An Empirical Test about Differential Board Monitoring and CEO Compensations in High-Tech vs. Traditional Firms

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Abstract

I examine how firm characteristics and CEO compensation contract affect the independent board monitoring activities between high-tech and traditional firms. Corporate board monitoring activities are measured by annual board meetings, and the propensity to hold board meetings is significantly and positively associated with the size of the firm and is significantly and negatively associated with Return on Equity (ROE) as predicted by corporate governance under managerial entrenchment hypothesis, Using data on 1,735 corporations during 1992-2000, I find evidence that high-tech firms use different compensation plans to motive CEOs and exhibit different attributes from those of traditional firms. CEOs in both high-tech and traditional firms who have long tenure, high level of cash compensation are less likely to hold frequent board meetings. However, the existence of executive stock options and CEO long-term incentive plan may increase the frequency of board meetings. My model performs well in predicting number of board meetings for high-tech and traditional firms using out-of-sample period of year 2001 and 2002. My results extend and refine the growing literature on the relation of executive compensation, board activities and corporate governance.

I. Introduction

In recent years, the monitoring role and effectiveness of corporate boards of directors has been a central issue in both academic and business communities. Various reforms have been proposed to achieve better corporate governance. In line with the proposed corporate governance reforms, the board meeting frequency has important implications for corporate governance because it is easier and cheaper for a firm to change its board meeting activities than to change the size, composition, or ownership characteristics of its board of directors.

Jensen (1993) suggests that generally boards of directors should stay inactive. However, corporate boards are under pressure to become more active in response to increasing problems with stakeholders and government regulations. Conger et al. (1998) argue that board meeting frequency is an important factor in improving board effectiveness. According to this viewpoint, corporate boards that meet more frequently could perform better in satisfying shareholders' interests. To address these conflicting views of board activities, Vafeas (1999) studies the connection between board meeting frequency and firm performance. Vafeas finds a weak relationship between board meeting frequency and the number of directorships held by independent directors. Moreover, corporate boards meeting more frequently have lower market values. However, the industry effect and the association between the frequency of board meetings and characteristics of CEOs are not addressed in Vafeas (1999).

One of the main functions of corporate boards is to select and evaluate the effectiveness of CEOs. On the other hand, it is the CEOs themselves who are the ones who usually set the board

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meeting agenda and determine the pace and progression of its coverage. Hermalin and Weisbach (1998) present a model that CEO influence over corporate board increases with the CEO's tenure in the firm. Hence overlooking the relation between board meeting frequency and CEO characteristics can lead to misspecification problem. Fluck and Khanna (2006) propose a model that active board monitoring can reduce executive compensation, and shareholders will be better off under an optimally compensated CEO with inactive corporate board. Hence it appears that the less active board monitoring (or less frequent board meeting) is related to better firm performance. In a recent research, Boone et al. (2007) find that board independence is negatively related to the power of a CEO and is positively related to the constrains on the CEO's influence.

In this research, I explore the differential impact of firm and CEO characteristics between high-tech and traditional firms on the frequency of board meetings for the era before the introduction of Sarbanes-Oxley in July 2002. According to Raheja (2005), corporate board structure will change with a firm's life cycle. This may be due to the amount of public information available about the firm or the fact that the verification cost of the firm's investment project decreases as the firm matures. To further explore the firm life cycle effect in different industry sectors, I study the characteristics of firm size and past performance in my research.

My analysis extends and refines the growing literature on the relation of firm attributes to corporate board activities. I study the impact of executive compensation on the board meeting frequency directly. I find that CEO stock options and long-term incentive plans have different effects for high-tech firms and for firms in traditional industries. Thus, the negative relation of executive incentive compensation and board meeting frequency documented in the literature (Vafeas (1999)) does not hold across industries.

The rest of the paper is organized as follows. Section 2 sets up the empirical test design. Section 3 describes the data and the sample. Section 4 presents the results of the Tobit regressions and conducts the out-of-sample validation tests. Section 5 concludes.

