

**Compensation of Outside Directors:  
An Empirical Analysis of Economic Determinants**

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### **Abstract**

Little is known about the economic environments and determinants of the compensation arrangements for outside board members. As delegated monitors of corporate management, board members act as shareholders' agents. Thus, a potential for misaligned interests exists, requiring in turn incentive arrangements that are incentive-compatible and individually rational. We study the economic determinants of both the levels and mix of compensation for outside board members. We also examine the effects of the existence of a director pension plan on the relation between director compensation and the hypothesized determinants. In sum, and contrary to criticism that the board of directors is often a passive, ineffective entity that dislikes conflict with incumbent management, we find that board compensation is structured to mitigate agency problems inherent in firms whose management control is separated from ownership.

JEL classification: J33, D82, D23

Key Words: Director compensation, outside directors, director pension plan, incentive contracts, agency theory

## **Compensation of Outside Directors: An Empirical Analysis of Economic Determinants**

### **1. Introduction**

While board member characteristics and board composition have attracted significant attention from both financial economists and practitioners, compensation paid to outside directors has escaped similar scrutiny. One possible reason for the paucity of the studies on director compensation (compared to the extensive line of research on CEO compensation) is that, relative to CEOs whose contributions and decisions critically affect firm performance and value, the board of directors' role as a corporate monitor appears of reduced importance, except for the extreme scenarios where the board's intervention is warranted.<sup>1</sup>

However, outside board members, acting as monitors of corporate behavior, also serve as shareholders' agents. Therefore, a potential for misaligned interests exists, requiring in turn incentive arrangements that are incentive-compatible and individually rational for board members, as for executives. Limited evidence suggests that outside board members are paid increasingly in a manner to mitigate such agency problems. For instance, over the past five years, remuneration for outside directors has increased by 70%, largely due to the growth of stock-based compensation (stock and stock options) [Oppermann, 1997; Schellhardt, 1999; Perry, 1999]. Further, Hambrick and Jackson (2000) find that outside directors of forty high-performing firms hold 1.3% of stock in their company (in 1987), compared to only 0.1% for a matched-industry sample of poorly-performing firms. Also, Perry (1999) documents that firms with independent boards whose outside directors receive stock options are more likely to dismiss the CEO of poorly-performing firms.

We attempt to fill the research void by comprehensively analyzing the economic determinants of both the levels of compensation paid to outside directors and the mixes of incentive-based compensation

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<sup>1</sup>For example, Rosenstein and Wyatt (1990) and Byrd and Hickman (1992) find that boards, especially those dominated by outsiders, appear to be effective in correcting severe corporate malfunctions. Weisbach (1988) finds that outsider-dominated boards are more likely to replace poorly performing CEOs. On the other hand, a growing body of evidence suggests that board characteristics are not significantly related to firm value [e.g., Hermalin and Weisbach, 1991; Agrawal and Knoeber, 1996; Core, Holthausen, and Larcker, 1999].

in the total board compensation package. The determinants we consider are agency-theory-based under the proposition that outside director compensation packages are constructed to alleviate potentially misaligned shareholder-board member interests. We examine cash compensation, stock option awards, and stock grants. We also examine the determinants behind the presence of outside director pension plans and explore whether the existence of such a plan affects our results.<sup>2</sup>

Using a sample of more than 1,700 U.S. firms over the 1992-1997 period, we provide strong, overall support for the hypothesized determinants. We find that the level of outside director stock option awards is positively related to the firm's growth opportunities, institutional stock holdings, and the threat of takeover, and negatively associated with firm size, the number of lines of business, managerial stock ownership, and regulation. By comparison to stock option awards, we find that the level of director stock grants is negatively related to the firm's growth opportunities and takeover threat. We find that the mix of stock option compensation to cash compensation is positively related to the firm's growth opportunities, institutional stock holdings, and negatively associated with managerial stock ownership, firm leverage, effective tax costs, free cash flow, firm size, number of business segments, and regulation. We find that the mix of stock grants to cash compensation is negatively related to growth opportunities and positively related to firm leverage, liquidity, firm size, and the number of segments. Finally, we find that director pension plans have a set of economic determinants similar to that for director cash compensation and that the existence of a director pension plan does not affect the relation between director compensation and the hypothesized determinants.

In summary, we conclude that outside board compensation packages are designed largely around agency-cost reduction, arising from management oversight and control that is separate from ownership. Thus, it appears that compensation packages paid to outside directors are designed to resemble compensation packages paid to the CEO. This conclusion contrasts with criticisms that board members

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<sup>2</sup>Two related, but tangential, studies are by Perry (1999) and by Vafeas (1999b) who examine the adoption of director incentive plans (i.e., the dichotomous measure of "use" or "non-use" of stock options for outside directors).

are often passive and ineffective, shunning conflict with incumbent management [Crystal, 1991; Jensen, 1993]. Our findings and conclusions, to our knowledge, represent the first comprehensive study on the relation between a set of firm characteristics and outside director compensation.

The rest of the study is organized as follows. Section 2 describes our hypothesized determinants. Section 3 describes board compensation measures and the research design. Section 4 provides descriptive statistics on our sample and section 5 presents our empirical findings. Section 6 provides evidence on robustness checks and contains the results on outside director pension plans. Section 7 concludes the study.

## **2. Hypothesized determinants**

Boards of directors are the elected agents of shareholders. Their role is to “manage” the “business and affairs” of the corporation (e.g., see Delaware General Corporation Law (DGCL) §141(a)). However, for large publicly-traded firms with many shareholders, internal management (e.g., the officers of the firm) run the day-to-day operations, with the board playing a crucial oversight role on behalf of shareholders. The existence of agency problems between shareholders and internal management and the resulting value loss has been well-documented [Berle and Means, 1932; Jensen and Meckling, 1976]. However, agency problems also exist between shareholders and outside directors as well [Williamson, 1984; Fama and Jensen, 1983].

Following Fama and Jensen (1983) and Jensen and Meckling (1976), we define agency costs as the costs of structuring, monitoring, and bonding a set of contracts among agents with conflicting interests and the value of output lost because the costs of full enforcement of contracts exceed the benefits. One way to alleviate the agency problems between shareholders and outside directors is to provide outside directors with compensation packages that directly align the interests of both parties. Types of compensation include cash (e.g., annual cash retainer, fee per board meeting, and fee for chairing a committee), stock option awards, restricted stock grants, and pension plans. Each award has its benefits and drawbacks in motivating directors to act in the best interests of their shareholders. These benefits and

detriments, in turn, depend on the characteristics of each firm.

In the following subsections, we describe the various hypothesized attributes that are related to the levels and mix of outside director compensation. When there is a clear directional hypothesis, we present it. Otherwise, we discuss the rationales behind conflicting predictions.

### *2.1. Investment opportunities*

High growth firms tend to include stock option awards and stock grants in upper management compensation packages.<sup>3</sup> The reliance on stock-based compensation is due, in part, to the high level of information asymmetry (and the low level of liquidity) that is typical of high growth firms. Since stock-based compensation captures future as well as present cash flows, prior studies argue that it dominates cash as a form of compensation for investment-rich firms [e.g., Smith and Watts, 1992].

We predict that firms with rich investment opportunities are likely to rely heavily on stock-based compensation. Thus, both the level of stock-based compensation and mix of stock-based compensation to cash are predicted to be positively related to the firm's growth opportunities. However, the incentives attached to stock option awards are not equivalent to those of stock grants. Stock option awards provide a convex payoff schedule, which likely induces the risk-taking that is critical for high growth firms [Bryan, Hwang, and Lilien, 2000]. By comparison, stock grants, because of their linear payoff schedule, likely contribute to the under-investment problem [Smith and Stulz, 1985] as risky, yet value-increasing, projects are less likely to be pursued. Thus, we predict that high growth firms will use stock option awards more heavily than stock grants in outside directors' compensation packages.

To measure investment opportunities, we use the market-to-book ratio and, alternatively, in our robustness checks, research and development expenditures scaled by the market value of the firm,

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<sup>3</sup>Prior studies researching the association between the firm's growth opportunities and CEO stock-based compensation (especially stock options) include Lewellen, Loderer, and Martin (1987), Clinch (1991), Smith and Watts (1992), Bizjak, Brickley, and Coles (1993), Gaver and Gaver (1993), Yermack (1995), Bushman, Indjejikian, and Smith (1996), and Kole (1997). However, there is no comparable empirical evidence on the board of directors' stock option awards and stock grants.

consistent with prior studies [e.g., Gaver and Gaver, 1993; Baber, Janakiraman, and Kang, 1996].

