

DOES MANAGERIAL OWNERSHIP REDUCE AGENCY COST IN TAIWAN? A PANEL THRESHOLD REGRESSION ANALYSIS

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Abstract

Two agency theories have dominated the corporate ownership debate, the convergence of interest and the entrenchment hypothesis. Following the work of Ang et al. (2000) and Sing and Davidson (2003) to a panel of 266 Taiwanese listed companies for the 1996-2006 period, we adopt an advanced panel threshold regression model to determine whether managerial ownership reduces agency costs. We find when managerial ownership is less than 36.55% or greater than 59.06%, consistent with the entrenchment hypothesis, a 1% increase in the managerial ownership decreases asset utilization efficiency by 0.32% and 0.5%, respectively. However, managerial ownership is between 51.35% and 59.06%, consistent with the convergence of interest hypothesis, a 1% increase in the managerial ownership increases asset utilization efficiency by 0.21%.

Keywords: Agency cost, Panel threshold effect, Managerial ownership.

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1. Introduction

Theory indicates that managerial ownership in a firm generates two agency costs between managers and shareholders, i.e. the convergence of interest and the entrenchment hypothesis. Under the former, according to Jensen and Meckling (1976), as insider ownership increases, managerial ownership serves to align the interests of managers and outside shareholders, agency costs will decline. However, under the latter, managers with larger shareholdings have greater control over the company. They may become entrenched through any mechanism that makes them immune from the discipline of the markets. An increasing ownership to a point at which managers become entrenched will actually increase agency costs (McConnell and Servaes, 1990; Schooley and Barney, 1994; and Morck et al., 1988). A number of studies since Jensen and Meckling (1976) have sought to evaluate empirically the effect of agency costs on ownership structure. One limitation with these studies, however, is that the absolute and relative measures of agency costs are rarely discussed, until Ang et al. (henceforth ACL) (2000) adopt both asset utilization and discretionary expenditures as a proxy for agency cost.

Following the work of ACL and Sing and Davidson (henceforth SD) (2003) to a panel of 266

Taiwanese listed companies for the 1996-2006 period, we adopt an advanced panel threshold regression model to determine whether there is a "threshold" optimal managerial ownership which reduces agency cost. We find that when managerial ownership is less than 36.55% and greater than 59.06% consistent with entrenchment hypothesis reflecting higher agency cost, asset utilization efficiency decreases by 0.32% and 0.5%, respectively, with a 1% increase in the managerial ownership. Especially, when managerial ownership is less than 5.27%, higher agency cost reflecting in excessive discretionary expenses, a 1% increase in the managerial ownership increases SG&A expenses by 12.89%. However, managerial ownership is between 51.35% and 59.06% reflecting lower agency costs, a 1% increase in the managerial ownership increases asset utilization efficiency by 0.21%. Therefore, when managerial ownership is between 51.35% and 59.06%, consistent with the convergence of interest hypothesis, where enhances the asset utilization efficiency and managerial ownership mitigates principal-agent conflicts.

This empirical study contributes to the previous literature in two respects. Firstly, according to prior studies that agency costs decline with increases in managerial ownership to a point, but after entrenchment occurs, agency costs increase with increases in managerial ownership. In contrast to

traditional linear models, Hansen's (1999) advanced panel threshold regression model, namely a nonlinear threshold model applied in this study, is able to determine whether there is a "threshold" optimal managerial ownership which reduces agency cost. Secondly, we use panel data for Taiwanese listed companies to fully explore the managerial ownership characteristics of various industries in Taiwan. Unlike that in the U.S., the firm in Taiwan is characterized by low institutional ownership and an inactive market for corporate control, especially that in relation to the board of directors. Moreover, shareholders have fewer rights in Taiwan than in the U.S. Thus, a natural setting for examining the influence of managerial ownership effects on agency cost is provided in Taiwan.