II. Empirical Test Design

Consistent with the theoretical literature (e.g., Stulz (1988), Stulz (1990), Zwiebel (1996), Fluck (1999)), my empirical test design relates number of board meetings to the notion of managerial-types. The manager's type is quantified as being proportional to the likelihood of value-maximizing behavior. More productive managers have a higher likelihood of taking value-maximizing investment decisions due to some combination of having better growth opportunities, being less entrenched, and having better incentive alignment with shareholder interests. Conversely, less productive managers are less likely to take value-maximizing investment decisions due to some combination of having inferior investment opportunities, being more entrenched, and having poor incentive alignment with shareholder interests.

I model the unobservable managerial type in a manner that facilitates econometric implementation of the entrenchment model. The unobservable managerial entrenchment is denoted by a real-valued parameter t^*. Higher t^*-values indicate more productive managers. The managerial type t^* is readily related to the decision of proposing board meetings. The theoretical models predict a negative relation between the magnitude of board activities and the strength of

the managerial-type, conditional on the firm characteristics. Therefore, I estimate the following specification based on Tobit model:

$$Y^* = \alpha_1 + \beta_1' t^* + \varepsilon_1 \tag{1}$$

$$\log(\text{meetings}) = \begin{cases} Y^* & \text{if} \quad Y^* > 0 \\ 0 & \text{if} \quad Y^* \leq 0 \end{cases} \tag{2}$$

To accommodate non-linearity, I use logarithm of number of board meetings during a year as the depended variable. I recognize Equation (1) as a univariate quantitative response model (see, e.g., Amemiya (1981)). Because of the censoring problem associated with the dependent variable, it is appropriate for us to use Tobit model to conduct the empirical analysis. The hypothesis here is that the observed log (meetings) is a non-decreasing function of t*.

II. 1. Estimation of Managerial Types

I assume the manager's type is a linear function of the form:

$$t^* = \alpha_2 + \beta_2' X + \varepsilon_2. \tag{3}$$

Here X is a vector that consists of a series of observable indicators reflecting the type of the manager, and ε_2 is a random error.

Combining the above three equations, I have the empirical specification of the Tobit model as:

$$\log(\text{meetings}) = \alpha_3 + \beta_3' X + \varepsilon_3 \tag{4}$$

The vector X should include variables, taken to be exogenous in the short- to medium-run, that determine the strength of the managerial type. Consistent with the foregoing discussion, X includes *three* classes of variables that proxy for: (1) the CEO's level of entrenchment based on her power over internal governance and monitoring mechanisms, (2) the CEO's incentives for shareholder value-maximization, and (3) the characteristics of the firm. I proxy the CEO's level of internal entrenchment and incentive compensation through the following six variables derived from the corporate governance literature.

CEO service length: This variable impacts managerial type in two ways. First, organizational theorists argue that tenure is positively related to the CEO's internal power (e.g., Finkelstein and Hambrick (1989)). Secondly, Murphy (1986, 1999) shows that CEOs nearing retirement have a shorter career horizon, relatively limited outside employment opportunity, and greater accumulated wealth tied to her equity interest in the firm. In addition, Berger et al. (1997) show that CEO tenure has significant effect on firm's debt policy. All these arguments suggest a positive association between tenure and the level of entrenchment. In my study, a CEO's service length is calculated as logarithm of number of years credit to retirement reported by *ExecuComp*.

CEO Compensations (salary and bonus): Following Jensen and Murphy (1990), cash salary and bonus provide relatively low-powered incentives. Furthermore, recent evidence indicates that entrenched CEOs tend to have a large share of their compensation paid though non-

contingent compensation (e.g., Core et. al (1999)). Higher amount of a CEO's cash compensation (i.e., salary and bonus) in her annual compensation indicates the level of entrenchment of a manager.