## *2.2. Managerial stock ownership*

Firms whose managers hold a large fraction of equity have a reduced demand for additional incentive or monitoring mechanisms [Jensen and Meckling, 1976]. Therefore, for these firms, we predict that outside directors' compensation packages will contain a lower mix of stock-based compensation. In addition, we expect the equilibrium levels of board compensation to be inversely related to managerial stock holdings.

However, at high managerial shareholdings, two forces potentially counterbalance the substitution of managerial ownership for incentive based board compensation. First, at sufficiently high levels of stock ownership, managerial entrenchment problems arise since outside monitoring forces such as takeover threats and proxy fights are unlikely to be effective [Stulz, 1988; Morck, Shleifer, and Vishny, 1988; McConnell and Servaes, 1990; Hermalin and Weisbach, 1991]. Second, managers typically are unable to diversify away the risk associated with their wealth, since their personal capital is largely invested in a single position of employment [Smith and Watts, 1992]. At significantly high levels of stock ownership, it is possible that managers become overly risk-averse, thereby under-investing in value-increasing, yet risky, projects. Therefore, as managerial stock holdings increase above an "optimal" level, the equilibrium level of outside director compensation and the mix of stock-based board compensation may become positively associated with managerial stock holdings. We examine this potential non-linear relation between managerial stock holdings and board compensation by including a quadratic form of managerial stock ownership as a separate independent variable in the regressions, patterned after prior studies [Stulz, 1988; McConnell and Servaes, 1990; Himmelberg, Hubbard, and Palia, 1999].

## *2.3. Institutional stock ownership*

The large stock holdings and sophistication of institutional investors can facilitate effective monitoring. This ensures that managers undertake value-maximizing investment projects [Graves, 1988;

Hansen and Hill, 1991; Bushee, 1998]. In addition, institutional investors have fewer free rider problems relative to fragmented individual shareholders. This provides them with strong incentives to engage in continuous information gathering of corporate affairs [Shleifer and Vishny, 1986]. Both lines of reasoning suggest a substitution effect between institutional shareholdings and the level and mix of stock-based compensation awarded to the outside board members.

However, managerial myopia (i.e., the focus on short-term performance) is often attributed to the primacy of “transient” institutional investors (i.e., those who trade actively on short-term earnings) in the market [Porter, 1992]. To counterbalance this effect, incentive-based compensation for outside directors may be required. In addition, large institutional investors have the clout to nominate board members of their own choice and transfer the monitoring role to the board itself. These arguments lead to a positive relation between institutional ownership and the equilibrium level of compensation and the use of incentive-sensitive stock-based compensation.

#### *2.4. Firm leverage*

Debt can play a disciplinary role and mitigate agency costs arising from excess investment [Grossman and Hart, 1982; Jensen, 1986; Stulz, 1990]. Contractual commitments to pay interest and principal on predetermined schedules limit managerial tendency to overinvest in value-decreasing projects and consequently force managers to liquidate poorly performing assets to avoid technical default of debt covenants. In addition, debtholders demand premiums for increased firm risk, which can occur if incentive plans attempt to align the interests of managers, directors, and stockholders at the expense of debtholders [John and John, 1993; Yermack, 1995]. These two propositions suggest an inverse relation between debt and both the equilibrium level and mix of board compensation. We measure leverage as the sum of short-term and long-term debt scaled by the market value of the firm.

#### *2.5. Liquidity constraints*

Firms with low liquidity are more likely to compensate outside directors with stock-based



compensation, rather than with cash compensation, since stock-based compensation conserves cash. Thus, we predict a negative relation between the mix of stock-based compensation to cash compensation and liquidity. We measure liquidity as free cash flow, defined as cash flows from operating activities less cash outflows for investing activities, scaled by firm value, consistent with Matsunaga (1995) and Dechow, Hutton, and Sloan (1996).

## *2.6. Tax costs*

Stock option awards provide either no tax deduction (for “incentive” stock options) or a tax deduction that is deferred until the options are exercised (for “non-qualified” stock options). Restricted stock grants offer a deferred tax deduction only when the restrictions lapse. Cash compensation, by contrast, is immediately deductible.<sup>4</sup> Therefore, the opportunity cost of losing the tax benefits by using stock-based awards increases with firms’ marginal tax rates [Scholes and Wolfson, 1992; Matsunaga, 1995]. Consequently, we expect firms with high marginal tax rates to shift the mix of director pay away from stock-based compensation and toward cash compensation. As a proxy for the firm’s marginal tax rates, we use net loss carryforwards scaled by market value of the firm [Matsunaga, 1995; Yermack, 1995]. Since firms with a balance of loss carryforwards are likely to incur reduced tax payments than firms without such a balance, the higher the net loss carryforward, the lower the marginal tax rates.

## *2.7. Firm size and the number of lines of business*

The complexities of investing and operating decisions for large diversified firms make the boards’ monitoring function extremely difficult [Eaton and Rosen, 1983]. Complex firms may also have more risky investment outcomes. Under these arguments, larger, multifaceted firms will be associated with higher outside director compensation levels and more stock-based compensation. In contrast, as firms grow, they

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<sup>4</sup>Starting January 1, 1994, the Internal Revenue Code §162(m) allows Section 12 firms to deduct remunerations exceeding \$1,000,000 for the CEO and the other four highest compensated employees, respectively, only if the board has a compensation committee comprised solely of two or more outside directors.

invest resources to establish effective internal control mechanisms, accounting systems, budgeting processes, and performance evaluation systems. If such planning and control systems provide timely information to the board on managerial performance, then the demand for incentive sensitive board compensation is likely to be reduced.

We use the natural logarithm of market value of the firm as a proxy for firm size, where market value of the firm is estimated as the sum of market value common stock and total book liabilities. As a proxy for the number of segments, we use the natural logarithm of the number of lines of business reported by Compustat's Business Segment File.

### *2.8. Regulation*

Direct monitoring and oversight by regulatory authorities decrease information asymmetries in regulated firms. With executives' actions more observable, regulated firms have reduced needs for incentive-sensitive compensation plans for outside directors [Demsetz and Lehn, 1985; Smith and Watts, 1992]. Regulated firms also tend to have limited investment opportunities due to constraints that the regulators impose [Joskow, Rose, and Shepard, 1993].

We use an indicator variable that takes the value of one for firms in the electric utility, banking, and insurance industries, and zero otherwise, consistent with Smith and Watts (1992).

### *2.9. Threat of takeover*

The demand for incentive-sensitive board compensation is likely to be low if active markets for corporate control discipline management and reduce agency costs [Jensen and Ruback, 1983; Fama and Jensen, 1983]. This implies a negative relation between the threat of takeover and compensation levels and mix. Conversely, since firms with mismatches between growth opportunities and financial resources are likely targets [Palepu, 1986], outside directors of firms that are taken over may be accused of poor management of corporate resources, and, consequently may be replaced [Gilson, 1990]. If the threat of takeover imposes added risk on outside board members, then compensation would increase.

Consistent with Agrawal and Knoeber (1998), we estimate the threat of takeover by measuring the incidence of takeovers in a firm's two-digit SIC industry during the preceding three years.<sup>5</sup>

### **3. Board compensation measures and research design**

#### *3.1. Outside director cash compensation, stock option awards, and stock grants*

Directors have the legal authority, within limitations, to determine their own compensation packages [DGCL §141(h); New York Business Corporation Law (NYBCL) §713(e)]. The amount and types of authorized shares available limit stock options and stock grants and shareholders must vote to amend the articles of incorporation if there is a change in stock (e.g., DGCL §242). Many states' corporate laws specifically allow the board of directors to create stock option plans for its directors. For example, Delaware gives this right exclusively to the board (DGCL §157). New York gives the right to the board (NYBCL §202(13)) but requires majority shareholder approval (NYBCL §505(d)).<sup>6</sup> The NASDAQ stock market listing requirements mandate shareholder approval for the establishment of a stock option plan for officers or directors [Sec. 4310(c)(25)(i)(a)].

