications

Table contains only the estimated coefficients of the board and ownership structure variables (OLS *t*-statistics in parentheses), and does not report coefficients for the economic determinant variables. Total compensation is the sum of salary, annual bonus, and our valuations for stock options, performance plans, phantom stock, and restricted stock. Mix is annual and long-term incentive pay and as a percentage of total compensation. *Board Structure*: CEO is board chair is an indicator variable equal to one if the CEO is also chairman of the board, zero otherwise. Board size is the total number of directors on the board. Inside directors is the percentage of the board who are managers, retired managers, or are relatives of current managers. Outside directors appointed by CEO is the number of outside directors on the board appointed by the CEO as a percentage of board size. Gray outside directors is the number of outside directors who are gray (a director is gray if he or his employer received payments from the company in excess of his board pay) as a percentage of board size. Interlocked outside directors is the number of outside directors who are interlocked (a director is interlocked if an inside officer of the firm serves on the board of that outside director's company) as a percentage of board size. Outside directors over age 69 is the percentage of the outside directors who are over age 69. Busy outside directors is the percentage of outside directors who serve on three or more other boards (six or more for retired outside directors). *Ownership Structure*: CEO percentage stock ownership is the percentage of outstanding shares owned by the CEO. Non-CEO insider owns 5% is an indicator variable equal to one if the firm has an internal board member (other than the CEO) who owns at least 5% of the outstanding shares, and zero otherwise. Percentage stock ownership per outside director is the total percentage of outstanding shares owned by outside directors divided by the number of outside directors. Outside blockholder owns 5% is an indicator variable equal to one if the firm has an external blockholder who owns at least 5% of the outstanding shares, and zero otherwise.

	Dependent variable is CEO total compensation			Dependent variable is mix of pay
	As reported in Table 2	Includes mix of pay as economic determinant	Average observations for each firm	
<i>Board structure</i>				
CEO is board chair	152,577 (2.86)	38,177 (1.10)	152,586 (2.05)	0.1412 (2.89)
Board size	30,601 (3.51)	11,971 (2.10)	34,034 (2.78)	0.0091 (1.07)
				0.0612 (2.81)
				0.0100 (2.80)

Inside directors	-5,639 (-3.22)	-2,011 (-1.76)	-5,464 (-2.21)	-0.0047 (-2.93)	-0.0019 (-2.71)
Outside directors appointed by CEO	4,137 (4.14)	1,558 (2.38)	4,761 (3.30)	0.0044 (4.93)	0.0014 (3.38)
Gray directors	7,356 (3.19)	3,978 (2.65)	7,144 (2.22)	0.0023 (1.13)	0.0018 (1.92)
Interlocked outside directors	4,358 (0.99)	977 (0.34)	5,186 (0.81)	0.0053 (1.33)	0.0018 (1.01)
Outside directors over age 69	4,136 (2.42)	5,394 (4.88)	5,156 (2.09)	0.0038 (2.48)	-0.0007 (-0.97)
Busy outside directors	2,016 (1.80)	756 (1.04)	2,808 (1.83)	0.0013 (1.26)	0.0007 (1.47)
<i>Ownership structure</i>					
CEO percentage stock ownership	-8,027 (-2.21)	-2,911 (-1.23)	-4,592 (-0.96)	-0.0054 (-1.64)	-0.0027 (-1.84)
Non-CEO insider owns 5%	-142,389 (-2.18)	-26,724 (-0.63)	-188,472 (-2.10)	-0.0750 (-1.27)	-0.0619 (-2.32)
Percentage stock ownership per outside director	-21,183 (-0.81)	30,936 (1.82)	-18,558 (-0.46)	-0.0167 (-0.71)	-0.0279 (-2.62)
Outside blockholder owns 5%	-86,100 (-1.98)	-121,267 (-4.23)	-101,629 (-1.61)	-0.0047 (-0.11)	0.0188 (1.06)
Adj-R ²	37.2%	73.7%	39.6%	48.2%	27.9%
F	9.85	41.73	5.30	14.95	6.81

Table 6

Sensitivity analysis of subsequent operating and stock return performance models to alternative specifications of the CEO compensation regression

This table contains only the estimated coefficient on predicted excess CEO compensation arising from the board and ownership structure variables (*t*-statistics in parentheses are based on White standard errors when the White (1980) test is significant (*p*-value < 0.05), and OLS standard errors otherwise), and does not report coefficients on the control variables defined and used in Tables 3 and 4. Predicted excess CEO compensation is based on a residual from the corresponding model in Table 5.