CEO stock ownership: The CEO's personal stock ownership in the firm provides high-powered incentives. However, higher CEO stock ownership also appears to increase CEO power. For example, Dennis et al. (1997) show that top-management ownership has a significant and negative impact on CEO replacement and turnover. In this study, I take the logarithm of market value of total shares owned by a CEO in the beginning of year *t* as a measure of top-management stock ownership. Moreover, I calculated the percentage of share ownership as number of shares owned by CEO divided by total number of shares outstanding at the beginning of year *t*.

Executive stock options: Executive stock options have become increasingly prominent means of delivering high-powered incentives to management. I consider the value of executive stock options awarded to the CEO in the beginning of year *t*[9]. Moreover, the log of a CEO's long-term incentive plan is also introduced into my research.

Duality: I include variables related to board structure that appear to enhance the CEO's internal power. I include a dummy variable to identify whether a CEO is also a chairman of the board (*Duality).* Jensen (1993) and Boyd (1994) argue that CEO "duality" diminishes the independence and effectiveness of the board in governing the CEO.

Since a manager's power in a firm is related to the characteristics of the firm, I also introduce firm attributes into my study. I use the logarithm of firm asset as a measure that indicates the stage of a firm's life cycle; I also calculate *market-to-book ratio of equity* as a proxy for the quality of investment opportunity set.

Next, I use the *asset structure*. This variable is introduced to control for differential structure of firms with different level of intangible assets. The measure is calculated as book value of property, plant and equipment divided by the book value of asset at the beginning of year *t*. According to Smith & Watts (1992), managers and shareholders are less likely to engage in wealth-transferring projects when a greater portion of assets is fixed. A lower value of asset structure implies greater agency conflict between shareholders and debt-holders and greater managerial entrenchment.

In addition, firm performance measures are introduced as return on equity (ROE) in previous two years (i.e., year *t-1* and year *t-2*). Exhibit 1 provides a precise definition of these variables and also their predicted sign with respect to board monitoring measured by board meetings.

There is a potential look-ahead bias if I use independent variables obtained from the end of the period, rather than the beginning of this period. In general, using end-of- the-period values are likely to overstate the explanatory power of the model. To control for this effect, all independent variables are taken to be the beginning-of-the-year values.

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[9] I use the method outlined in Murphy (1999) to calculate option values using the stated exercise price and year-end stock prices. Data required to execute calculations are typically disclosed, but for cases where details are omitted, vesting is assumed to occur two years after the grant, and the exercise period is assumed to be the same as that for the most recent option where an exercise period is provided.

I also consider several control variables in my analysis to address the potential omitted variable problem. Firm age and size of the firm are positively correlated (e.g., Audretsch (1995)), and smaller firms are more likely to have a greater proportion of asset value in growth options. Empirically, older or more mature firms have diminishing growth opportunities and tend to have higher payout yield (e.g., Fama and French (2001)). To address the age effect, I calculated the age of a firm as the difference between the reporting year in the sample and the stock listing date of the firm. The listing date is obtained through CRSP monthly file. The second variable is *debt ratio*. According to the entrenchment literature (e.g., Zwiebel (1996), Fluck (1999)), highly entrenched managers use more debt to control themselves from taking non-value-maximizing behaviors *voluntarily*. I use the ratio of book value of debt to the sum of book value of debt and market value of equity as a proxy for a firm's debt policy.

III. Data and Sample Selection

The data are taken from the 2001 S&P *ExecuComp* database. This database contains records of 3,746 top-managers from publicly traded companies that are included in various S&P indices, covering the period from 1992 to 2000. For each firm in the database, I take the annual board meeting frequency and compensation records for the CEO, and also obtain the firm's accounting and financial information from the S&P *Compustat* file. I include all firms in the *ExecuComp* database from 1992 through 2000, but exclude financial service (SIC code 4900 to 4999) corporations and utility (SIC code 6000 to 6999) corporations. My final sample in this study consists of 6,294 firm-year records. The whole sample is classified into high-tech and traditional industries according to the 6-digit North American Industrial Classification System (NAICS) code published by the Bureau of Census. In my sample, high-tech industries are defined as makers or creators of technology, whether they are in the form of products, communications or services. There are five broad sectors in my research: Aerospace technology, Biotechnology, Information technology, Nanotechnology and Robotics. Based on the 2002 NAICS codes, there are 46 industrial groups selected as high-tech industries in this research.