We use four outside director compensation components: cash compensation, stock option awards, stock grants, and pension plans. Each metric is for one outside director. Cash compensation is defined as:

(1) Cash compensation = Annual cash retainer + (number of board meetings × fee per meeting),

where the number of board meetings is reported in the company's proxy statements and the fee per meeting attended usually is paid in cash.<sup>7</sup>

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<sup>5</sup>Palepu (1986) and Mitchell and Mulherin (1996) show that takeover activity has an important industry component.

<sup>6</sup>Shareholders can sue directors for wasting corporate assets if they feel that directors are being overcompensated. However, a shareholder vote approving, for example, the issuance of stock options to board members shifts the burden of proof from the board to the shareholders. For this reason, many companies present director option plans directly to the shareholder.

<sup>7</sup>If the annual retainer changes in the middle of the year, the previous and current year's annual retainers are prorated according to the relevant number of months and then summed to measure the current year's

The cash compensation metric potentially suffers from measurement error. For instance, it does not include a fee for chairing a standing committee, since not every outside director serves in that capacity. This fee is paid only once a year and is usually smaller than the combined fees paid for committee meetings. Furthermore, since cash compensation includes fees per board meetings, firms with more annual board meetings will register higher cash compensation per director. In addition, the number of board meetings appears to be correlated with firm characteristics such as past firm performance and managerial shareholdings [Vafeas, 1999a]. These points suggests that the level of cash compensation and the regression coefficients in our models may be unduly influenced by firms having abnormally high or low board meetings. We perform sensitivity analyses in Section 6 to address this issue.

Outside director's stock option awards are measured as:

(2) Stock option compensation = (per share option value  $\times$  number of options awarded),

where the per share option value is estimated using the Black-Scholes (1973) model.

Instead of using a dichotomous measure of stock options for outside directors [Perry, 1999; Vafeas, 1999b], our measure takes into account the ex-ante value of stock option awards. However, this metric contains measurement error to the extent that Black-Scholes does not incorporate unique characteristics of stock options, such as non-transferability of stock options and directors' limited ability to hedge their wealth [Huddart, 1994; Cuny and Jorion, 1995; Carpenter, 1998]. The metric also does not include one-time stock options that are often granted to outside directors upon their nomination. If this one-time option grant reduces the need for further annual option awards, then our measure understates the incentive effects derived from stock options.

Director stock grants are defined as:

(3) Stock grants = (number of shares granted  $\times$  average stock price),

where average stock price is the average of beginning and end of the year stock prices.

The mixes of director stock option awards and of stock grants to cash compensation are:

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annual retainer. This adjustment mitigates a potential measurement error from mismatched time periods.

- (4) Mix of stock option awards to cash compensation  
= stock option compensation  $\div$  cash compensation, and
- (5) Mix of stock grants to cash compensation  
= stock grants  $\div$  cash compensation.

In addition, firms often provide outside directors with pension plans for a certain number of years after retirement. Pension benefits usually are determined by the number of years of service to the firm. If director tenure is positively related to the quality of that service, then director pension benefits reflect performance as well. The lack of consideration for the relation between director compensation (both cash and stock-based) and director pension benefits can cause a measurement problem if pensions represent a form of (deferred) compensation. We examine these potential relations in our sensitivity section. We use an indicator variable as our measure of an outside director pension plan.

### *3.2. Regression Specifications*

Since stock options awards and stock grants are not provided every year to outside directors, these variables have a preponderance of left-censored values (at zero). To accommodate for the highly-right-skewed distributions used in the levels regressions, we add the value of one to stock option compensation and stock grant values before log-transformation, an approach similar to Lewellen, Loderer, and Martin (1987). For the mixes, we use a Tobit model because the distribution is less severely skewed, even though it is also left-censored.<sup>8</sup> We also take natural logs of firm size, the number of segments, the percentage of managerial ownership, and the percentage of institutional stock ownership to mitigate potential concerns arising from these skewed distributions.

We include control variables for firm performance and firm risk in the levels regressions, since cash compensation and stock values are related to these characteristics [e.g., Core, Holthausen, and Larcker, 1999]. For firm performance, we use yearly stock returns; for firm risk, we use beta, estimated from a

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<sup>8</sup>As a sensitivity check, we use OLS and a log-transformation for the mix variables. The results with both specifications are qualitatively the same as those reported throughout the paper.

one-factor market model using a maximum of 60 monthly stock returns ending at fiscal year-end.

For all regression results, we present the summary year-by-year regression coefficients to mitigate potential serial correlations that may arise if we used the pooled data set. One advantage to this approach is that the summary of yearly regression coefficients is relatively free from heteroscedasticity. The major disadvantage of this approach is the loss of information relating to year-to-year variation, potentially leading to reduced power of the empirical tests.

#### **4. Sample and descriptive statistics**

##### *4.1. Sample*

All required data on outside director compensation are taken from Standard & Poor's (S&P) ExecuComp database for the 1992-1997 period. ExecuComp covers companies from the S&P 500, S&P 400 mid-cap, and S&P 600 small-cap indices. Firms changing their fiscal year-ends are dropped (for that particular year) to ensure that board compensation relates to the whole year. The sample firms must also have data on the determinants and on the parameters of the Black-Scholes option pricing model available from Compustat and CRSP databases. The data on managerial ownership and institutional stock ownership are from Compact Disclosure. Compustat's Business Segment Files provide the number of segments.

Table 1 presents the distribution of the sample firms by industry and stock exchange. The distributions of the sample companies by one-digit SIC code (panel A) and by stock exchange (panel B) indicate that our sample firms are from a wide range of industries, market capitalizations, and stock exchanges, reducing the concern with sample clustering.<sup>9</sup>

##### *4.2. Descriptive statistics*

Panel A of Table 2 provides several interesting findings. Consistent with anecdotal evidence [e.g.,

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<sup>9</sup>For purposes of exposition, we refer to the NASD as a stock exchange.

Schellhardt, 1999], average level of cash compensation increased only 11%, from \$23,960 in 1992 to \$26,550 in 1997, whereas stock option levels increased 170%, from \$13,840 in 1992 to \$37,290 in 1997. Further, although the value of stock grants rose significantly from 1992 to 1997 (from \$2,200 to \$6,610), the increase in total outside director compensation over the period was attributable largely to the dramatic increase in stock option awards.

Examination of the time trends of the mixes between stock-based and cash compensation tells the same story. The mixes of stock option awards and stock grants relative to cash compensation increased from 0.66 and 0.08 in 1992 to 1.60 and 0.25 in 1997, respectively. The percentages of sample firms issuing stock options (stock grants) increased from approximately 29% (15%) in 1992 to 56% (31%) in 1997. As a result, over 75% of the sample firms granted either stock options or stock to the board of directors in 1997, compared to 43% in 1992.

Finally, we note a steep drop in the percentage of firms offering a pension plan for outside directors. This decrease, from about 35% in 1992 to 16.75% in 1997, became visible in 1996. One possible explanation is that firms increasingly are replacing director pension plans with stock options or stock grants [Oppermann, 1997].

Panel B provides descriptive statistics for the compensation variables and determinants used in the analyses for the whole sample. Since the sample firms are from different industries, size groups, and exchange listings, considerable cross-sectional variations are found in the levels and the mixes of board compensation and the hypothesized determinants. The mean cash compensation is \$25,050 with an inter-quartile range of \$15,000. The mean values of stock options and stock grants are \$24,430 and \$3,520, respectively, compared to the median values of \$0, indicating highly skewed distributions. The mix variables reveal a similar pattern. The means (medians) for stock option and stock grants are 1.13 (0.00) and 0.14 (0.00), respectively.

Panel B also reveals wide cross-sectional variation in the hypothesized determinants. The average market-to-book ratio is 1.84 with an inter-quartile range of 0.97. The mean (median) values of the managerial stock ownership and institutional holdings are 12.11% (4.53%) and 52.42% (54.36%),

respectively. The average firm leverage is 0.16, relative the median leverage of 0.14. The mean (median) values of free cash flow and net operating loss, both scaled by firm value are -0.01 (0.00) and 0.01 (0.00), respectively. The mean (median) values of firm size and the number of segments are \$7.99 billion (\$1.57 billion) and 1.96 (1.00), respectively, and 17% of the sample firms are in regulated industries. The mean value of the threat of takeover, measured as the incidence of takeovers in a firm's two-digit SIC industry during the preceding three years, is 0.19, suggesting that on average slightly less than 20% of firms in a typical industry experienced takeover activity. The average stock returns and market beta for the sample firms are 0.23 and 1.19, respectively.