The rest paper is organized as follows. Section 2 reviews the results of previous empirical research. Section 3 provides the sample data, the variables we use in our empirical analysis and describes the methodology. Section 4 discusses the empirical results, and Section 5 concludes and presents a few implications that emerge from our findings.

2. Managerial ownership and agency costs

Jensen and Meckling (1976) hypothesized that agency problem worsens as managerial ownership decreases. Demsetz and Lehn (1985) conclude that ownership concentration is used to offset agency problems, while Crutchley and Hansen (1989) and Bathala, et al. (1994) notes that higher levels of insider ownership may be used to decrease agency costs. Consistent with the existence of the two agency costs, a series of papers examine the effect of managerial ownership on 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. They find that Tobin's Q rises as managerial ownership increases from 0% to 5%, decreases within the managerial ownership range of 5% to 25%, and increases again beyond 25%. Several subsequent studies (e.g. Cho, 1988; Short and Keasey, 1999; Gugler and Yurtoglu, 2003) have reported the same up/down/up again relationship between ownership concentration and performance as Morck et al. (1988). McConnell and Servaes (1990) examine a larger data set than the Fortune 500 firms examined by Morck et al. and find an inverted U-shaped relationship between managerial ownership and Tobin's Q, with the turning point lying between 40% and 50% (see *endnote 1*). Thomsen and Pedersen (2000) also have observed the inverted U-shaped for European corporations. Hermalin and Weisbach (1991) analyze 142 NYSE firms and find that Tobin's Q rises with ownership up to a stake of 1%; the relationship is negative in the ownership range of 1% to 5%, becomes positive again in the ownership range

of 5% to 20%, and turns negative for ownership levels exceeding 20%. Holderness et al. (1999) find weak support for Morck et al. (1998) in that a significant relationship between managerial ownership and firm performance is observed only when the ownership is below 5%. Cui and Mak (2002) find a W-shaped relationship between managerial ownership and Tobin's Q for high R&D firms listed on the NYSE, AMEX and NASDAQ. Davies et al. (2005) present results which suggest that the managerial ownership-corporate value relationship is a double-humped curve for U.K. Han (2006) examines the relationship between insider ownership and firm value using panel data on real estate investment trusts, and finds a significant nonlinear relation between Tobin's Q and insider ownership that is consistent with the trade-off between the incentive alignment effect and the entrenchment effect of insider ownership. Dwivedi and Jain (2007) show that directors' shareholding has a non-linear negative relationship with firm value in listed Indian firms. Using small privately owned firms to proxy a zero-agency cost for the 100% owner-manager firm, Ang et al. (2000) find that agency costs are higher when manager's ownership share are small, when the number of non-manager shareholders increase, and when outsiders manage the firm. Sing and Davidson (2003) extend the work of Ang et al. (2000) to large firms. They find that managerial ownership is positively related to asset utilization but does not serve as a significant deterrent to excessive discretionary expenses. Furthermore, smaller boards serve the same role, but outside block ownership and independent outsiders on a board do not appear to protect the firm from agency costs. Using a survey sample of approximately 3800 Australian small and medium enterprises for 1996-1997 and 1997-1998, Fleming et al. (2005) find that a positive relationship between equity agency costs and the separation of ownership and control. Following the approach in Ang et al. (2000), Davidson et al. (2006) find that greater CEO ownership is associated with lower agency costs both before and after the IPO. Further board composition and involvement by venture capital firms does not appear to mitigate agency costs.

3. Data and methodology

A. Sample

To explore the relationship between managerial ownership and agency, the balanced panel data are used in this investigation for a sample of 266 selected Taiwan Stock Exchange (TSE)-listed companies in Taiwan covering the period from 1996 to 2006. All data are obtained from the *Taiwan Economic Journal* (TEJ) database of Taiwan. Financial and insurance firms are excluded, because the nature of capital and investment in these industries is not comparable to those of non-financial firms. The final sample is 266

public trading companies, distributed across the eighteen industry sectors as follows: Electron (55), Textiles (30), Plastics (18), Steel and Iron (18), Construction (18), Chemical (17), Food (16), Transportation (12). The residual 82 companies are from the remaining sectors. The electronics and textiles industries together account for about one-third of the sample, while each of the remaining industries makes up less than eight percent.