Table 1 reports firm characteristics in terms of board meeting frequencies for high-tech and traditional firms. Comparing to high-tech firms, traditional firms are larger, are more profitable, are paying higher cash dividends, have more debts and tangible assets; meanwhile, firms holding board meetings more frequently are larger, more profitable, have more debt and tangible assets compared to firms holding board meetings less frequently. These findings are consistent with other studies (e.g., Vafeas(1999)). However, there is no linear relation between board meetings and the growth opportunities measured by market-to-book ratio.

IV. Results of Multivariate Analysis

To address the non-linear relationship in the model, I use logarithm of number of board meetings in year t as dependent variable. I estimate the Tobit model given in Equation (4) above, assuming a symmetric distribution of the random disturbance ε_3. I parameterize $F(\varepsilon_3)$ as the cumulative distribution functions of the normal distributions. Note that Equation (4) gives the likelihood of board meeting frequencies. Examining the right hand of side of this equation, I see that if the estimate for the coefficient of β_j for any independent variable X_j is positive

(negative), then that variable is positively (negatively) related to the likelihood of holding board meetings.

IV.1. Analysis of the Baseline Model

Table 2 reports the results of my basic model. I find that the likelihood of board meetings is significantly related to firm and CEO characteristics for both high-tech and traditional firms, as predicted by the empirical framework. Ceteris paribus, the board meeting frequency decreases significantly with a CEO's total cash compensation (i.e., salary and bonus), and market value of stock ownership. All of these factors are significant at the 1% level and are positively associated with the power of a CEO in the firm. These factors are indicators of managerial entrenchment. Conversely, the frequency of board meetings is positively associated with a CEO's duality and the level of executive stock options.

In addition, I find there are significant differences between high-tech and traditional firms. For traditional firms, board meeting frequency has positive and significant association with a CEO's service length, but this effect is negative and insignificant for high-tech firms; the coefficient for percentage of CEO share ownership is negative for traditional firms but positive for high-tech firms; the coefficient for long-term incentive plan is positive for traditional firms but negative and significant for high-tech firms. These effects do show differential board monitoring in different industries.

Furthermore, I find that for both high-tech and traditional firms, board meeting frequency is positively related to firm size, measured by the book value of assets, and negatively related to firm performance, measured by return on equity (ROE), in the previous year. These effects are consistent with results reported in Vafeas (1999). Interestingly, I also find that there are significant differences between high-tech firms and traditional firms: growth opportunity, measured by market-to-book ratio of equity, will significantly decrease the propensity of board meetings for traditional firms but will increase the propensity of board meetings for high-tech firms.

My new study shows that board monitoring activities, measured by board meeting frequency, have significant association with industrial sectors. Meanwhile, a top manager's internal power and compensation plans play an important role in corporate board monitoring. My basic model is highly significant from the perspective of likelihood-ratio tests: the chi-square test-statistics have p-values less than 0.001, and McFadden pseudo-R^2 yields 26.1%[10] for the pooled sample. I emphasize that the apparent success of the basic model in addressing board meeting frequencies with respect to industrial sectors should be interpreted with caution. The predictive power of the models can only be reliably tested with out-of-sample forecast tests. These tests are implemented in Section 4.2 below.