#### *4.3. Comparisons of board compensation and hypothesized determinants across stock exchanges*

To highlight the cross-sectional variation in our data set, we test for differences in means across stock exchanges in Table 3. Consistent with a common belief, NASD companies, on average, exhibit higher growth opportunities, are smaller, have fewer segments, and are riskier than NYSE firms. Further, relative to NYSE firms, NASD firms have higher levels of managerial stock ownership, lower institutional stock holdings, lower leverage, lower free cash flow, higher net operating loss, and higher incidences of takeover in their industries. Similar differences are found between NYSE and AMEX firms.

Stock option levels are highest for NASD firms while stock grant values are greatest for NYSE firms. More interesting, the mean of the ratio of stock option awards to cash compensation is 0.73 for NYSE firms' directors, compared to 2.26 for NASD firms' directors. This finding is consistent with the prediction that stock options provide a more efficient incentive to directors of high growth firms to mitigate value loss from under-investment.

## **5. Empirical evidence**

### *5.1. Regression results for the levels of outside director compensation*

We begin by presenting the results for the regressions on the levels of outside director compensation components. Table 4 reports average yearly coefficients and our t-statistics are based on



standard errors using yearly regression coefficients. The four columns provide results for cash, stock option awards, stock grants, and total compensation, respectively.

In column (4), the coefficient on the market-to-book ratio is significantly positive, consistent with the hypothesis that total compensation is positively associated with the firm's growth opportunities. However, this result is solely due to the significantly positive coefficient for the regression on stock option awards (column (2)). In contrast, the coefficients are significantly negative for the regressions on cash compensation and stock grants (columns (1) and (3), respectively). In tandem, these findings support the prediction that, relative to stock grants and cash, stock option awards are a more efficient means of providing desired incentives to outside directors of firms with a rich investment opportunity set.

For all four regressions, the coefficients on the percentages of managerial stockholdings are statistically negative. These results are consistent with the substitution hypothesis, namely that high ownership aligns otherwise divergent interests, reducing the demand for other incentive mechanisms [Jensen and Meckling, 1976]. When we include a quadratic form of managerial stock ownership as a separate independent variable (to test for a potential non-linear relation between managerial stock holdings and board compensation), we find significant positive coefficients for all dependent variables. This suggests that as managerial stock ownership goes beyond optimal levels, managers likely become either overly risk-averse or entrenched, prompting shareholders to respond with adequate monetary incentives to outside directors to mitigate any potential value loss.

The coefficients on institutional ownership are all significantly positive, suggesting that high institutional ownership complements, rather than substitutes for, outside director compensation.

The coefficient on leverage is significantly negative only for the regression on stock option awards. Thus, heavily leveraged firms have fewer stock option awards in board compensation. One possible explanation is that the value loss from increased agency costs of debt exceeds incentive effects of stock options. An alternative explanation based on debt's disciplinary role does not appear to be plausible, since we find no evidence of a negative relation between leverage and director cash compensation or stock grants.

Director cash compensation and stock grants are positively related to both firm size and the number of lines of business, consistent with the view that as the complexity of the firm's operations increases, the equilibrium levels of these compensation components also increase. However, the level of board's stock option awards is negatively related to firm size and number of segments, suggesting that well-established internal monitoring mechanisms reduce the need for stock option awards.

The coefficients on regulation are significantly negative, supporting the prediction that regulated firms have reduced need for monitoring by outside directors.

Finally, the threat of takeover appears to have opposing effects on board compensation. While the coefficient on takeover threat is significantly positive when the dependent variable is stock option awards, it is significantly negative when the dependent variable is either cash compensation or stock grants. An explanation for this result is the down-side risk protection on directors' wealth (due to the convexity of the option payoff function). Conversely, stock grants can exacerbate the risk due to the linear payoff schedule.

The coefficients on the two control variables, stock returns and beta, have the expected signs overall. As firm performance improves, directors' stock option awards and total compensation increase. As systematic risk increases, stock option awards increase to compensate for the increased risk. It is possible, however, that this latter positive relation is mechanically induced, since systematic risk is positively related to volatility of stock returns, which in turn increases the estimate of the fair value of stock options. Interestingly, the relation between stock grants and beta is negative, suggesting that as firm risk increases, stock grants become inefficient in providing desired incentives to outside directors possibly due to the linear payoff function.

In summary, the results in table 4 indicate that the equilibrium levels of board compensation are systematically related to the firm's investment opportunities, managerial and institutional stock ownership, firm size, the number of lines of business, industry membership, and the threat of takeover. One notable observation is that outside board stock option awards and stock grants are related to firm characteristics quite differently. Since stock option awards create a convex payoff schedule, they appear to be more efficient in providing desired incentives to outside directors when firms have abundant investment

opportunities and a high likelihood of takeover threat, relative to stock grants which have a linear payoff function in stock price.

### *5.2. Tobit results on the mix of board compensation*

Table 5 presents the summary results of year-by-year Tobit regressions of the relation between the mix of board compensation and the hypothesized determinants. Column (3) provides the results for the ratio of all stock-based compensation to cash compensation. Columns (1) and (2) show the results for the mixes of stock option awards and stock grants, respectively.

The coefficients on the market-to-book ratio, managerial shareholdings, institutional ownership, leverage, firm size, the number of segments, and regulation are consistent with those reported in Table 4 and will not be elaborated upon. One exception we note is that unlike the results reported for compensation levels, we do not find a significant positive coefficient for the quadratic term of managerial stock ownership for the mix regressions.

The coefficient on free cash flow is significantly negative for the mix of stock option awards, suggesting that liquidity constraints lead to heavy reliance on stock option awards relative to cash compensation. However, the liquidity constraint appears to have the opposite association with the mix of stock grants, contrary to prediction, and the explanation is not readily apparent.

The coefficients for the firm's net operating loss carryforward are significantly positive, consistent with the prediction that as implicit tax costs of stock option awards and stock grants decrease, firms are more likely to use stock-based compensation, relative to cash compensation.

In sum, the results in table 5 provide evidence that the mix of director stock option awards and the mix of stock grants are systematically related to certain firm characteristics. In particular, the mix of stock option compensation is positively related to the firm's growth opportunities, institutional stock holdings, and negatively associated with managerial stock ownership, firm leverage, effective tax costs, levels of free cash flow, firm size, the number of segments, and regulation. The mix of stock grants is negatively related to growth opportunities and managerial stock ownership, and positively related to firm leverage, liquidity, firm

size, and the number of segments.

## **6. Sensitivity analyses and effects of cash pension plans**

In this section, we test whether our results are sensitive to the number of board meetings and to alternative proxies for the firm's growth opportunities, log-transformations of certain variables, and industry clustering of the sample firms. We also examine cash pension plans for outside directors. We propose that these pension plans are deferred cash compensation and test whether the economic determinants behind the existence of the plans are similar to those behind the levels of cash compensation. We then examine the robustness of the results reported in tables 4 and 5 to the presence of a pension plan in regression models. The rationale behind this test is that if pensions are deferred cash compensation to directors, then the mix of stock options and grants to cash compensation will be upwardly biased for those firms with pensions.

### *6.1. Number of board meetings and cash compensation*

Cash compensation paid to directors increases with the number of board meetings since it includes fees per board meeting. As we show in table 2, the average number of board meetings over the 1992-1997 period remains fairly constant at around 7.20. However, the actual number of board meetings varies from 1 through 43. This suggests that the levels regression on cash compensation and the Tobit models on mixes should be related to the number of board meetings. In addition, the number of board meetings is related to firm specific attributes, such as past firm performance and managerial shareholdings [Vafeas, 1999a]. Thus, it is possible that our independent variables are correlated with the number of board meetings, producing ambiguous interpretations of the reported results.

To examine these issues, we perform three sensitivity analyses. First, we add the log of the number of board meetings as an independent variable to levels and mixes regressions. Table 6 presents the results. As expected, the coefficient on the number of board meetings is significantly positive for the cash compensation regression (0.34;  $t = 24.10$ ) in panel A. The coefficients on the mixes models in panel B are

all significantly positive (the coefficients vary between 0.33 and 0.96; the t-statistics are between 4.89 and 5.83). More important, the coefficients and statistical significance levels of the other independent variables are virtually identical to those reported in tables 4 and 5. The one exception is that leverage becomes significantly negative at the .05 level for the levels regressions on cash compensation and total compensation.