B. Measures

Following ACL and SD, for the first measure of agency costs the ratio of annual sales to total assets is adopted as the first proxy for agency costs related to management's ability to utilize assets efficiently. The higher the asset turnover ratio, the larger amount of sales and eventually cash flow the firm has in a specific level of assets. Whereas the lower asset turnover ratio reflects that managers have deployed assets in unproductive purposes that unable to generate cash flows. Thus, it's expected that the higher asset turnover ratios that a firm has, the lower agency conflict the firms has. As in SD, the ratio of selling, general, and administrative (SG&A) expenses to total sales is used as a second proxy for agency cost reflecting management excessive pay and perquisite consumption. It's expected that when agency costs are high, managers will consume relatively large discretionary expense on SG&A expenses. Conversely, when agency costs are low, managers will save relatively large SG&A expenses.

There are two categories of explanatory variables in our panel data. The threshold variable, i.e., managerial ownership (MOWN) is measured by the total common equity held by all managers (directors, supervisors, and top executives) as a fraction of common equity outstanding, the key variable commonly used in the prior studies (e.g., McConnell and Servaes, 1990; Himmelberg et al., 1999; Hanson and Song, 2000; Cheung and Wei, 2006) that we use it to investigate whether there is an asymmetric threshold effect of managerial ownership on agency cost. As in SD, three control variables commonly used in the analysis of agency cost are also included in this study; namely, the natural log of the book value of total assets (Size) to capture intangibles related to the firm's size; the ratio of total liabilities to total assets (Leverage); and the board size (Board), which is calculated as the number of board members (director and supervisor).

Table 1 presents the descriptive statistics for our pooled sample of the 1996-2006 period. The total number of firms is 266, and there are a total of 2,926 firm-year observations. A comparison of the agency cost statistics in our sample with those in the SD sample reveals that our sample has considerably higher asset utilization efficiency than those in the SD sample. Our pooled sample mean is 69.84 and

median is 59, while they show an average asset turnover ratio of 1.43. They report mean (median) ratio of SG&A expense to sales at 27.9% (19.5%), those in our pooled sample have lower SG&A expense ratio at 13.24% (8.43%). The pooled mean (median) managerial ownership is 21.92% (19.94%), a mean value that is greatly higher than the 10.6% reported by Morck et al. (1998) and 15.62% by SD. As for the control variables, on average for the pooled sample, the average board of director and supervisor is composed of 10.09 members, the ratio for Leverage is 40.12%, the size distribution of our sample firm is also skewed by the large differences between mean (18582million NT\$) and median (7470.36 million NT\$) total assets. On the basis of the Jarque-Bera test results, the normality of all the variables is rejected.

<Insert Table 1 about here>

C. Research Methodologies

a. Panel Unit Root models

An extension of the traditional least squared estimation method, Hansen's (1999) panel threshold regression model requires that the variables in the model be stationary in order to avoid spurious regressions and go further estimations of the panel threshold regression. Thus, the unit root test is first performed. Since panel data are only used in this investigation, the Levin-Lin-Chu (LLC) (Levin et al., 2002), the Im-Pesaran-Shin (IPS) (Im et al., 2003), the Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979), and the PP-Fisher Chi-square (Phillips and Perron, 1988) approaches are adopted. Based on the results of the unit test of each panel (i.e. the explained variables, the threshold variable and the control variables) in **Table 2**, it is abundantly clear that all the variables have stationary characteristics since the nulls of the unit root are mostly rejected.

<Insert Table 2 about here>

b. Panel Threshold Autoregressive model

It's assumed that there is an optimal managerial ownership ratio and the threshold model is used to estimate this ratio as this can capture the relationship between managerial ownership and agency cost; this should help financial managers understand the conditions under which the theory holds and in turn, this should help them formulate corporate governance policy. The procedures are briefly introduced as follows (*see endnote 2*).