As a robustness check, I introduce three variables that are related to a firm's life cycle (firm age) and capital structure (debt ratio) as additional control variables into my analysis. The results are shown in Table 3. Clearly, there is no significant impact from firm age. It is interesting to that a firm's debt policy exhibits significant influence on the firm's boar monitoring activities –

[10] Only a small fraction of observations is censored in my model, the OLS regression will give us quite the same effects comparing to Tobit model qualitatively.

corporate board tends to hold more meetings when the firm uses more debt, this is the case for both high-tech and traditional firms. Overall, I still have effects that are discovered in the baseline model. My results show that, there is no relation between board activities, measured by board meeting frequency, and several firm attributes including firm age in this study. One possible explanation is that other firm attributes considered in the study, i.e., firm size measured by book value of assets, asset structure reported as fraction of tangible asset, and firm performance measured by return on equity in the previous two years, have outperformed the omitted effect.

IV.2. Out-of-sample Predictive Power

In this section I examine the predictive power of the basic model using out-of-sample forecast tests. I designate the 1992-2000 period as the in-sample period and 2001-2002 as the out-of-sample period. I first estimate the specification of baseline Tobit model (cf. Table 2) using the cross-sectional and time-series data for high-tech and traditional firms during the in-sample period. Using these estimated coefficients, I then compute the predicted likelihood of board meetings on a *firm-by-firm* basis for both in-sample period and out-of-sample years. That is, for each firm I use the independent variable values for 2001-2002 in Equation (4) to compute the likelihood of log (meetings). The predictive performance is reported using two measurements, mean squared prediction error (MSPE) and mean absolute prediction errors (MAPE).

Table 4 compares the predictions from the specification with actual board meeting records reported in the *ExecuComp* database. For both the in-sample period of 1992-200 and out-of-sample period of 2001-2002, the table cross-tabulates the predictions of the model regarding predicted board meetings against the actual board meeting frequencies. For both in-sample period and out-of-sample period, the predicted values in Table 4 show vary close approximation to the actual board meeting frequencies. I also have similar results measured by mean absolute prediction errors (MASE). The resulting MSPE and MAPE show little difference between in-sample period and out-of-sample period, this means that the model's prediction power is non-decreasing for the out-of-sample period.

V. Summary and Conclusions

The theoretical and empirical literature on corporate governance and managerial entrenchment makes a number of relatively unambiguous refutable predictions regarding corporate board activities. I extend this framework to allow for the role of managerial compensation contracts. The predictions are then that (ceteris paribus) the likelihood of board meeting frequency is negatively related to the level of managerial entrenchment and firm performance, and positively related to firm size set and the power of performance-based managerial incentives. Since I generally face active managers in practice, I should consider the role of corporate board monitoring when managers are in control. In this case, my empirical framework under managerial entrenchment is distinct from traditional studies about board activities. In particular, I directly incorporate the strength of internal corporate governance mechanisms and firm characteristics in my study.

Consistent with theoretical literature, my empirical test design views observed board meeting frequency to be driven by the likelihood of managers to take non-value-maximizing

decisions. My results support the theoretical predictions of the management entrenchment literature. I have several principal findings. As predicted by the corporate governance hypothesis, board meeting frequency is significantly and negatively associated with the likelihood of non-value-maximizing behavior by top-management for both high-tech and traditional firms. Other things held equal, firms exhibiting greater CEO power attributes, such as longer CEO tenure and larger amount of compensation paid in cash salary and bonus — are significantly less likely to hold as many board meetings. Such firms also tend to be larger, have better performance records and possess more intangible assets. The superior performance of the Tobit model is robust, applying to both in-sample fit and out-of-sample forecast tests.

There are significant differences about CEO compensation policies between high-tech and traditional firms in my research. For traditional firms, board meeting frequency has positive and significant association with a CEO's service length, but this effect is negative and insignificant for high-tech firms; the coefficient for percentage of CEO share ownership is negative for traditional firms but positive for high-tech firms; the coefficient for long-term incentive plan is positive for traditional firms but negative and significant for high-tech firms. These differential board monitoring activities in different industries have not been addressed in academic literature.