Second, we delete from the final sample those firm-year observations that have an “abnormally” high number of board meetings during a year compared to other firm-years.<sup>10</sup> We define an abnormal level of board meetings as one with an absolute change of more than 100% in the number of meetings for the same company over two adjacent years.<sup>11</sup> This screening process eliminates 98 firm-year observations, or 1.2% from the sample. Our results on the levels of components of director compensation and the mix of stock-based compensation remain almost unchanged after deleting firm-year observations classified as having unusually high number of board meetings.

Finally, we eliminate firm-year observations that fall in either the bottom 5% (4 meetings per year) or the top 5% (13 meetings) of the distribution of the number of board meetings, assuming that it is unusual to have less than four meetings or more than 13 meetings during a year. Since this cutoff is rather arbitrary, we also use a 10% threshold to truncate the extreme observations. We continue to have similar results after removing from the sample those extreme firm-year observations.

## *6.2. Alternative variable definitions*

As an alternative proxy for the firm’s growth opportunities, we use research and development (R&D) expenditures scaled by firm value [e.g., Baber, Janakiraman, and Kang, 1996]. The coefficients on R&D have the same signs as those using the market-to-book ratio and the statistical significance remains

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<sup>10</sup>Although an examination of potential determinants of a sudden change in the board activity is beyond the scope of our study, unusual board activities appear to related to poor prior firm performance [Vafeas, 1999a], new external financing, restructuring or divestitures, mergers and acquisitions.

<sup>11</sup>We also use different cutoff points for the abnormally high number of board meetings including 50% (losing 5.4% of the original observations) and 200% (0.25%) and obtain similar results.

qualitatively the same.

The regressions use log-transformed variables for the levels of board compensation and also for certain independent variables to mitigate concern over non-normal distributions. Since we estimate statistical significance of the independent variables using annual regression coefficients only, the benefit of using the log-transformed variables is likely small. When we use raw variables in regressions, we obtain similar results.

It is unlikely that industry clustering causes a serious bias in estimating regressions since as table 1 shows, the sample firms are from a variety of industries without any particular industries dominating the sample. Nonetheless, we estimate the regressions for each two-digit SIC industry (after dropping the regulation dummy) and aggregate the regression coefficients only across these industries and obtain qualitatively similar results.

### *6.3. Sensitivity to the presence of a director cash pension plan*

Thus far, we have examined the determinants behind cash compensation, stock grants, and stock options. A fourth type of director compensation, a cash pension plan upon retirement from board activities, is also prevalent.<sup>12</sup> In this section, we provide some preliminary evidence on the determinants of the presence of a pension plan for outside directors, and we examine whether the presence of a pension plan for outside directors affects our inferences on the relation between the mix of stock-based compensation and the hypothesized economic determinants.

Directors' retirement plans typically are defined benefit plans equal to the last annual retainer that the outside director received prior to retiring from the board. A "vesting" period of three to ten years of service as a board member is usual. Payments are received upon retirement or a specified age (65 or 70 being the most common). Many plans include benefits for a surviving spouse.

As table 2 shows, the percentage of firms offering cash retirement plans for outside directors has

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<sup>12</sup>A fifth type of compensation, a phantom stock or deferred stock grant pension plan, is not examined because the ExecuComp data set does not contain information on this type of plan.

diminished dramatically over time. In 1992, 34.78% of our sample firms offered these plans. By 1997, the percentage declined to 16.75%. Perusal of proxy statements indicate that the predominant stated reason for firms discontinuing cash pension plans is that they do not align the interests of directors with shareholders. This is because cash pension plans act as deferred cash compensation whereas deferred stock plans are more akin to stock options. Thus, we expect that the coefficients of the determinants of pension plans will behave most similarly to the cash compensation variables as shown in table 4.

Table 7 provides the summary of year-by-year results on the relation between the presence of a pension plan for outside directors and the economic determinants. In contrast to table 4, we are unable to calculate a dollar value for pensions. Therefore, the dependent variable takes the value of one if the firm has an outside cash pension plan and zero otherwise. In column (1), we use a logit model to calculate the coefficients. In column (2), we present OLS results so that the reader can compare the coefficients from the cash compensation regressions in table 4 with the pension results. The OLS estimators are unbiased but are not efficient due to the heteroskedastic nature of the disturbance. In addition, since a binary dependent variable produces error terms that are not normally distributed, classical tests of significance on the estimators cannot be done. To mitigate these concerns, we report t-statistics using yearly regression coefficients.

As column (1) shows, the existence of a pension plan is negatively associated with the firm's growth opportunities, managerial stock holdings, the likelihood of a takeover threat, and systematic risk of the firm. It is positively associated with institutional shareholdings, firm size, and the number of segments. From column (2), we note that the OLS coefficients on these independent variables are similar to those found for director cash compensation (shown in column (3)). Thus, with the exception of the sign and significance level on the regulation, it appears that current cash compensation and the existence of a pension plan (deferred cash compensation) have similar determinants. To our knowledge, this is the first evidence on the potential determinants of pension plans for outside directors.

Table 8 examines the degree to which the presence of an outside director pension plan affects the results reported in tables 4 and 5. For instance, pension benefits may provide outside directors with

incentives to adopt a long-term decision horizon and consequently replace, at least partially, stock-based compensation. In panel A, we find that cash compensation is significantly positively related to the existence of a pension plan. In contrast, the level of stock option awards is significantly negatively related to the presence of such a plan. These findings suggest that pension plans supplement (substitute) for cash (incentive-based) compensation.

The results for the Tobit models in panel B provide similar results and interpretations. While this paper does not explore this issue more fully, we believe that it is a topic of interest for future research. For this study, however, we note the coefficients and significance levels of the other variables in the analyses do not differ substantially from those presented in tables 4 and 5. The two exceptions are the coefficients on beta in the cash compensation regression and on institutional ownership in the stock compensation regression which, in panel A of table 8, are not significantly different from zero. Hence, we conclude that our earlier results are not influenced unduly by the presence or absence of an outside director pension plan.

## **7. Conclusions and future research**

This study tests hypothesized determinants of compensation for outside members of the board of directors. Using a large sample of U.S. firms over the 1992-1997 period, we find that the level of director stock option awards is positively related to the firm's growth opportunities, institutional stock holdings, and the threat of takeover, and negatively associated with firm size, the number of lines of business, managerial stock ownership, and regulation. Conversely, the level of stock grants is negatively related to the firm's growth opportunities and takeover threat. We find that the mix of stock-based compensation relative to cash compensation is positively related to firm's growth opportunities, institutional stock holdings, and negatively associated with managerial stock ownership, firm leverage, effective tax costs, level of free cash flow, firm size, the number of segments, and regulation. Further, the mix of stock grants relative to cash compensation is negatively related to growth opportunities and positively related to firm leverage, liquidity, firm size, and the number of segments. The documented differences between stock options and stock are attributable to their respective payoff functions. Since stock option awards create a convex payoff



schedule, they appear to be more efficient in providing desired incentives to outside directors when firms have abundant investment opportunities and a high likelihood of takeover threat, relative to stock grants, which have a linear payoff function in stock price.

We also examine the determinants and effects of an outside director pension plan. We find that director cash compensation and the presence of a pension plan have a similar set of economic determinants. In addition, the existence of a pension plan appears to influence the amount of cash compensation and stock options given to outside directors. We believe this is an interesting, yet preliminary result, and are intending to address it in more detail in a later paper.

In sum, and contrary to some criticisms that the board of directors are often a passive, ineffective entity that dislikes conflict with the incumbent management [Crystal, 1991; Jensen, 1993], we find that board compensation is structured to mitigate agency problems inherent in firms whose management control is separated from ownership.

Future research can extend our study by incorporating the possible endogenous aspects of board stock option awards and stock grants. Prior studies show that the adoption and existence of executives' incentive contracts not only reflect the firm- and industry-specific characteristics underlying the firm's contracting and economic environment, but they also affect the executives' operating, investing, or financing decisions [Larcker, 1983; Lambert, Lanen, and Larcker, 1989; Holthausen, Larcker and Sloan, 1995; Guay, 1999].