Dependent variable measuring performance is	Specification of CEO total compensation regression			Dependent variable in compensation regression is mix of pay	
	As reported in Tables 3 and 4	Includes mix of pay as economic determinant	Average observations for each firm		Dependent variable in compensation regression is $\ln(\text{total})$ and $\ln(\text{sales})$ is used as economic determinant
<i>Average ROA for subsequent period</i>					
One year	- 3.403 (- 4.84)	- 6.835 (- 5.38)	- 2.770 (- 2.91)	- 5.138 (- 3.08)	- 3.119 (- 4.50)
Three year	- 2.968 (- 4.24)	- 6.891 (- 5.33)	- 2.430 (- 2.76)	- 4.521 (- 2.70)	- 2.451 (- 3.77)
Five year	- 2.427 (- 3.69)	- 6.171 (- 4.94)	- 2.170 (- 2.50)	- 3.600 (- 2.46)	- 1.660 (- 2.76)
<i>Average stock return for subsequent period</i>					
One year	- 12.432 (- 3.73)	- 24.153 (- 3.95)	- 8.364 (- 2.40)	- 18.394 (- 2.35)	- 3.591 (- 1.08)
Three year	- 7.059 (- 3.47)	- 16.885 (- 4.63)	- 4.926 (- 1.84)	- 7.271 (- 1.53)	- 1.411 (- 0.72)
Five year	- 4.438 (- 2.54)	- 11.995 (- 3.84)	- 3.114 (- 1.28)	- 6.394 (- 1.58)	0.011 (0.01)

outside directors over 69, stockholdings of outside directors and the existence of an outside blockholder exhibit different associations. Moreover, the results in Table 6 indicate that the predicted excess compensation from the board and ownership structure variables (when using the mix of pay as the dependent variable in the compensation equation) is significantly negatively related to subsequent operating performance, but not significantly related to subsequent stock market returns. If the mix of pay were optimized from the firm's perspective, we would not expect a negative correlation between the predicted component of mix of pay arising from the board and ownership structure variables with subsequent performance.²³ The observed negative correlation between the predicted mix of pay from board and ownership structure with subsequent performance suggests that mix of pay reflects an agency problem, and thus cannot be considered solely an economic determinant of the CEO's total compensation.

6.2. *Averaging individual firm observations*

As indicated previously, we have multiple observations for our firms, which suggests that the *t*-statistics may be somewhat overstated. Moreover, long-term grants may not be given every year, and this will tend to induce measurement error in our measure of total compensation, even though the compensation consulting firm annualizes some of the unusually large grants in the data. To mitigate these two issues, we averaged all the observations available for a given firm and then used the average of the observations in the regressions (this forced us to drop the year controls from the regressions). As can be seen from the third column of Table 5, only the significance of CEO percentage stock ownership in the compensation equation is affected by the averaging. Moreover, the third column of Table 6 indicates that the predicted excess compensation still exhibits a statistically significant negative association with subsequent operating performance, and the relation with subsequent stock market performance, though somewhat diminished, is still significant one year and three years ahead.

6.3. *Using log-transformed CEO compensation and sales*

The results in Table 2 estimate CEO compensation using untransformed data. However, it is also common to estimate regressions involving levels of

²³ Mehran (1995) finds that pay is more risky as the proportion of outside directors increases, and that contemporaneous firm performance (not future firm performance), measured by Tobin's Q and ROA, is positively correlated with mix of pay. He interprets these findings as evidence that more effective boards use greater pay mix, and that greater pay mix leads to higher performance. Our results, however, indicate that the predicted component of mix arising from board and ownership structure variables is negatively correlated with subsequent performance.

compensation after transforming compensation and sales via the natural logarithm. One justification for this practice is that the typical ‘guide charts’, which are used by human resource consultants to set compensation levels, are constructed by regressing the logarithm of compensation on the logarithm of firm size (e.g., Amacom, 1975). In order to test the robustness of our results, we use $\ln(\text{compensation})$ as a dependent variable and $\ln(\text{sales})$ as an economic determinant, but continue to define the other economic determinants and board and ownership structure variables as previously. The advantage of this specification is that the regression coefficients on the board and ownership structure variables measure the proportionate effects of a variable on compensation, rather than the dollar value effect. Since our firms are generally large firms, the dollar value specification may be appropriate; nevertheless, the logarithmic transformation directly addresses this issue.

The results of this log-transformed specification are contained in column 4 of Table 5. The interpretation of the coefficient on CEO is Board Chair of 0.1412 is that a CEO who is also board chair is paid 14.12% more than a CEO who is not board chair. In this alternative specification, the coefficients on board size, gray directors, busy directors, non-CEO insider holding 5% and outside blockholders owning 5%, retain the same sign but fall in significance. The remaining board and ownership structure variables retain their signs and significance levels, and overall the board and ownership structure variables explain a significant amount of the variance in \ln of *compensation* (incremental R^2 of 8.55% and F -statistic of 7.51). Moreover, column 4 of Table 6 indicates that the predicted board and ownership structure arising from this alternative specification still exhibits a significantly negative association with subsequent operating and stock market performance, though the ability to predict subsequent stock market performance is somewhat diminished.²⁴

