II. BOARD OWNERSHIP AND FIRM VALUE IN TAIWAN - A PANEL SMOOTH TRANSITION REGRESSION MODEL[1]

Feng-Li LIN[2]

Abstract

Using a panel of 504 Taiwanese listed firms during a 10-year period (2002-2011), this study tests whether there is an optimal level of board ownership, which maximizes firm value. This work adopts Tobin's Q as the proxy for firm value and finds that board ownership between 11.57% and 14.35% are an optimal level of board ownership to maximize firm value. This shift in financing sources propels the nonlinear relationship uncovered in this study and sheds light on Taiwan's legal system of ownership structure.

Keywords: firm value, Tobin's Q, board ownership, board of directors, entrenchment, panel smooth transition regression

JEL Classification: G31,G32, G34, C22

1. Introduction

Involvement of the board of directors (BOD) in firms can result in both benefits and costs to shareholders. This net benefit to shareholders is based on the benefits of BOD involvement (e.g. considerable ownership positions, organization-specific skills, decision-making power, active monitoring) exceeding the potential costs (e.g., extract private benefits, entrenchment). Whether there are benefits or costs of BOD involvement is an open question. I undertake this study in the Taiwan market, which provides a richer setting to examine the net valuation effect of board of directors. Unlike the U.S. and U.K. systems, in which the board of directors represents a widely dispersed group of shareholders, and are the market-based system of corporate governance, most Taiwan listed firms are characterized by large controlling shareholders, usually family groups, which are actively involved in the board of directors. Similar to German boards, corporate boards in Taiwan are two-tier board

[1] This study was presented at 2013 Global Business, Economics, and Finance Conference, Wuhan University, China, 9-11 May 2013.

[2] *Department of Accounting, Chaoyang University of Technology, Taichung, Taiwan, No. 168 Jifong E. Rd., Wufong Township Taichung County, 41349, Taiwan, R.O.C., Phone: +886-4-23323000 ext.7421, Fax: 886-4-23329898, E-mail:bonnie@cyut.edu.tw*

systems composed of directors and supervisors. Directors and supervisors are both elected by shareholders at annual meetings and generally serve a 3-year term. Boards of directors are responsible for maintaining the firm value and ensuring good practice in terms of audit, transparency and accountability, while supervisors are responsible for monitoring the directors and reviewing and auditing reports prepared for the shareholders. However, the supervisory board is not independent as in the German's two-tier system and its members can be elected from family members of current employees and directors (Lee *et al*., 2011).

Taiwan's legal system is based on the German civil law, but common law countries on average provide better shareholder protection than civil-law countries (La Porta *et al*., 1999). The legal basis of corporate governance in Taiwan primarily arises from application of the Company Law, the Securities and Exchange Law, and their related rules and regulations. The Securities and Exchange Law enhances the regulation of disclosure and transparency of listed firms. The Company Law particularly binds rules to protect present and future shareholders and creditors. The overall poor investor protection in Taiwan due to its legal environment suggests that internal governance may play a more important role on a firm's market value. The stance of Taiwan's legal system on ownership structure and the separation of ownership and control are ambiguous. Only Article 26 of the Securities and Exchange Act explicitly endorses and requires a degree of ownership concentration in the hands of the directors and supervisors. The assumption of the Article is that a fixed minimum degree of ownership concentration in the hands of the directors and supervisors would be beneficial to all firms. However, whether the Article contributes to this aim is questionable, depending primarily on the tradeoff between heightened monitoring and extraction of the private benefits of control.

Therefore, the current critical corporate governance issue for Taiwan is to find an optimal level of directors and supervisors ownership to maximize firm value to meet the aim of Article 26 of the Securities and Exchange Act. This empirical study contributes to previous literature in three aspects. First, it applies the panel smooth transition regression model of González, Teräsvirta and Dijk (2004, 2005) (PSTR) to determine a “threshold” ownership ratio. In contrast to traditional linear models, this nonlinear threshold model is able to determine the “trade-off” between the benefits of heightened monitoring of board of director and supervisor and the increased extraction of private benefits of control. Second, this PSTR model is able to determine an optimal level of ownership for an adequate regulatory standard. In contrast to traditional linear models, the distinction between ‘high’ and ‘low’ board ownership firms is often based on an arbitrary threshold level of the variable that is used to split the sample. Third, in most studies, the composition of these groups is fixed for the complete sample period, in the sense that firms are not allowed to switch groups over time. In this section, I apply the PSTR model to alleviate these shortcomings.