According to Hansen (1999), the panel threshold regression model with fixed effects is set up as follows first:

$$A_{it} = \begin{cases} \mu_i + \lambda' \omega_{it} + \alpha_1 m_{it} + \varepsilon_{it} & \text{if } m_{it} \leq \gamma \\ \mu_i + \lambda' \omega_{it} + \alpha_2 m_{it} + \varepsilon_{it} & \text{if } m_{it} > \gamma \end{cases} \quad (1)$$

$$\lambda = (\lambda_1, \lambda_2, \lambda_3, \lambda_4)^t, \quad \omega_{it} = (s_{it}, l_{it}, b_{it})^t$$

where A_{it} represents agency cost, the ratio of annual sales to total assets and the ratio of selling, general, and administrative expenses, SG&A, to total sales are used as the proxy, respectively; m_{it} , managerial ownership, is also a threshold variable; and γ is the specific estimated threshold value. There are three control variables (ω_{it}) that may affect agency cost, and these are s_{it} : a natural log of total assets (Size); l_{it} : the ratio of total liabilities to total assets (Leverage); b_{it} : the number of board members including director and supervisor (Board). Besides these, there is μ_i : the fixed effect which represents the heterogeneity of companies under different operating conditions. It's assumed that the errors ε_{it} are independent and identically distributed, with the mean zero. The finite variance is $\sigma^2(\varepsilon_{it} \sim iid(0, \sigma^2))$; i represents different companies; and t represents different periods.

For the estimation procedures, we first eliminate the individual effect μ_i using the 'within transformation' estimation techniques in the traditional fixed effect model of panel data. By using the ordinary least squares and minimizing the concentrated sum of squares of errors, $S_1(\gamma)$, the estimators of our threshold value and the residual variance, $\hat{\gamma}$ and $\hat{\sigma}^2$ can be obtained, respectively.

For the testing procedures, first, we have to go on to test the null hypothesis of no threshold effect, $H_0: \alpha_1 = \alpha_2$, which can be based on the likelihood ratio test: $F_1 = (S_0 - S_1(\hat{\gamma})) / \hat{\sigma}^2$, where S_0 and $S_1(\hat{\gamma})$ are sum of squared errors under null and alternative hypotheses, respectively. However, as the asymptotic distribution of F_1 is non-standard, we use the procedure of bootstrap to construct the critical values and p-value.

Upon the existence of threshold effect, $H_0: \alpha_1 \neq \alpha_2$, we should test for the asymptotic distribution of threshold estimate, $H_0: \gamma = \gamma_0$, and adopt the likelihood ratio test: $LR_1(\gamma) = (S_1(\gamma) - S_1(\hat{\gamma})) / \hat{\sigma}^2$ with the asymptotic confidence intervals (see endnote 3): $c(\alpha) = -2 \log(1 - \sqrt{1 - \alpha})$.

Furthermore, if the single threshold is indeed exists, we can extend the panel threshold regression model with single threshold to the double as follows.

$$A_{it} = \begin{cases} \mu_i + \lambda' \omega_{it} + \alpha_1 m_{it} + \varepsilon_{it} & \text{if } m_{it} \leq \gamma_1 \\ \mu_i + \lambda' \omega_{it} + \alpha_2 m_{it} + \varepsilon_{it} & \text{if } \gamma_1 < m_{it} \leq \gamma_2 \\ \mu_i + \lambda' \omega_{it} + \alpha_3 m_{it} + \varepsilon_{it} & \text{if } m_{it} > \gamma_2 \end{cases} \quad (2)$$

where threshold value $\gamma_1 < \gamma_2$.

Following the same procedure, we can go further to the ones with triple or multiple thresholds ($\gamma_1, \gamma_2, \gamma_3, \dots, \gamma_n$).