6.4. Summary of sensitivity analysis

Overall these sensitivity results reinforce our findings that the board and ownership variables measure managerial entrenchment. The results in Table 5 suggest that the strength of the association between CEO compensation and the board-of-director variables is more robust than the strength of the association between CEO compensation and the ownership variables. If a board variable is significant in Table 2, it is generally significant in the alternative specifications,

²⁴ Since the predicted component arising from the board and ownership variables is already measured as a proportionate effect on compensation in this specification, we do not deflate by total compensation. The economic interpretation of the coefficients is similar to the other specifications. For example, a 40% increase in predicted compensation arising from the board and ownership structure variables results in a one-year reduction in ROA of 2.05% (0.40 times 5.138).

which is less true for the ownership structure variables. Moreover, the results in Table 6 provide at least some assurance that the negative association between predicted excess compensation and future performance is not being induced by obvious model misspecification. In addition, the results in Table 6 suggest that prediction of subsequent accounting operating performance is more robust than the predictions of subsequent stock market performance. Given uncertainty about whether the performance effects of the governance structure would be fully impounded in the level of stock price, it is not surprising that predictions of subsequent stock market performance with board and ownership structure are less robust to alternative specifications.

In order to further assess the relative importance of the board and ownership structure, we computed two different measures of predicted excess compensation: the predicted excess compensation related to board structure and the predicted excess compensation related to ownership structure. These two measures (both deflated by total compensation) have a statistically significant negative correlation of -0.33 ($p < 0.001$, two-tail), consistent with the intuition that the two monitoring mechanisms are substitutes. If we include both measures of predicted excess compensation in the accounting performance and stock return performance regression models, we find that predicted excess compensation arising from the board structure is significantly negatively associated with both operating and stock market performance across the alternative specifications examined. However, the association between predicted excess compensation arising from the ownership structure and both operating and stock market performance, while negative, exhibits varying levels of significance across specifications. For example, in the specification reported in Sections 4 and 5, predicted excess compensation from the ownership structure is only marginally significant (approximately 20% level, two-tailed) in explaining subsequent accounting and stock market performance. However, if we include mix of pay as an economic determinant, the predicted excess compensation from the ownership structure is significant in explaining subsequent accounting and stock market performance. Overall, the results suggest that board structure variables used in our analysis are somewhat more important than the ownership structure variables in predicting future performance.

7. Summary and conclusions

This study documents that board and ownership structure are associated with the level of CEO compensation, after controlling for the standard economic determinants of compensation (the firm's demand for a high-quality CEO, prior firm performance, and risk). With respect to board-of-director structure, we find that CEO compensation is a decreasing function of the percentage of the board composed of inside directors, and is an increasing function of board size, the

percentage of the board who are outside directors appointed by the CEO, the percentage of the board who are gray outside directors, the percentage of outside directors who are over age 69, the percentage of outside directors who serve on three or more other boards (six or more other boards if retired), and whether the CEO also is board chair. With respect to ownership structure, we find that CEO compensation is a decreasing function of the CEO's ownership stake. In addition, CEO compensation is lower when there is a non-CEO internal board member or an external blockholder who owns at least 5% of the shares. However, we find no statistical association between percentage ownership per outside director and CEO compensation. Overall, both board characteristics and ownership structure have a substantive cross-sectional association with the level of CEO compensation, though the results on board characteristics are more robust to alternative specifications.

The predicted component of compensation arising from the board and ownership variables exhibits a negative correlation with subsequent firm operating and stock return performance. This result suggests that the estimated coefficients on the board-of-director and ownership structure variables from the compensation regression reflect the relative effectiveness of various governance structures in controlling agency problems, as opposed to the explanation that these variables are additional proxies for the firm's demand for a high-quality CEO. Thus, the board and ownership structures affect the extent to which CEOs obtain compensation in excess of the level implied by economic determinants, which we conjecture predicts the manifestation of other contracting inefficiencies within the firm that lead to poorer subsequent performance. Finally, our robustness checks suggest that board and ownership structure more consistently predict future accounting operating performance than future stock market performance.

Our results are largely consistent with many of the guidelines for improving corporate governance that have been recently promulgated by various groups, such as the National Association of Corporate Directors (1996). In particular, calls for improving corporate governance by separating the Chairman and CEO, relying on smaller boards, imposing mandatory retirement ages or term limits, eliminating gray directors, limiting the number of other boards on which a board member may serve, are all consistent with our results. While our results indicate that, on average, these guidelines have identified substantive issues in the creation of effective governance mechanisms, our evidence does not imply that it is appropriate to adopt strict rules for the composition of the board or ownership structure. Contrary to many guidelines for improving corporate governance, we find no evidence that independent outside directors create a more effective board than inside directors, nor do we find that greater equity ownership by outside directors results in improved governance systems. Given the prior mixed evidence on the importance of outside directors and our evidence that inside directors may be superior to outside directors, the attention

focused on the importance of outside directors and their ownership stakes appears misplaced.

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