The rest of this study is organized into four sections. Section 2 reviews the results of previous empirical research. Section 3 provides the methodology, the sample data and the variables I use in my empirical analysis. Section 4 discusses the empirical results. Section 5 concludes and presents a few implications emerging from the findings.

2. Ownership Structure and Firm Value

Whether there are benefits or costs of BOD involvement is uncertain and has been the subject of numerous studies. Boards of directors have an incentive, due to their considerable ownership positions, to reduce principle-agent problems by maintaining high levels of monitoring (Jensen and Meckling, 1976). Boards of directors are more likely to possess organizational-specific skills that are critical to the success of the firm and have more influence and decision-making power within the firm (Filatotchev *et al*., 2007). Ho *et al*. (2004) show that high director ownership affects corporate policies (e.g. debt, dividend, and leasing policies) for growth firms the way in which it reliefs the intensity of monitoring mechanisms and mitigates agency costs. Li and Srinivasan (2011) suggest that boards with founder-directors provide more high-powered incentives in the form of pay and retention policies than the average US board. However, it is possible for board of directors to use their power and position within the firm to extract private benefits of control. In Taiwan, tighter control over the boards and higher separation of control rights and cash flow rights lead to a more severe expropriation of wealth from minority shareholders (Kuan *et al*., 2011).

Numerous studies suggest that the shareholdings of members of the BOD have a non-linear relationship with firm value. Morck *et al*. (1988) look at the relationship between managerial ownership and performance in a 1980 cross-section of 371 Fortune 500 firms. The result indicates that the convergence of interest effect is dominant within low and high regions of managerial ownership, while the 5% to 25% ownership range reflects the entrenchment effect. Using a sample of U.K. firms, Short and Keasey (1999) have reported the same up/down/up again relationship between managerial ownership and performance as Morck *et al*. (1988). They find that firm performance increases with managerial ownership between 0% and 12.99%, decreases until managerial ownership reaches 41.99%, and then increases again. They argue that managerial entrenchment occurs at higher levels of ownership for U.K. firms compared to U.S. firms, because of institutional differences, including monitoring by institutional investors and the ability to mount takeover defenses. Davies *et al*. (2005) present the similar results for U.K. firms, which suggest that the managerial ownership–corporate value relationship is a double-humped curve. With equity holdings around 50%, managers will have implicit control of their company, but their objectives will still not be completely aligned with those of external shareholders. Only at very high levels of managerial ownership, will managers effectively be majority owners in their firms, thus leading to a convergence of interests with outside shareholders. Thomsen and Pedersen (2000) also have observed the inverted U-shaped relationship between managerial ownership and Tobin's Q for European corporations.

However, Cui and Mak (2002) examine high R&D firms listed on the NYSE, AMEX and NASDAQ and find that Tobin's Q initially declines as managerial ownership increases from 0% to 10%, increases between 10% and 30%, and declines again between 30% and 50%. There is another increase in Tobin's Q above 50% ownership, so that there is a W-shaped relationship. Chen *et al*. (2003) study 123 Japanese firms from 1987 to 1995 and find that the relationship between managerial ownership and Tobin's Q is both positive and monotonic, thereby supporting the interest-alignment effect. Joh (2003) found that profitability increases sharply when ownership is between 5% to 25% and then increases more slowly when ownership exceeds 25% for Korean firms. Dwivedi and Jain (2007) show that directors' shareholding has a non-linear negative relationship with firm value in listed Indian firms. López Iturriaga and Crisóstomo (2010) found that ownership concentration initially improves the value of most Brazilian firms. However, after a certain threshold, in firms with growth opportunities, the risk increases that large shareholders expropriate wealth at the expense of minority shareholders.

3. Data and Methodology

3.1 Sample Set

I conduct my investigation using balanced panel data for a sample of 504 selected Taiwan Stock Exchange (TSE)-listed firms in Taiwan from 2002 to 2011. All data were obtained from the Taiwan Economic Journal3 (TEJ) database of Taiwan. Financial and insurance firms were excluded, because the nature of capital and investment in these industries is not comparable with non-financial firms. The final sample is 504 public trading firms, distributed across the nineteen industry sectors as follows: Electronics (190), Textiles (44), Construction (33), Other (30), Chemical (29), Electric Machinery (27), Iron and Steel (26), Plastics (21), Food (19), Transportation (17), Electrical and Cable (13), Department Store (10), Rubber (9), Paper, Pulp (7), Tourism (7), Oil, Gas and Electricity (7), Cement (7), Glass and Ceramics (4), Automobile (4). The electronics industries account for about 37.7% of the sample, while the remaining industries each make up less than ten percent.