I examine CEO power measured by CEO duality, defined as the same manager being both president and chairman, does significantly affect the likelihood of board meeting frequency. With a larger sample covering the 1992-2000 period, I find that CEO duality are significant determinants of board meeting frequency for firms in traditional industries, but not significant determinants for high-tech firms – a phenomenon that has not previously been addressed in the academic literature. These effects do show differential board monitoring in different industries. Overall, my analysis confirms that executive characteristics are significant factors in determining board meeting frequency.

Exhibit 1. Definition of Variables

I define the dependent and independent variables. For the independent variables, I also indicate their theoretically predicted sign in Tobit regressions. A positive (negative) sign implies that increases in variable value increase (decrease) the likelihood of board meeting frequency, holding other things fixed. All independent variables are taken the beginning of the year.

Dependent variable		**Definition**
log (meetings)		Log (number of board meetings) during year *t*. The number of board meetings is extracted from ExecuComp database.
Independent variables	Predicted Sign	**Definition**
CEO Service Length	Negative	Log (1+CEO years credit to service history). CEO years credit to service is defined as number of years recognized for her retirement plan in her firm. Records are extracted from ExecuComp database.
Cash Compensation	Negative	Log (1+ value of salary and bonus given to a CEO in a certain year). Records are extracted from ExecuComp database.
MV of CEO shares	Negative	Log (1+Market value of shares owned by a CEO). The price of stock is taken from CRSP at the beginning of year *t;* the number of shares owned by a CEO is obtained through ExecuComp database.
CEO stock ownership (%)	Negative	(Number of shares owned by CEO)/(Total number of shares outstanding in the market). The number of shares owned by a CEO is taken at the beginning of year t and obtained through ExecuComp database.
Executive stock options	Positive	Log (1+value of executive stock options). Records are extracted from ExecuComp database.
Long-term incentive plan	Positive	Log (1+long-term incentive plan). Records are obtained from ExecuComp database.
Duality	Positive	A dummy variable equals to 1 if a CEO is also the chairman of the board of the directors, otherwise 0.
Return on Equity in year t-1	Negative	(Operating Income in year t-1)/(Annual Common Equity in year t-1). Records are obtained from Compustat database.
Return on Equity in year t-2	Negative	(Operating Income in year t-2)/(Annual Common Equity in year t-2). Records are obtained from Compustat database.
Value of assets	Positive	Log (1+Book value of assets). Book value of assets is taken at the beginning of year t. Records are available through Compustat.
Market to book ratio	Positive	(Market value of equity)/(Book value of equity).Records are taken at the beginning of year t, records are obtained from Compustat.
Asset Structure	Negative	Book value of Properties, Plants and Equipment divided by the book value of assets at the beginning of year t. Records are obtained from Compustat.
Other control variables considered		Definition
Hi-tech Dummy	—	A dummy variable equals to 1 if a firm is classified as hi-tech company, otherwise 0.
Debt ratio	—	Book value of total debt divided by book value of debt + market value of equity at the beginning of year t.
Firm age	—	Firm age equal to the current reporting year minus the beginning date of a firm's listing year obtained through CRSP monthly file.