4. Empirical Results

As indicated by Hansen (1999), if there is a threshold effect, then the existence of a triple, double, and single threshold effect must be tested. The bootstrap method proposed by Hansen (1999) is followed to obtain the approximations of the F statistics and then the p-values is to be calculated. The bootstrap procedure is repeated 1000 times for each of the three panel threshold tests. Panel A of Table 3 presents test statistics F_1 , F_2 , and F_3 , along with their bootstrap p-values of the effect of managerial ownership on the asset turnover ratio. We find that the test for a single threshold F_1 and a double threshold F_2 is insignificant with a bootstrap p-value of 0.119 and 0.178, respectively; only the test for a triple threshold F_3 is significant with a bootstrap p-value of 0.087. Thus, it's concluded that managerial ownership has three threshold effects on asset turnover ratio. The point estimates of the three thresholds ($\hat{\gamma}_1, \hat{\gamma}_2$ and $\hat{\gamma}_3$) are 36.55%, 51.35% and 59.06%, and they separate all of the observations into four regimes.

Panel B of Table 3 shows the same test statistics of the relationship between managerial ownership and the ratio of SG&A to total sales. It's found that only a single threshold F_1 is significant with a bootstrap p-value of 0.012, a double threshold F_2 and a triple threshold F_3 are insignificant with a bootstrap p-value of 0.185 and 0.157, respectively. Thus, we conclude that managerial ownership has single threshold effect on the ratio of SG&A to total sales. The point estimate of the single threshold ($\hat{\gamma}_1$) is 5.27 and it separates all of the observations into two regimes. The estimated model from our empirical results of managerial ownership and agency cost is represented as follows: asset turnover ratio in model (3) and the ratio of SG&A to total sales in model (4) as dependent variable for proxy agency cost, respectively.

$$A_{it} = \mu_i - 7.0543s_{it} - 0.1364l_{it} + 0.1943b_{it} - 0.3203m_{it}I(m_{it} \leq 0.3655) + 0.0835m_{it}I(0.3655 < m_{it} \leq 0.5135) + 0.2127m_{it}I(0.5135 < m_{it} \leq 0.5906) - 0.5865m_{it}I(m_{it} > 0.5906) + \varepsilon_{it} \quad (3)$$

$$A_{it} = \mu_i - 3.1791s_{it} + 0.1794l_{it} - 0.3905b_{it} + 12.8924m_{it}I(m_{it} \leq 0.0527) - 0.0588m_{it}(m_{it} > 0.0527) + \varepsilon_{it} \quad (4)$$

<Insert Table 3 about here>

Table 4 presents the regression slope estimates together with the conventional OLS standard errors and the White-corrected standard errors for each

regime. Panel A of Table 4 shows the coefficients of four regimes when asset turnover ratio as proxy for agency cost in model(3), $\hat{\alpha}_1$ is -0.3203, $\hat{\alpha}_2$ is 0.0835, $\hat{\alpha}_3$ is 0.2127, and $\hat{\alpha}_4$ is -0.5865, except to $\hat{\alpha}_2$, all significant at the 1% level under the consideration of homogenous standard errors or heterogeneous standard errors. In the first regime, where the managerial ownership is less than 36.55%, the estimate of coefficient $\hat{\alpha}_1$ is -0.3203, which indicates that asset turnover ratio decreases by 0.3203% with an increase of 1% in managerial ownership. In the second regime, where the managerial ownership is greater than 36.55% and less than 51.35%, the estimate of coefficient $\hat{\alpha}_2$ is 0.0835, but insignificant, which indicates that no relationship between managerial ownership and asset turnover ratio. In the third regime, where the managerial ownership is greater than 51.35% and less than 59.06%, the estimate of coefficient $\hat{\alpha}_3$ is 0.2127, which indicates that asset turnover ratio increases by 0.2127% with an increase of 1% in managerial ownership. In the fourth regime, where the managerial ownership is greater than 59.06%, the estimate of coefficient $\hat{\alpha}_4$ is 0.5865, which indicates that asset turnover ratio increases by 0.5865% with an increase of 1% in managerial ownership. Our empirical result indicates that when managerial ownership is less than 36.55 or greater than 59.06%, a 1% increase in managerial ownership decreases asset utilization efficiency (increases agency costs) by 0.3203% and 0.5865%, respectively. Conversely, when managerial ownership is between 51.35% and 59.06%, a 1% increase in managerial ownership increases asset utilization efficiency (reduces agency costs) by 0.2127%, where managerial ownership improves asset utilization efficiency and reduces agency costs.