3.2 Variables

This work adopts Tobin's Q as the proxy for firm value, because Q considers risk and the contribution of intangible assets. With other measures, such as return on assets or return on equity, the results are likely to be distorted by such effects as growth options and human capital (La Porta *et al*., 2002; Cronqvist and Nilsson, 2003; Maury, 2006). This study follows La Porta *et al*. (2002) in defining Tobin's Q as the book value of assets, minus the book value of equity, minus deferred taxes, plus the market value of common stock, divided by the book value of total assets.

The threshold variable, that is, BMOSH, the percentage of equity owned by the board of directors and supervisors to total equity, is the key variable used to examine whether there is an asymmetric threshold effect of board ownership on firm value. This work also includes control variables commonly used in analyzing firm value (e.g., Maury, 2006), namely, the natural log of the book value of total assets (Size); the ratio of total liabilities to total assets (Leverage); the rate at which a firm is growing

[3] The Taiwan Economic Journal *(TEJ) was founded in April 1990 in Taiwan and provides the most accurate and reliable data on companies throughout Asia. In addition to the tremendous depth and breadth of its financial and corporate data, it offers the timeliest updates on all the countries it covers. This is why it is the preferred data source of the most sophisticated and demanding analysts in the world.*

(Growth), calculated as the annual percentage change in sales. Consistent with Dushnitsky and Lenox (2006), measures of average industry Q are employed to control time-variants and industry-specific variations. Industry Q is measured as the arithmetic average of the all the firms in the same industry and the same year as the firm under consideration.

Table 1 presents the descriptive statistics for the pooled sample of 2002 to 2011. The total number of firms is 504, for a total of 5,040 firm-year observations. The average (median) value of Tobin’s Q is 1.35 (1.13). The board of directors and supervisors hold, on average (median), 22.56% (19.46%) of all the shares. Overall, the degree of change in board ownership every year over the sample period is small. As for the control variables, the size distribution of the sample firm is also skewed by the large differences between mean (223,797.76 million NT$) and median (62435.61 million NT$) total assets for the pooled sample, the ratio for Leverage is 38.37%, the rate of Sales growth is 30.72%, the pooled mean of Industry Q is 1.35. Based on the Jarque-Bera test results, I reject the normality of all the variables.

Table 1

Sample Descriptive Statistics

Variables	Average	Max.	Min.	Std. Dev.	25^{th} percentile	Median	75^{th} percentile	Jarque-Bera
Tobin's Q	1.35	15.28	0.21	0.84	0.87	1.13	1.57	264676.8***
BMOSH	22.56	81.85	0.13	13.56	12.60	19.46	29.18	1767.018***
Leverage	38.37	99.13	1.27	16.81	25.90	37.78	48.95	139.692***
Growth	30.72	75718.49	-134.40	1082.98	-7.07	5.47	19.56	4710000000***
IQ	1.35	3.17	0.62	0.35	1.09	1.36	1.65	35.80695***
Size ($millions)	223,797.76	15,281,262.38	2,468.32	636,460.26	30,748.05	62,435.61	143,586.77	88229.85***

*Notes: *, **, ***Significant at the 10%, 5%, and 1% levels, respectively. Jarque-Bera Test for Normality.*

The sample size is 504 firms for each of the 2002-2011 periods and is a total of 5040 firm-year observations results. Tobin's Q is measured as the book value of assets minus the book value of equity minus deferred taxes plus the market value of common stock divided by the book value of total assets. BMOSH is defined as the percentage of equity owned by the board of directors and supervisors to total equity. Leverage is measured as the ratio of total liabilities to total assets. Growth is calculated as the annual percentage change in sales. IQ is measured as the arithmetic average of the all the firms in the same industry and the same year as the firm under consideration.

3.3 Panel Unit-Root Models

An extension of the traditional least squares estimation method, the panel smooth transition regression model requires that the variables in the model be stationary in order to avoid spurious regressions. Thus, I first perform the unit root test. Since I only use panel data in this investigation, I adopt the Levin–Lin–Chu (LLC) (2002), the Im–Pesaran–Shin (IPS) (2003), the Augmented Dickey–Fuller (ADF) (Dickey and Fuller, 1979) and the PP–Fisher Chi-square (Phillips and Perron, 1988). Based on the results of the stationary test of each panel (i.e., the explained variables, the threshold variable and the control variables) in Table 2, it is clear that all the variables have stationary characteristics, since the nulls of the unit root are mostly rejected, especially in the case of the LLC test.