Table 1. Annual Board Meetings and Firm Characteristics

	High-tech Firms				Traditional Firms			
Variables	Obser-vations	Mean	Median	**Std. Dev**	Obser-vations	Mean	Median	**Std. Dev**
Book value of assets (millions of dollars)								
Less than 5 meetings	328	1082.13	367.838	2555.16	603	1613.97	529.367	4452.45
5 to 10 meetings	1834	3353.24	797.304	7686.29	2649	3381.21	972.921	14603.7
More than 10 meetings	421	6193.23	1529.70	12251.9	459	8642.74	1325.30	33413.1
Fraction of Tangible Assets								
Less than 5 meetings	328	0.485	0.369	0.433	603	0.553	0.526	0.315
5 to 10 meetings	1834	0.544	0.542	0.381	2649	0.608	0.565	0.385
More than 10 meetings	421	0.545	0.424	0.407	459	0.629	0.567	0.367
Return on Equity								
Less than 5 meetings	328	17.210	13.808	94.299	603	12.715	13.857	16.578
5 to 10 meetings	1834	5.716	13.052	91.331	2649	11.179	13.371	166.083
More than 10 meetings	421	1.281	10.877	76.851	459	11.165	10.323	226.000
Debt-to-equity								
Less than 5 meetings	328	0.198	0.119	0.214	603	0.267	0.256	0.231
5 to 10 meetings	1834	0.279	0.240	0.453	2649	0.355	0.358	0.216
More than 10 meetings	421	0.289	0.369	0.268	459	0.394	0.405	0.247
Market-to-book value of equity								
Less than 5 meetings	328	4.675	3.206	6.332	603	3.320	2.439	3.995
5 to 10 meetings	1834	4.321	2.869	11.556	2649	3.401	2.325	14.236
More than 10 meetings	421	4.319	2.909	4.781	459	3.399	2.114	6.525
Dividend Yield								
Less than 5 meetings	328	0.376	0	0.836	603	0.936	0.423	1.254
5 to 10 meetings	1834	0.900	0	1.332	2649	1.329	0.965	1.469
More than 10 meetings	421	1.184	0	4402	459	2.015	1.203	11.830

Table 2. The baseline models of industry effect on the likelihood of board meetings.

I classify all observations into high-tech group and traditional industry group according to sample firms' six-digit NAICS code. I identify 46 industry sectors as hi-tech industry; all other observations are classified into traditional industry sector. The Tobit model estimates are provided for the high-tech and traditional industries of the sample. The value of *t*-statistic is reported in the parenthesis. McFadden *pseudo-*R^2 is calculated as $1 - L_M/L_0$, where L_M is the log-likelihood for the estimated model, and L_0 is the log-likelihood in the model with only an intercept.

Explanatory variables	Predicted sign	High-tech firms	Traditional firms	Pooled Sample
Intercept	—	1.628 (4.64)***	1.784 (3.89)***	1.701 (6.15)***
Cash Compensation	Negative	-0.075 (-3.36)***	-0.131 (-5.23)***	-0.109 (-6.62)***
CEO Service Length	Negative	-0.138 (-0.30)	1.531 (3.16)***	0.786 (2.39)**
MV of CEO Shares	Negative	-0.0233 (-7.45)***	-0.019 (-5.41)***	-0.021 (-9.47)***
CEO stock ownership (%)	Negative	0.035 (0.20)	-0.258 (-2.36)**	-0.197 (-2.20)**
Executive stock options	Positive	0.003 (1.05)	0.009 (0.98)	0.005 (1.02)
Long-term incentive plan	Positive	-0.707 (-2.71)***	1.099 (3.11)***	0.018 (0.09)
Duality	Positive	0.0187 (1.40)	0.027 (1.84)*	0.025 (2.49)***
Return on equity in year t-1	Negative	-0.213 (-2.12)**	-0.531 (-3.67)***	-0.365 (-4.44)***
Return on equity in year t-2	Negative	-0.204 (-2.05)**	0.025 (0.56)	-0.012 (-0.30)
Value of assets	Positive	0.074 (15.86)***	0.038 (6.42)***	0.057 (15.92)***
Market-to-book	Positive	0.067 (1.07)	-0.265 (-1.71)*	0.039 (0.66)
Asset structure	Negative	-0.003 (-0.16)	0.014 (0.94)	-0.001 (-0.09)
Hi-tech Dummy		—	—	0.0536 (5.35)***
Estimated Sigma		0.338	0.353	0.347
Log Likelihood		-1143.42	-1100.78	-2292.67
Num. of Observations		2583	3711	6294
Pseudo R2		27.3%	25.9%	26.7%

Asterisks *, **, *** indicate *t*-statistic significance at 10%, 5%, and 1% levels, respectively

Table 3. The effect of omitted variables on the likelihood of board meetings.