The distinction between "dedicated" institutional investors and "transient" institutional investors appears to be another fruitful area in future compensation studies. Namely, do the different types of institutional investors affect agency relations of the firm? Recent studies begin to provide some guidance on this issue [e.g., Bushee, 1998].

Our understanding of board compensation could be further enhanced by investigating the composition of the board to determine the nature of the relation between board composition and board compensation. Perry, 1999, presents some interesting work in this area. In order to gain additional insights into efficient board contracting, more work on this line appears warranted.

Further, we consider only the effect of the “flow” of stock options and exclude the “stock” of options that are granted in prior years. Since stock options granted in prior years are on average in-the-money [Guay, 1999] and in-the-money stock options have greater sensitivity to stock price, future research can examine the incentive effects of both the “flow” and the “stock” of stock options.

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Table 1  
Distribution of the sample firms by one-digit Standard Industry Code (SIC) and exchange listing

Panel A: The distribution by one-digit SIC code

One-digit SIC	Industry description	Number of firms in the final sample
(1)	Primary	96
(2)	Manufacturing-nondurables	321
(3)	Manufacturing-durables	467
(4)	Transportation and utilities	215
(5)	Wholesalers and retailers	208
(6)	Financial services	232
(7)	Business services	131
(8)	Consumer services	<u>53</u>
	Total number of firms	1,723

Panel B: Exchange listings

Stock exchange	Number of firms
New York Stock Exchange	1,187
NASD	494
American Stock Exchange	<u>42</u>
Total	1,723

Final sample firms satisfy the following requirements:

- (i) The annual data on the board of directors' stock option awards, stock grants, and cash compensation (annual retainer and fees paid for committee meetings) are available from the Standard & Poor's ExecuComp database for at least one year over the period 1992-1997;
- (ii) The firm maintains the same fiscal year-end from one year to the next;
- (iii) The data on the parameters for the Black-Scholes option valuation model and the hypothesized determinants of the board of directors' compensation are available from Compustat's 1998 Primary, Secondary, and Tertiary, Full Coverage, Research Annual file, and the Center for Research in Stock Prices (CRSP) database.

Table 2  
Descriptive statistics on the board of directors' compensation and hypothesized determinants

Panel A: Trends in the board's cash compensation, stock option awards, stock grants, and pension plans over the 1992-1997 period

Variable	1992	1993	1994	1995	1996	1997
No. of firms	966	1,336	1,418	1,455	1,425	1,379
No. of board meetings	7.36	7.20	7.19	7.16	7.11	7.23
<i>Level of board compensation (\$1,000)</i>						
Cash compensation	23.96	23.97	24.71	25.19	25.53	26.55
Stock option awards	13.84	15.39	19.94	23.37	33.15	37.29
Stock grants	2.20	1.96	2.49	2.82	4.64	6.61
Stock option awards plus stock grants	16.04	17.36	22.42	26.19	37.78	43.90
Total compensation	40.00	41.32	47.14	51.38	63.32	70.45
<i>Mix of board compensation</i>						
Mix of stock option awards to cash compensation	0.66	0.76	1.02	1.09	1.47	1.60
Mix of stock grants to cash compensation	0.08	0.08	0.10	0.12	0.18	0.25
Mix of stock option awards plus stock grants to cash compensation	0.74	0.84	1.12	1.21	1.66	1.85
<i>% of firms that grant:</i>						
Stock option awards	29.19%	34.80%	41.04%	47.76%	52.00%	56.05%
Stock grants	15.21%	15.86%	18.19%	20.55%	26.31%	31.18%
Stock options or stock grants	42.96%	49.03%	56.91%	64.19%	70.02%	75.70%
<i>% of firms with a pension plan for outside directors</i>						
	34.78%	31.36%	31.73%	34.24%	24.49%	16.75%

Table 2 (Continued)

Panel B: Descriptive statistics on the board of directors' compensation variables and hypothesized determinants for the pooled sample

Variable	Mean	Std. dev	1 <sup>st</sup> quartile	Median	3 <sup>rd</sup> quartile
<i>Level of board compensation (\$1,000)</i>					
Cash compensation	25.05	11.89	17.00	24.50	32.00
Stock option awards	24.43	62.88	0.00	0.00	22.15
Stock grants	3.52	10.45	0.00	0.00	0.00
Stock option awards plus stock grants	27.95	63.04	0.00	8.05	28.33
Total compensation	52.99	64.33	24.80	36.00	56.92
<i>Mix of board compensation</i>					
Mix of stock option awards to cash compensation	1.13	2.76	0.00	0.00	0.92
Mix of stock grants to cash compensation	0.14	0.41	0.00	0.00	0.00
Mix of stock option awards plus stock grants to cash compensation	1.27	2.77	0.00	0.29	1.15
<i>Economic determinants</i>					
Market-to-book ratio	1.84	1.14	1.12	1.44	2.09
Managerial ownership	12.11	17.38	1.03	4.53	16.34
Institutional ownership	52.42	20.25	38.47	54.36	67.28
Leverage	0.16	0.14	0.04	0.13	0.25
Free cash flow	-0.01	0.06	-0.02	0.00	0.03
Net operating loss	0.01	0.04	0.00	0.00	0.00
Firm value (\$ billion)	7.80	22.08	0.54	1.55	5.53
No. of segments	1.96	1.39	1.00	1.00	3.00
Regulation dummy	0.17	0.37	0.00	0.00	0.00
Takeover threat	0.19	0.09	0.14	0.17	0.21
Return	0.23	0.44	-0.03	0.16	0.41
Beta	1.19	0.64	0.77	1.13	1.51

The variables are defined as follows:

Cash compensation	=	annual director retainer plus the number of board meetings times fees paid per director meeting;
Stock option awards	=	annual stock option compensation measured as per share Black-Scholes option value times the number of stock options granted;
Stock grants	=	annual stock compensation measured as the number of shares granted times the average stock price;



Stock option plus stock grants	=	stock option awards plus stock grants;
Mix of stock option awards to cash compensation	=	the ratio of stock option awards to cash compensation;
Mix of stock grants to cash compensation	=	the ratio of stock grants to cash compensation;
Mix of stock option awards plus stock grants to cash compensation	=	the ratio of stock option awards plus stock grants to cash compensation;
Market-to-book ratio	=	the ratio of market value of the firm to book value of total assets, where market value of the firm is measured as the sum of market value of equity and book value of total liabilities;
Managerial ownership	=	proportion of shares held by officers, directors, beneficial owners, and principal stockholders owning ten percent or more of the company stock. Officers, directors, and beneficial ownership are only included if they hold at least 1,000 shares;
Institutional ownership	=	proportion of shares held by all institutions filing a 13-F form with the SEC, i.e., organizations, companies, universities and other groups that have greater than \$100 million in equity assets;
Leverage	=	short-term debt plus long-term liabilities scaled by firm market value;
Free cash flow	=	free cash flow scaled by firm market value, where free cash flow is measured as cash inflows from operating activities plus cash outflows to investing activities;
Net operating loss	=	net operating loss carryforward scaled by firm market value;
Firm value	=	market value of the firm;
No. of segments	=	the number of separately reported business segments; estimated over 60 months ending at the end of fiscal year, where the market return is proxied by the value-weighted market return;
Regulation dummy	=	an indicator variable for regulated firms which equals 1 for firms in the electric utility industry (two-digit SIC of 49) or financial industries (SIC of 60, 62, 64 through 67) and 0 otherwise;
Takeover threat	=	the incidence of takeovers in the firm's two-digit SIC industry during the preceding three years;
Return	=	stock rates of return during the fiscal year; and
Beta	=	the systematic risk measured using a one-factor market model and using a maximum of 60 monthly returns ending at fiscal year-end.