Table 2

Panel Unit Root Test Results

Method	LLC		IPS		ADF - Fisher Chi-square		PP - Fisher Chi-square	
Tobin's Q	-32.5427	[0***]	-13.3265	[0***]	1819.32	[0***]	2578.84	[0***]
BMOSH	-914.657	[0***]	-52.2634	[0***]	1487.19	[0***]	2087.49	[0***]
Size	-22.4419	[0***]	-0.8626	[0.1942]	1153.66	[0***]	1739.64	[0***]
Leverage	-33.6896	[0***]	-5.17665	[0***]	1334.5	[0***]	1611.88	[0***]
Growth	-26.6015	[0***]	-14.2033	[0***]	1820.36	[0***]	3486.6	[0***]
IQ	-44.2103	[0***]	-18.3543	[0***]	2151.9	[0***]	3035.91	[0***]

*Notes: The numbers in brackets indicate p-values. ***, **, and * indicate significance at the 0.01, 0.05 and 0.1 level, respectively. Tobin' Q is measured as the ratio of the market value of equity and book value of debt, preferred equity, long-term debt and net current liabilities to the book valued of assets. BMOSH is defined as the percentage of equity owned by the board of directors and supervisors to total equity. Size is measured as the logarithm of the book value of total assets. Leverage is measured as the ratio of total liabilities to total assets. Growth is calculated as the annual percent change in sales. I Q is measured as the arithmetic average of the all the firms in the same industry and the same year as the firm under consideration.*

3.4 Panel Smooth Transition Regression Model

I introduce the procedures briefly as follows. According to González, Teräsvirta and Dijk (2004, 2005), I set up the panel smooth transition regression model as follows:

$$Q_{i,t} = \mu_i + \sum_{m=0}^{M} \sum_{k=1}^{K} \beta_{m,k} x_{i,t,k} g(BMOSH_{i,t};\gamma, C_m) + \varepsilon_{i,t} \quad (1)$$

where: the variables $x_{i,t,k}$ are $BMOSH_{i,t}$, $Size_{i,t}$, $Leverage_{i,t}$, $Growth_{i,t}$, and $IQ_{i,t}$ for k=1 to 5, respectively, and $h(BMOSH_{i,t}, C_m)$ is one if $C_m \leq BMOSH_{i,t}$. The values of C_m are obtained from the regression with $C_0 = 0$.

The symbol $g(BMOSH_{i,j};\gamma, C_m)$ represents a transition function which depends on the variables already described and in which γ determines the slope of the transition function and C is the threshold parameter.

In the PSTR model, the transition function $g(BMOSH_{i,t};\gamma, C_m)$ is a continuous and bounded function of the threshold variable $(BMOSH_{i,t})$ and is normalized to be bounded between 0 and 1, and these extreme values are associated with regression coefficientsβ0and β0+β1. The value of $(BMOSH_{i,t})$ determines the value of $g(BMOSH_{i,t};\gamma, C_m)$and, thus, the effective regression coefficients $\beta_0 + \beta_1$, $g(BMOSH_{i,t};\gamma, C_m)$for firm i at time t. Following Granger and Teräsvitra (1993), (1994) and Jansen and Teräsvitra (1996), I estimate this function by using the logistic transition function

$$g(BMOSH_{i,t} : \gamma, C) = (1 + \exp(-\gamma \prod_{j=1}^{m} (BMOSH_{i,t} - C_j))^{-1}, \gamma > 0, C_1 \le C_2 \le ..C_m \quad (2)$$

where: $C = C_1, C_2, ...C_M$, is an M-dimensional vector of location parameters and the parameter γ determines the smoothness of the transitions.

In practice, it is usually sufficient to consider m = 1 or m = 2, as these values allow for commonly encountered types of variation in the parameters. When the m = 1 and $\gamma \to \infty$, the PSTR model is like of panel threshold model of Hansen (1999). When the m = 2 and $\gamma \to \infty$, the model becomes a three-regime threshold model whose outer regimes are identical and different from the middle regime. When m > 1 and $\gamma \to \infty$, the number of distinct regimes remains two, with the transition function switching back and forth between zero and one at $C_1, C_2, ...C_m$, . Finally, for any value of m the transition function (2) becomes constant when $\gamma \to 0$, in which case the model collapses into a homogenous or linear panel regression model with fixed effects.