I classify all observations into high-tech group and traditional industry group according to sample firms' six-digit NAICS code. I identify 46 industry sectors as hi-tech industry; all other observations are classified into traditional industry sector. The Tobit model estimates are provided for the high-tech and traditional industries of the sample. The value of *t*-statistic is reported in the parenthesis. McFadden *pseudo-*R^2 is calculated as $1 - L_M/L_0$, where L_M is the log-likelihood for the estimated model, and L_0 is the log-likelihood in the model with only an intercept.

Explanatory variables	Predicted sign	High-tech firms	Traditional firms	Pooled Sample
Intercept	—	1.639 (4.56)***	1.769 (3.80)***	1.701 (5.96)***
Cash Compensation	Negative	-0.075 (-3.31)***	-0.137 (-5.42)***	-0.112 (-6.69)***
CEO Service Length	Negative	-0.001 (-0.29)	0.013 (2.60)***	0.007 (2.11)**
MV of CEO Shares	Negative	-0.022 (-7.03)***	-0.017 (-4.78)***	-0.021 (-8.96)***
CEO stock ownership (%)	Negative	-0.012 (-0.07)	-0.284 (-2.58)***	-0.214 (-2.37)**
Executive stock options	Positive	0.003 (1.01)	0.007 (0.98)	0.005 (1.00)
Long-term incentive plan	Positive	-0.006 (-2.59)***	0.011 (3.05)***	0.001 (0.08)
Duality	Positive	0.017 (1.29)	0.026 (1.76)*	0.023 (2.33)***
Return on equity in year t-1	Negative	-0.020 (-1.93)*	-0.049 (-3.35)***	-0.035 (-4.21)***
Return on equity in year t-2	Negative	-0.019 (-1.93)*	0.003 (0.62)	-0.001 (-0.22)
Value of assets	Positive	0.073 (14.18)***	0.031 (4.89)***	0.055 (13.77)***
Market-to-book	Positive	0.001 (1.22)	-0.002 (-1.24)	0.001 (0.92)
Asset structure	Negative	-0.001 (-0.08)	0.012 (0.78)	-0.002 (-0.24)
Debt-to-equity		0.078 (1.88)*	0.105 (2.73)***	0.057 (2.05)**
Firm Age		-0.011 (-1.31)	0.009 (1.12)	0.001 (0.12)
Hi-tech Dummy	—	—	—	0.0601 (6.21)***
Estimated Sigma		0.338	0.353	0.347
Log Likelihood		-1138.37	-1221.53	-2100.41
Num. of Observations		2583	3711	6294
Pseudo R2		26.8%	26.3%	26.1%

Asterisks *, **, *** indicate *t*-statistic significance at 10%, 5%, and 1% levels

Table 4: Out-of-sample prediction performance of the Tobit model for 2001-2002

The baseline model's prediction performance is measured by Mean Squared Prediction Error (MSPE) and Mean Absolute Prediction Error (MAPE). Using coefficients estimated from 1992-2000 sample (cf. Table 2), the predicted values of $\hat{y}$ are calculated for the period 2001-2002, and the performance measures for both in-sample period and out-of-sample period are constructed as:

$$MSPE = \frac{\sum (y - e(y))^2}{n - p} \qquad MAPE = \frac{\sum |y - e(y)|}{n - p}$$

Panel A. High-tech Firms

	Mean of log (meetings)	Predicted Mean of log (meetings)	MSPE (Std. Dev)	MAPE (Std. Dev)	Number of observations
In-sample period, 1992~2000	1.857	1.869	0.112 (0.218)	0.223 (0.216)	2583
Out-of-sample period, 2001~2002	1.862	1.910	0.128 (0.232)	0.257 (0.305)	646

Panel B. Traditional Firms

	Mean of log (meetings)	Predicted Mean of log (meetings)	MSPE (Std. Dev)	MAPE (Std. Dev)	Number of observations
In-sample period, 1992~2000	1.872	1.881	0.127 (0.209)	0.272 (0.234)	3711
Out-of-sample period, 2001~2002	1.866	1.893	0.141 (0.215)	0.295 (0.294)	970

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