The coefficients of two regimes are further presented when the ratio of SG&A to total sales as proxy for agency cost in Panel B of Table 4. $\hat{\alpha}_1$ is 12.8924, significant under the consideration of homogenous standard errors and heterogeneous standard errors (at the 1% and 10%, respectively). $\hat{\alpha}_2$ is 0.0527 but insignificant. In the first regime, where the managerial ownership is less than 5.27%, the estimate of coefficient $\hat{\alpha}_1$ is 12.8924, which indicates that the ratio of SG&A to total sales increases by 12.8924% with an increase of 1% in managerial ownership. In the second regime, where the managerial ownership is greater than 5.27%, the estimate of coefficient $\hat{\alpha}_2$ is insignificant, which indicates that no relationship between managerial ownership and the ratio of SG&A to total sales. Our empirical result indicates that when managerial ownership is less than 5.27, a 1% increase in managerial ownership increases SG&A expenses (increases agency costs) by 12.8924%.

Overall, combining together with both results of the asset turnover ratio and SG&A expense ratio as

proxy for agency cost, it's concluded that when managerial ownership is less than 36.55 or greater than 59.06% reflecting asset utilization inefficiency and higher agency cost, especially, when managerial ownership less than 5.27% cannot deterrent excessive discretionary (SG&A) expenses. However, when managerial ownership is between 51.35% and 59.06% managerial ownership reduces agency costs through enhancing asset utilization efficiency.

<Insert Table 4 about here>

In the estimations of the coefficients of the control variables, shown in Table 5, it's noted that firm Size is significantly and negatively related to either asset turnover ratio in Panel A of Table 5 or SG&A expense ratio in Panel B of Table 5. The interpretation here is that larger firms have lower asset utilization efficiency but higher SG&A expense saving. The Leverage is significantly and positively related to both asset turnover ratio and SG&A expense ratio. This means that the higher the leverage that a firm has, the higher is its asset utilization efficiency, but the higher the leverage that a firm has, the higher is its SG&A expense consuming. Finally, Board size is not significantly related to agency cost as proxy by both asset turnover ratio and SG&A expense ratio. Thus, Board size does not affect agency costs.

<Insert Table 5 about here>

5. Conclusion

Two main agency theories currently dominate the corporate ownership structure debate, namely the convergence of interest and the entrenchment hypothesis. A number of studies since Jensen and Meckling (1976) have sought to evaluate empirically the effect of agency costs on ownership structure, but until Ang et al. (2000) adopting the absolute and relative measures of agency costs by asset utilization and discretionary expenditures. Following the work of Sing and Davidson (2003), this paper analyzes whether managerial ownership affects agency cost by using a panel of 266 Taiwanese listed companies in 18 industries during the eleven-year 1996-2006 period. An advanced panel threshold regression model is adopted to determine whether managerial ownership reduces agency cost. This shift in financing sources propels the nonlinear relationship that we uncover in this study and sheds fresh light on existing agency theories of corporate ownership structure.