The initial specification stage of the modeling cycle essentially consists of testing homogeneity against the PSTR alternative. The PSTR model (1) with (2) can be reduced to a homogenous model by imposing $H_0^2 : \beta_1 = 0$ or $H_1^2 : \gamma_1 = 0$. But the associated tests are nonstandard because under either null hypothesis the PSTR model contains unidentified nuisance parameters. Thus, I follow Luukkonen, Saikkonen, and Teräsvirta (1988) to solve these nuisance parameters. I test homogeneity using the null hypothesis $H_0 : \gamma \to 0$. To circumvent the identification problem, I replace by its first-order Taylor expansion around γ=0. This leads to the auxiliary regression, as follow:

$$Q_{i,t} = \mu_i + \beta_0^{'*} x_{i,t} + \beta_1^{'*} x_{i,t} BMOSH_{i,t} + ... + \beta_m^{'*} x_{i,t} BMOSH_{i,t}^m + \varepsilon_{i,t}^* \quad (3)$$

Therefore, testing $H_0 : \gamma \to 0$ in (*4*) is equivalent to testing the null hypothesis $H_0 : \beta_0^{'*} = ... = \beta_m^{'*} = 0$ in (3). We may note that under the null hypothesis $\{\varepsilon_{i,t}^* \{= \{\varepsilon_{i,t}\}$, so the Taylor series approximation does not affect the asymptotic distribution theory.

The homogeneity test can also be used for determining the appropriate order m of the logistic transition function in (2). Granger and Teräsvirta (1993) and Teräsvirta (1994) proposed a sequence of tests for choosing between m = 1 and m = 2. Applied to the present situation this testing sequence reads as follows:

Using the auxiliary regression (3) with m = 3, test the null hypothesis $H_0 : \beta_2 = \beta_1 = \beta_0 = 0$. If it is rejected, can continue to proceed with the following linear test:

$$H_{04} : \beta_2 = 0; H_{03} : \beta_1 = 0, \beta_2 = 0; H_{02} : \beta_0 = 0, \beta_2 = \beta_1 = 0$$

Select m = 2 if the rejection of H_{03} is the strongest one, otherwise select m = 1. After PSTR model determine the types of variation in the parameters, proceed with model parameter estimation. In the PSTR model (1) is a relatively straightforward application of the fixed effects estimator and nonlinear least squares (NLS).

2. Empirical Results

Table 3 shows the result of using LM (chi-square statistic), LMF (F statistic), and LRT (T statistic) tests of homogeneity to test whether the model is non-linear relationship. Homogeneity is rejected for the transition variable, the p-values are all significant at the 1% level; these tests suggest that this model is a non-linear model. Then, I apply the sequence of homogeneity tests to determine the order m of the logistic function. Results for the specification test sequence the F-version of the standard and robust test for m-1, 2, and 3 are shown in Table 4, point at m = 1 as the strongest rejection does occur for null hypotheses (H01). Given the choices of maximin r =2, then the results of testing the number of regimes are significant, and that at 1% level. Thus, based on the robust test I conclude that there are two threshold effects of board ownership on firm value. For the remainder of the analysis, I work with this double threshold model.

Table 3

Homogeneity Tests

H0: Linear Model		
H1: PSTR model with at least one Threshold Variable (r=1)		
Transition variable $BMOSH_{it}$	Test	*p*-value
Wald Tests (LM)	95.62***	0
Fisher Tests (LMF)	5.829***	0
LRT Tests (LRT)	95.539***	0

****, **, and * indicate significance at the 0.01, 0.05 and 0.1 levels, respectively.*

Table 4

Sequence of Homogeneity Tests for Selecting m

Transition variable $BMOSH_{it}$	F- Test	*p*-value
(m=3) $H_{03}:\beta_3 = 0$	2.491***	0
(m=2) $H_{02}:\beta_2 = 0\|\beta_3 = 0$	0.763	0.72
(m=1) $H_{01}:\beta_1 = 0\|\beta_3 = \beta_2 = 0$	2.548***	0.001

****, **, and * indicate significance at the 0.01, 0.05 and 0.1 levels, respectively.*

Table 5 presents the regression slope estimates together with the White-corrected standard errors for two regimes. When there is a double threshold effect of board ownership on firm value, all observations are split into three regimes.