Table 3  
Comparison of mean values of the board of director compensation variables  
and hypothesized determinants across stock exchange listing

Variable <sup>a</sup>	Means across exchange			Tests for difference <sup>b</sup>			
	NYSE	NASDAQ	AMEX	NYSE vs. NASD		NYSE vs. AMEX	
				t-stat.	z-stat <sup>c</sup>	t-stat.	z-stat <sup>c</sup>
No. of observations	5,792	2,016	171				
<i>Level of board compensation (\$1,000)</i>							
Cash compensation	27.76	17.81	18.28	37.53***	34.75***	13.64***	10.84***
Stock option awards	18.70	40.78	25.42	-11.66***	-17.25***	-1.76*	-4.87***
Stock grants	4.51	0.82	1.63	19.87***	19.31***	5.42***	4.81***
Stock option awards plus stock grants	23.22	41.59	27.06	-9.68***	-8.44***	-1.01	-1.80*
Total compensation	50.98	59.41	45.34	-4.32***	-6.89***	1.54	3.13***
<i>Mix of board compensation</i>							
Mix of stock option awards to cash compensation	0.73	2.26	1.49	-16.37***	-18.73***	-2.94***	-5.29***
Mix of stock grants to cash compensation	0.17	0.05	0.07	14.54***	18.65***	3.32***	4.62***
Mix of stock option awards plus stock grants to cash compensation	0.90	2.31	1.57	-15.02***	-11.17***	-2.59**	-2.32**
<i>Pension plan</i>	0.36	0.06	0.12	34.77***	25.03***	8.65***	6.17***
<i>Economic determinants</i>							
Market-to-book ratio	1.66	2.37	1.91	-19.54***	-19.39***	-2.84***	-3.72***
Managerial ownership	10.70	15.44	18.84	-10.41***	-19.74***	-4.81***	-6.09***
Institutional ownership	53.92	49.14	42.16	8.58***	9.49***	7.02***	6.79***
Leverage	0.18	0.10	0.14	25.62***	26.62***	3.82***	4.55***
Free cash flow	0.01	-0.01	-0.01	11.67***	13.33***	2.74***	4.07***

Net operating loss	0.00	0.01	0.03	-4.23***	-4.70***	-3.72***	-5.49***
Firm value (\$ billion)	9.99	2.09	1.16	22.27***	33.20***	25.10***	11.99***
No. of segments	2.17	1.28	1.67	29.37***	24.78***	5.79***	3.98***
Regulation dummy	0.18	0.14	0.02	5.05***	4.77***	12.59***	5.36***
Takeover threat	0.19	0.20	0.18	-2.46**	-3.11***	2.14**	0.38
Return	0.22	0.27	0.16	-3.72***	-0.21	1.61	3.15***
Beta	1.12	1.42	1.30	-15.90***	-15.72***	-2.74***	-2.19**

<sup>a</sup>Please refer to Table 2 for variable definitions.

<sup>b</sup>Tests for differences are in relation to the NYSE sample.

<sup>c</sup>Non-parametric Wilcoxon rank-sum z-statistics.

\*\*\*(\*\*, \*) Statistically significant at the 1% (5%, 10%) level, two-tailed.

Table 4  
 Summary of year-by-year ordinary least squares regression results for the association between the level of the board of directors' compensation components and the hypothesized economic determinants (Reported coefficients are inter-temporal means and t-statistics are based on yearly regression coefficients.)

Independent variable <sup>a</sup>	Dependent variable is log of			
	Cash compensation (1)	1+ Stock option awards (2)	1+ Stock grants (3)	Total compensation (4)
Intercept	1.74*** (9.12)	0.83*** (6.28)	-0.68*** (-4.92)	1.72*** (12.17)
Market-to-book ratio	-0.08*** (-6.42)	0.21*** (8.19)	-0.05*** (-4.68)	0.08*** (4.54)
Ln(Managerial ownership)	-0.05*** (-3.32)	-0.08*** (-8.37)	-0.05*** (-3.51)	-0.05*** (-5.63)
Ln(Institutional ownership)	0.11*** (4.15)	0.22*** (4.95)	0.03* (1.95)	0.15*** (6.67)
Leverage	0.01 (0.20)	-0.47*** (-5.16)	0.09 (0.89)	-0.05 (-0.89)
Ln(Firm value)	0.18*** (31.31)	-0.16*** (-7.99)	0.21*** (10.37)	0.14*** (19.10)
Ln(No. of segments)	0.02*** (3.88)	-0.22*** (-8.10)	0.08*** (5.30)	-0.06*** (-7.54)
Regulation dummy	-0.12*** (-9.29)	-0.54*** (-4.68)	-0.03 (-1.04)	-0.22*** (-5.51)
Takeover threat	-0.56*** (-3.18)	2.35*** (8.45)	-1.24*** (-4.96)	0.34* (1.89)
Return	-0.01 (-0.53)	0.36*** (3.99)	0.02 (0.58)	0.16*** (3.08)
Beta	-0.04** (-2.36)	0.41*** (12.07)	-0.12*** (-4.82)	0.16*** (12.07)
Adjusted R <sup>2</sup>	0.32	0.14	0.13	0.18

<sup>a</sup>Please refer to Table 2 for variable definitions.

\*\*\* (\*\*, \*) Statistically significant at the 1% (5%, 10%) level, two-tailed.

Table 5

Summary of year-by-year Tobit regression results for the association between the mix of the board of directors' compensation components and the hypothesized economic determinants (Reported coefficients are inter-temporal means and t-statistics are based on yearly regression coefficients.)

Independent variables <sup>a</sup>	Dependent variable is		
	Mix of stock option awards to cash compensation (1)	Mix of stock grants to cash compensation (2)	Mix of stock option awards plus stock grants to cash compensation (3)
Intercept	-1.65*** (-3.03)	-2.99*** (-15.91)	-2.63*** (-5.64)
Market-to-book ratio	0.97*** (8.03)	-0.11*** (-5.33)	0.83*** (6.86)
Ln(Managerial ownership)	-0.17*** (-4.98)	-0.06*** (-7.51)	-0.17*** (-5.80)
Ln(Institutional ownership)	0.86*** (4.41)	0.08*** (5.57)	0.62*** (5.33)
Leverage	-2.79*** (-7.48)	0.36* (1.87)	-1.30*** (-5.02)
Free cash flow	-9.12*** (-4.46)	1.05*** (3.05)	-6.79*** (-5.24)
Net operating loss	5.25*** (6.49)	0.92*** (3.99)	4.75*** (6.01)
Ln(Firm value)	-0.51*** (-6.93)	0.24*** (19.67)	-0.08** (-2.15)
Ln(No. of segments)	-0.61*** (-4.68)	0.12*** (4.17)	-0.34*** (-5.44)
Regulation dummy	-2.03*** (-29.11)	0.03 (0.90)	-0.76*** (-8.31)
No. of non-censored observations (%)	2,535 (44.7%)	1,258 (22.2%)	3,497 (61.7%)

<sup>a</sup>Please refer to Table 2 for variable definitions.

\*\*\* (\*\*, \*) Statistically significant at the 1% (5%, 10%) level, two-tailed.

Table 6

Summary of year-by-year ordinary least squares regression results for the association between the level and the mix of the board of directors' compensation components and the hypothesized economic determinants with the number of board meetings as additional independent variable (Reported coefficients are inter-temporal means and t-statistics are based on yearly regression coefficients.)

## Panel A: Results for the levels of board compensation components

Independent variable <sup>a</sup>	Dependent variable is log of			
	Cash compensation (1)	1+ Stock option awards (2)	1+ Stock grants (3)	Total compensation (4)
Intercept	1.21*** (5.65)	0.15 (0.85)	-1.11*** (-4.92)	0.94*** (5.38)
Market-to-book ratio	-0.08*** (-6.76)	0.21*** (9.21)	-0.06*** (-6.73)	0.08*** (5.40)
Ln(Managerial ownership)	-0.03** (-2.10)	-0.06*** (-6.96)	-0.05*** (-2.57)	-0.03*** (-3.01)
Ln(Institutional ownership)	0.11*** (4.35)	0.21*** (4.54)	0.04 (1.56)	0.15*** (5.89)
Leverage	-0.07** (-2.03)	-0.59*** (-7.26)	0.10 (0.99)	-0.17*** (-3.51)
Ln(Firm value)	0.16*** (33.08)	-0.18*** (-8.50)	0.21*** (7.11)	0.11*** (15.20)
Ln(No. of segments)	0.01** (2.44)	-0.23*** (-8.95)	0.08*** (3.86)	-0.07*** (-16.37)
Regulation dummy	-0.17*** (-10.59)	-0.59*** (-5.08)	-0.04 (-1.14)	-0.28*** (-6.85)
Takeover threat	-0.49** (-2.39)	2.42*** (9.65)	-1.03*** (-3.73)	0.44*** (2.89)
Return	-0.01 (-0.07)	0.37*** (4.61)	0.05 (0.72)	0.18*** (3.80)
Beta	-0.04** (-2.35)	0.41*** (13.14)	-0.14*** (-4.81)	0.16*** (13.58)
Ln(No. of board meetings)	0.34*** (24.10)	0.44*** (12.29)	0.25*** (6.88)	0.52*** (30.67)
Adjusted R <sup>2</sup>	0.36	0.14	0.15	0.24