Overall, this study provides evidence that when managerial ownership is less than 36.55 or greater than 59.06% reflecting asset utilization inefficiency and higher agency cost, especially, when managerial ownership less than 5.27% does not deterrent

excessive discretionary (SG&A) expenses. While managerial ownership is between 51.35% and 59.06% reflecting lower agency costs, a 1% increase in the managerial ownership increases asset utilization efficiency by 0.21%, where consistent with the convergence of interest hypothesis, enhances the asset utilization efficiency and managerial ownership mitigates principal-agent conflicts. These results are some consistent with those in Sing and Davidson (2003). It's recommended that future research be conducted to continue this line of work. While this study offers some solid evidence with regard to the influence of managerial ownership on agency cost, it might be expected that this influence should be felt beyond the managerial ownership structure. Other outside monitoring mechanism such as outside block ownership and institutional ownership are hypothesized to affect agency costs. For a greater understanding, it's suggested to confirm the findings herein that the alternative external influences on agency costs could also be simultaneously included.

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Endnotes

¹ Similar to German boards, corporate boards in Taiwan are comprised of two separate organizations – a board of directors and a board of supervisors. Directors are responsible for managing the company, while supervisors are responsible for monitoring the directors. Managerial decisions within a firm are determined by the votes of its directors during board meetings. Supervisors do not participate in the decision-making or the voting process, but are designated to monitor the board of directors. Unlike German boards, Taiwanese boards of directors and supervisors are parallel organizations. Supervisors do not have the right to approve directors' decisions. Even though they may ask managers or directors to address questions, directors and managers have some influence over what information is given to supervisors (Yeh and Woidtke, 2005).

² For the detailed illustration, please refer to Hansen (1999).

³ Note that $LR_1(\gamma_1)$ is testing for $H_0 : \gamma = \gamma_0$, while F_1 is testing $H_0 : \alpha_1 = \alpha_2$.

Appendices

Table 1. Sample descriptive statistics

Variables	Mean	Std. Dev.	Maximum	Median	Minimum	Jarque-Bera
Asset turnover ratio	69.84	49.73	452	59	0	6173.05***
SG&A expense ratio	13.24	30.01	873.51	8.43	0.79	21940591***
Mown	22.92	13.03	81.52	19.94	0.19	617.6***
Board	10.09	4.49	32	9	1	2492.14***
Leverage	40.12	16.15	98.99	39.56	1.55	124.32***
Total assets (\$ millions)	18582	38297.63	507539.8	7470.36	485.65	247601.2***

The sample size is 266 firms for each of the 1996-2006 period and is a total of 2926 firm-year observations results. Asset turnover ratio is measured as the ratio of annual sales to total assets. SG&A expense ratio is measured as the ratio of selling, general, and administrative expenses, SG&A, to total sales. Mown is measured by the total common equity held by all managers (directors, supervisors, and top executives) as a fraction of common equity outstanding. Leverage is measured as the ratio of total liabilities to total assets. Sales growth is calculated as the annual percent change in sales.

Table 2. Panel Unit Root Test Results Panel

Method	Levin, Lin & Chu	IPS	ADF - Fisher Chi-square	PP - Fisher Chi-square
Asset turnover ratio	-19.46 [0***]	-3.71 [0***]	723.27 [0***]	965.00 [0***]
SG&A expense ratio	-45.17 [0***]	-1.06 [0.14]	508.72 [0.76]	723.23 [0***]
Mown	-35.76 [0***]	-4.84 [0***]	665.53 [0***]	1185.33 [0***]
Size	-34.47 [0***]	-12.15 [0***]	1122.42 [0***]	1269.67 [0***]
Leverage	-21.22 [0***]	-5.96 [0***]	791.06 [0***]	806.91 [0***]
Board	-4.10E+16 [0***]	-3.20E+13 [0***]	542.59 [0***]	774.24 [0***]

The sample size is 266 firms for each of the 1996-2006 period and is a total of 2926 firm-year observations results. Asset turnover ratio is measured as the ratio of annual sales to total assets. SG&A expense ratio is measured as the ratio of selling, general, and administrative expenses, SG&A, to total sales. Mown is measured by the total common equity held by all managers (directors, supervisors, and top executives) as a fraction of common equity outstanding. Size is measured as the natural log of the book value of total assets. Leverage is measured as the ratio of total liabilities to total assets. Board is calculated as the number of board members (director and supervisor).