Table 5

Estimation Results of Two-Regime PSTAR Model

	β_0	β_1	β_2
$BMOSH_{it}$	-1.0188	7.6884**	-6.5612*
T-value	1.1059	2.3950	1.9723
Threshold value	C_1	C_2	
	11.57%	14.35%	
Slopes parameters	γ_1	γ_2	
	0.0009	1.9936	

****, **, and * indicate significance at the 0.01, 0.05 and 0.1 levels, respectively.*

The estimated model from the empirical results is represented as follows:

$$Q_{i,t} = \beta_0 x_{it1} + \beta_1 x_{it2}\left(BMOSH_{i,t}, 0.0009, 11.57\%\right) + \beta_{it2} x_{it3}(BMOSH_{it}\ , 1.9936, 14.35\%) + \varepsilon_{i,t}$$

$$\beta_0 = (-1.0188, -49.0045, -0.0158, 0.1343, 0.9539)$$

$$\beta_1 = (7.6884, -0.0546, -0.4516, -0.3784, -0.7253)$$

$$\beta_2 = (-6.5612, -0.5930, 0.6686, 0.2445, 0.5938)$$

$$x_{it} = (BMOSH_{i,t}, Size_{i,t}, Leverage_{i,t}, Growth_{i,t}, \text{ and } IQ_{i,t})$$

The regimes are distinguished by the different regression slopes, β_0, β_1 and β_2. In the first regime, where the board ownership is less than 11.57%, the estimate of coefficient β_0 is -1.0188, but it is insignificant; this means there is no relationship between board ownership and firm value when the board ownership is less than 11.57%. In the second regime, where the board ownership is higher than 11.57% but lower than 14.35%, the estimate of coefficient $\beta_0+\beta_1$ is 6.6696, which is significant at the 5% level and which indicates that Tobin's Q increases by 6.6696% with an increase by 1% in board ownership. In the third regime, where the board ownership is higher than 14.35%, the estimate of coefficient β0+β1+β2 is 0.1084, , which is significant at the 10% level and which indicates that Tobin's Q increases by 0.1084% with an increase by 1% in board ownership. The estimates 11.57% and 14.35% are larger and, respectively, smaller values in the empirical distribution of the board ownership threshold variable. Thus, the three classes of firms shown by the point estimates are those with ''low- BMOSH '' (board ownership ≦11.57%), ''median-BMOSH" (11.57%＜board ownership ≦ 14.35%) and "high- BMOSH " (board ownership＞14.35%). Comparing the median- BMOSH regime with the high-BMOSH regime, I find that the median-BMOSH regime increases Tobin's Q 9.225(6.6696/0.1084) times more than does the high-BMOSH regime. The slope of the panel threshold does not have a fixed value; in the median-BMOSH regime it is 6.6696, whereas in the high- BMOSH regimes the slope is 0.1084, respectively. Therefore, the results clearly show that the relationship between board ownership and Tobin's Q (i.e., the slope value) varies in accordance with different changes in ownership structure, and there is a decreasing trend. This is shown in Figure 1, where the transition function is plotted against Tobin's Q, with each circle representing an observation. A clear majority of observations lie in either one of the extreme regimes, but there is also a number of them located in-between. I am compelled to conclude that there is an optimal board ownership between 11.57% and 14.35%, where firm value is sharply increasing. The results are in sharp contrast to those in the literature. Recall that Morck *et al*. (1988) found that the Tobin's Q first increase as managerial ownership increases from 0% to 5% but then decrease when managerial ownership further increases again beyond 25%. The board ownership, by contrast, always increases firm value here but vary in speed when they are in different regimes. The effect of board ownership is strongest in the medium ownership regime and weakest in the high ownership regime, lending strong support to alignment effect. These results are consistent with the findings of Joh (2003) that profitability increases sharply when ownership is between 5% to 25% and increases gradually when ownership exceeds 25%.

In the coefficient estimations of the control variables shown in Table 6, firm size is significantly negatively related to Tobin's Q in the ''low- BMOSH'' regime. Leverage is significantly and positively related to Tobin's Q in the ''high- BMOSH'' regime. When the board ownership is high, can exert function of their professional supervision managers, and obtain the confidence of creditors, so that company can easy obtain liabilities to finance, it also shows that firm value is sure, so there is a higher firm value (Hung *et al*., 2005). Sales growth is significantly and positively related to Tobin's Q in the ''low-BMOSH'' and ''median-BMOSH'' regime, stated briefly, the higher the sales growth, the higher firm value is. IQ is significantly and positively related to Tobin's Q in all regimes.