Table 6 (Continued)

## Panel B: Results for the mixes of board compensation components

Independent variables <sup>a</sup>	Dependent variable is		
	Mix of stock option awards to cash compensation (1)	Mix of stock grants to cash compensation (2)	Mix of stock option awards plus stock grants to cash compensation (3)
Intercept	-2.88*** (-3.74)	-3.50*** (-14.82)	-4.07*** (-6.09)
Market-to-book ratio	0.97*** (8.16)	-0.11*** (-5.25)	0.83*** (7.05)
Ln(Managerial ownership)	-0.13*** (-4.25)	-0.05*** (-4.10)	-0.13*** (-3.90)
Ln(Institutional ownership)	0.87*** (4.26)	0.08*** (5.97)	0.62*** (5.04)
Leverage	-3.01*** (-7.54)	0.27 (1.40)	-1.54*** (-4.87)
Free cash flow	-9.22*** (-4.62)	0.96*** (2.63)	-6.94*** (-5.56)
Net operating loss	4.83*** (6.19)	0.79*** (3.71)	4.31*** (5.61)
Ln(Firm value)	-0.55*** (-7.01)	0.22*** (18.04)	-0.13*** (-3.12)
Ln(No. of segments)	-0.63*** (-4.88)	0.12*** (3.86)	-0.36*** (-5.80)
Regulation dummy	-2.10*** (-31.80)	-0.01 (-0.10)	-0.85*** (-9.47)
Ln(No. of board meetings)	0.82*** (4.89)	0.33*** (5.46)	0.96*** (5.83)
No. of non-censored observations (%)	2,535 (44.7%)	1,258 (22.2%)	3,497 (61.7%)

<sup>a</sup>Please refer to Table 2 for variable definitions.

\*\*\*(\*\*, \*) Statistically significant at the 1% (5%, 10%) level, two-tailed.

Table 7  
Summary of year-by-year logit and ordinary least squares regression results on the economic determinants for the presence of a pension plan for outside directors (Reported coefficients are inter-temporal means and t-statistics are based on yearly regression coefficients.)

Independent variable <sup>a</sup>	Pension plan <sup>b</sup>		Cash compensation (3)
	Logit model (1)	OLS (2)	
Intercept	-5.00*** (-7.22)	-0.34*** (-3.64)	1.74*** (9.12)
Market-to-book ratio	-0.17*** (-4.24)	-0.01*** (-3.91)	-0.08*** (-6.42)
Ln(Managerial ownership)	-0.25*** (-4.71)	-0.04*** (-6.18)	-0.05*** (-3.32)
Ln(Institutional ownership)	0.52*** (4.27)	0.06*** (4.40)	0.11*** (4.15)
Leverage	0.47 (1.21)	0.08 (1.31)	0.01 (0.20)
Ln(Firm value)	0.48*** (9.39)	0.08*** (7.54)	0.18*** (31.31)
Ln(No. of segments)	0.24*** (7.40)	0.05*** (7.40)	0.02*** (3.88)
Regulation dummy	0.95 (1.04)	0.03* (1.83)	-0.12*** (-9.29)
Takeover threat	-3.14*** (-4.89)	-0.45*** (-4.25)	-0.56*** (-3.18)
Return	-0.14 (-1.39)	-0.02* (-1.85)	-0.01 (-0.53)
Beta	-0.60*** (-10.03)	-0.07*** (-7.65)	-0.04** (-2.36)
Adjusted R <sup>2</sup>	-	0.20	0.32
Concordant	79.40%	-	-

<sup>a</sup>Please refer to Table 2 for variable definitions.

<sup>b</sup>The dependent variable takes the value of 1 if a firm has a pension plan for outside directors and 0 otherwise.

\*\*\* (\*\*, \*) Statistically significant at the 1% (5%, 10%) level, two-tailed.



Table 8

Summary of year-by-year ordinary least squares regression results for the association between the level and the mix of the board of directors' compensation components and the hypothesized economic determinants with the presence of director pension plans as an additional independent variable (Reported coefficients are inter-temporal means and t-statistics are based on yearly regression coefficients.)

## Panel A: Results for the levels of board compensation components

Independent variable <sup>a</sup>	Dependent variable is log of			
	Cash compensation (1)	1+ Stock option awards (2)	1+ Stock grants (3)	Total compensation (4)
Intercept	1.79*** (10.37)	0.78*** (5.40)	-0.71*** (-3.38)	1.75*** (13.41)
Market-to-book ratio	-0.08*** (-6.21)	0.21*** (8.40)	-0.06*** (-6.86)	0.08*** (4.75)
Ln(Managerial ownership)	-0.04*** (-2.98)	-0.08*** (-8.00)	-0.05*** (-2.53)	-0.05*** (-5.29)
Ln(Institutional ownership)	0.10*** (4.68)	0.23*** (5.25)	0.04 (1.42)	0.15*** (7.00)
Leverage	-0.01 (-0.27)	-0.48*** (-5.42)	0.16 (1.36)	-0.06 (-1.15)
Ln(Firm value)	0.17*** (41.80)	-0.14*** (-7.53)	0.21*** (6.32)	0.13*** (19.28)
Ln(No. of segments)	0.01** (2.04)	-0.21*** (-7.85)	0.09*** (3.44)	-0.06*** (-8.44)
Regulation dummy	-0.13*** (-8.82)	-0.53*** (-4.75)	-0.01 (-0.20)	-0.22*** (-5.54)
Takeover threat	-0.49*** (-2.54)	2.25*** (8.23)	-1.00*** (-3.44)	0.37** (2.11)
Return	-0.01 (-0.35)	0.36*** (4.06)	0.04 (0.73)	0.17*** (3.29)
Beta	-0.03 (-1.64)	0.40*** (11.53)	-0.13*** (-4.11)	0.17*** (11.96)
Pension plan	0.13*** (8.06)	-0.17*** (-5.80)	0.07 (1.27)	0.04 (1.69)
Adjusted R <sup>2</sup>	0.33	0.14	0.14	0.18

Table 8 (Continued)

## Panel B: Results for the mixes of board compensation components

Independent variables <sup>a</sup>	Dependent variable is		
	Mix of stock option awards to cash compensation (1)	Mix of stock grants to cash compensation (2)	Mix of stock option awards plus stock grants to cash compensation (3)
Intercept	-1.97*** (-3.44)	-2.85** (-12.72)	-2.81*** (-5.78)
Market-to-book ratio	0.94*** (8.11)	-0.11*** (-5.33)	0.82*** (6.95)
Ln(Managerial ownership)	-0.20*** (-5.12)	-0.06*** (-5.92)	-0.19*** (-5.72)
Ln(Institutional ownership)	0.89*** (4.60)	0.06*** (2.93)	0.64*** (5.59)
Leverage	-2.71*** (-7.11)	0.32 (1.65)	-1.28*** (-5.33)
Free cash flow	-8.84*** (-4.31)	0.93*** (2.81)	-6.71*** (-5.04)
Net operating loss	5.36*** (6.40)	0.82*** (3.19)	4.76*** (5.86)
Ln(Firm value)	-0.44*** (-6.08)	0.22*** (13.17)	-0.04 (-1.01)
Ln(No. of segments)	-0.56*** (-4.28)	0.11*** (3.46)	-0.31*** (-5.16)
Regulation dummy	-2.01*** (-25.52)	0.02 (0.58)	-0.73*** (-7.16)
Pension plan	-0.83*** (-6.94)	0.20*** (3.67)	-0.45*** (-3.44)
No. of non-censored observations (%)	2,535 (44.7%)	1,258 (22.2%)	3,497 (61.7%)

<sup>a</sup>Please refer to Table 2 for variable definitions.

\*\*\*(\*\*, \*) Statistically significant at the 1% (5%, 10%) level, two-tailed.