Table 3. Tests for threshold effects

Panel A: Threshold effects relating managerial ownership and asset turnover ratio

	<u>Single threshold effect test</u>	<u>Double threshold effect test</u>	<u>Triple threshold effect test</u>
Threshold -value	36.55	36.55 59.06	36.55 51.35 59.06
F	26.356	19.304	19.3
p-value	0.119	0.178	0.087*
Critical Value of F			
1%	52.171	40.714	27.8
5%	33.379	27.615	21.98
10%	27.841	23.276	18.943

Panel B: Threshold effects relating managerial ownership and SG&A expense ratio

	<u>Single threshold effect test</u>	<u>Double threshold effect test</u>	<u>Triple threshold effect test</u>
Threshold -value	5.27	5.27 9.03	5.27 8.57 9.03
F	96.325	16.029	23.288
p-value	0.012**	0.185	0.157
Critical Value of F			
1%	100.461	58.29	58.816
5%	38.828	30.381	40.537
10%	25.012	21.26	27.997

Notes: F Statistics and p-values result from repeating the bootstrap procedure 1000 times for each of the three bootstrap tests.

***, **, and *, represent significance at the 1%, 5%, and 10% levels, respectively.

Table 4. Estimation of Coefficients**Panel A:** Coefficients relating managerial ownership and asset turnover ratio

	Coefficient estimate	OLS se	t_{OLS}	White se	t_{White}
$\hat{\alpha}_1$	-0.3203	0.0938	-3.4143***	0.1144	-2.7995***
$\hat{\alpha}_2$	-0.0835	0.0733	-1.1396	0.0911	-0.9167
$\hat{\alpha}_3$	0.2127	0.0878	2.423***	0.1292	1.6467**
$\hat{\alpha}_4$	-0.5865	0.1682	-3.4859***	0.4318	-1.3581*

Notes. $\hat{\alpha}_1$, $\hat{\alpha}_2$, $\hat{\alpha}_3$ and $\hat{\alpha}_4$ are the coefficient estimates for regimes of $m_{it} \leq \hat{\gamma}_1$, $\hat{\gamma}_1 < m_{it} \leq \hat{\gamma}_2$, $\hat{\gamma}_2 < m_{it} \leq \hat{\gamma}_3$, and $m_{it} > \hat{\gamma}_3$.

Panel B: Coefficients relating managerial ownership and SG&A expense ratio

	Coefficient estimate	OLS se	t_{OLS}	White se	t_{White}
$\hat{\alpha}_1$	12.8924	1.4123	9.1284***	8.2442	1.5638*
$\hat{\alpha}_2$	-0.0588	0.0806	-0.7296	0.0601	-0.9795

Notes. $\hat{\alpha}_1$, $\hat{\alpha}_2$ are the coefficient estimates for regimes of $m_{it} \leq \hat{\gamma}_1$ and $m_{it} > \hat{\gamma}_2$.

Table 5. Estimation of Coefficients of Control Variables**Panel A:** Agency cost in terms of asset turnover ratio

	Coefficient estimate	OLS se	t_{OLS}	White se	t_{White}
θ_1	-7.0543	1.1333	-6.2245***	1.6179	-4.3602***
θ_2	0.1364	0.0468	2.9171***	0.0605	2.2559**
θ_3	0.1946	0.2626	0.7411	0.2289	0.8502

Panel B: Agency cost in terms of SG&A expense ratio

	Coefficient estimate	OLS se	t_{OLS}	White se	t_{White}
θ_1	-3.1791	1.3027	-2.4403***	1.2152	-2.6161***
θ_2	0.1794	0.0542	3.3112***	0.0647	2.7711***
θ_3	-0.3905	0.3014	-1.2959*	0.4396	-0.8884

Notes. θ_1 , θ_2 and θ_3 represent the estimated coefficients: Size, Leverage, and Board.

***, **, and *, represent the significant at 1%, 5%, and 10% levels, respectively.