Table 6

Estimation Results of Control Variables

Variable	β_0	β_1	β_2
Size	-49.0045***	-0.0546	-0.5930
Leverage	-0.0158	-0.4516	0.6686***
Growth	0.1343**	-0.3784**	0.2445
IQ	0.9539***	-0.7253***	0.5938***

****, **, and * indicate significance at the 0.01, 0.05 and 0.1 levels, respectively.*

Table 7 presents the percentages of firms that fall into each of the three regimes in each year. I find that the percentage in the ''low-BMOSH'' category ranges from 16% to 25% of the sample over the sample period. Approximately 21% of the firms fall into the low-BMOSH regime. The median-BMOSH regime of firms ranges from 8% to 15% of the sample over the same period, and 12% of the firms fall into the median-BMOSH regime. The high-BMOSH regime of firms ranges from 62% to 75% of the sample, and 67% of the firms fall into the high-BMOSH regime. Claessens *et al*. (2000) found that management in roughly 80% of Taiwanese listed firms is from the controlling family. Yeh and Woidtke (2005) also found that ultimate controllers in Taiwan have power in selecting both directors and supervisors, and can strengthen their control by selecting family members or persons they trust. Further analysis as to whether different characteristics exist in the three regimes of board ownership found that nearly 68% (75%) of the median-BMOSH regime samples are 100% (90%) control-affiliated directors with ultimate controllers. These results indicate that support for alignment effects is because Taiwan's board of directors and supervisors are dominated by ultimate controllers related to family conglomerates who hold a large portion of equity, and generally have an incentive to align outside shareholder interests by contributing to firm value (Villalonga and Amit, 2006; Maury, 2006).

Table 7

Number [Percentage] of Firms in Each Regime by Year

	Year										
Firm class	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average
11.57%≧ BMOSH	81	90	96	105	110	109	104	112	117	127	105
	[16]	[18]	[19]	[21]	[22]	[22]	[21]	[22]	[23]	[25]	[21]
11.57%< BMOSH≦ 14.35%	43	39	56	60	57	64	69	74	74	59	60
	[9]	[8]	[11]	[12]	[11]	[13]	[14]	[15]	[15]	[12]	[12]
BMOSH >14.35%	380	375	352	339	337	331	331	318	313	318	339
	[75]	[74]	[70]	[67]	[67]	[66]	[66]	[63]	[62]	[63]	[67]

The numbers in brackets indicate the percentage of firms in each regime.

5. Conclusions

The stance of Taiwan's legal system on ownership structure and the separation of ownership and control are ambiguous. Only Article 26 of the Securities and Exchange Act explicitly endorses and requires a degree of ownership concentration in the hands of the directors and supervisors. The assumption of the Article is that a fixed minimum degree of ownership concentration in the hands of the directors and supervisors would be beneficial to all firms. Therefore, the critical corporate governance issue for Taiwan today is to find an optimal ratio of board ownership to maximize firm value to meet the aim of Article 26 of the Securities and Exchange Act.

The results substantiate the view that there must be an optimal level of board ownership between 11.57% and 14.35%, which maximizes firm value, lending strong support to alignment effects. Almost 68% of the optimal level of board ownership is 100% control-affiliated directors with ultimate controllers. This can be explained by the fact that Taiwan ultimate controller involvement in directors and supervisors leads to increased firm value. The results substantiate an optimal level of board ownership for an adequate regulatory standard.

References

Chen, C.R., Guo, W., and Mande, V., 2003. Managerial ownership and firm valuation: Evidence from Japanese firms, *Pacific-Basin Finance Journal*, 11(3), pp. 267–283.

Claessens, S., Fan, P. H. J., Djankov, S., and Lang, H. P. L., 2000. *Expropriation of minority shareholders in East Asia*, CEI Working Paper Series, No. 2000-4.

Cronqvist, H., and Nilsson, M., 2003. Agency costs of controlling minority shareholders *Journal of Financial and Quantitative Analysis,* 38(4), pp. 695-719.

Cui, H., and Mak, Y.T., 2002. The Relationship Between Managerial Ownership and Firm Performance in High RandD Firms, *Journal of Corporate Finance,* 8(4), pp. 313–336.

Davies, J.R., Hillier, D., and McColgan, P., 2005. Ownership Structure, Managerial Behavior and Corporate Value, *Journal of Corporate Finance,* 11(4), pp. 645–660.

Dickey, D. A., and Fuller, W.A., 1979. Distribution of the estimators for autoregression time series with a unit root, *Journal of the American Statistical Association*, 74(366a), pp. 427–432.

Dushnitsky, G., and Lenox, M.J., 2006. When does corporate venture capital investment create firm value? , *Journal of Business Venturing*, 21(6), pp. 753-772.

Dwivedi, N., and Jain, A.K., 2007. Corporate Governance and Performance of Indian Firms: The Effect of Board Size and Ownership, *Employee Responsibilities and Rights Journal,* 17 (3), pp.161-172, Filatotchev, I., Isachenkova, N., and Mickiewicz, T., 2007. Corporate governance, managers' independence, exporting, and performance of firms in transition economies, *Emerging Markets Finance and Trade*, 43 (5), pp. 62-77.

González, A., Teräsvirta, T., and Dijk, D.V., 2004. Panel smooth transition regression model and an application to investment under credit constraints, *Stockholm School of Economics working papers.*

Granger, C.W., and Terasvirta, T., 1993. *Modeling nonlinear economic relationships*, Oxford University Press.

Hansen, B.E., 1999. Threshold effects in non-dynamic panels: estimation, testing and inference, *Journal of Econometrics,* 93(2), pp. 345-368.

Ho, S.S., Lam, K.C., and Sami, H., 2004. The investment opportunity set, director ownership, and corporate policies: Evidence from an emerging market, *Journal of Corporate Finance* 10(3), pp. 383–408.

Hung, J.H., Chen, H.J., and Wang, Y.C., 2005. Internal governance mechanisms and corporate performance: A perspective on ownership structure and board characteristics, *Fu Jen Management Review.* 12(3), pp. 23-40.

Im, K.S., Pesaran, M.H., and Shin, Y., 2003. Testing for unit roots in heterogeneous panels, *Journal of Econometrics*, 115(1), pp. 53–74.

Jensen, M.C., and Meckling, W.H., 1976. Theory of the Firm: Managerial Behavior, Agency Cost and Ownership Structure, *Journal of Financial Economics,* 3(4), pp. 305-360.

Jansen, E.S., and Teräsvirta, T., 1996. Testing parameter constancy and super exogeneity in econometric equations, *Oxford Bulletin of Economics and Statistics*, 58(4), pp. 735-763.

Joh, S.W., 2003. Corporate governance and firm profitability: Evidence from Korea before the economic, *Journal of Financial Economics,* 68(2), pp. 287-322.

Kuan, T.H., Li, C.S., and Chu, S.H., 2011. Cash holdings and corporate governance in family-controlled firms, *Journal of Business Research* 64 (2011) pp. 757–764.

La Porta, R., Lopez de Silanes, F., Shleifer, A., and Vishny, R., 2002. Investor Protection and Corporate Valuation, *Journal of Finance,* 57(3), pp. 1147-1170.

Lee, S.C., Lin, C.T., and Chang, P.T., 2011. An Ohlson valuation framework for valuing corporate governance: The case of Taiwan, *Pacific-Basin Finance Journal* 19(4), pp. 420–434.

Levin, A., Lin, C.F., and James Chu, C.S., 2002. Unit root in panel data: asymptotic and finite-sample properties, *Journal of Econometrics*, 108(1), pp.1–24.

Li, F., and Srinivasan, S., 2011. Corporate governance when founders are directors, *Journal of Financial Economics*, 102(2), pp. 454-469.

Iturriaga, F.J.L., and Crisóstomo, V.L., 2010. Do leverage, dividend payout, and ownership concentration influence firms' value creation? An analysis of Brazilian firms, *Emerging Markets Finance and Trade*, 46 (3), pp. 80-94.

Maury, B., 2006. Family ownership and firm performance: Empirical evidence from Western European corporations”, *Journal of Corporate Finance,* 12(2), pp. 321-341.

Morck, R., Shleifer, A., and Vishny, R.W., 1988. Management Ownership and Market Valuation: An Empirical Analysis, *Journal of Financial Economics,* 20(1), pp. 292-315.

Phillips, P.C., and Perron, P., 1988. Testing for a unit root in a time series regressions *Biometrika*, 75(2), pp. 335–346.

Short, H., and Keasey, K., 1999. Managerial Ownership and the Performance of Firms: Evidence from the UK, *Journal of Corporate Finance,* 5(1), pp. 79–101

Teräsvita T., 1994. Specification, estimation, and evaluation of smooth transition autoregressive models, *Journal of the American Statistical Association* 89(425), pp. 208-218.

Thomsen, S., and Pedersen, T., 2000. Ownership Structure and Economic Performance in the Largest European Companies, *Strategic Management Journal*, 21 (6), pp. 689-705

Villalonga, B., and Amit, R., 2006. How do family ownership, control and management affect firm value? , *Journal of Financial Economics,* 80(2), pp. 385-417.

Yeh, Y.H., and Woidtke, T., 2005. Commitment or entrenchment? Controlling shareholders and board composition, *Journal of Banking and Finance,* 29(7), pp.1857-1885.