DO CHANGES IN MANAGERIAL OWNERSHIP MATTER?

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Abstract

Agency theory predicts that managerial ownership reduces agency cost and increases firm value. However, empirical evidence on the ownership and firm value relation is, at best, mixed. To date, there is no evidence on how exactly managerial ownership affects firm value and through what channel ownership improves value. Our paper fills in the void in the literature by addressing these issues. As a firm's operating efficiency is an important indicator of its managerial performance, we uses changes in managerial ownership as an argument to evaluate changes in firm value and hypothesizes that changes in managerial ownership affect firm's operating efficiency, which in turn drives firm value. Using a large panel data set (4,451 observations for 1,162 firms for year 1990-2001), we find significantly positive relation between changes in managerial ownership, operating efficiency and changes in firm value. Larger increase in managerial ownership provides greater alignment of managerial interests with those of shareholders, hence greater improvement in firm value. However, this relation is not monotonic. The positive impact on firm's value increases at a decreasing rate. Our simultaneous equation tests remove the endogeneity concern between managerial ownership and firm value.

Keywords: Corporate Governance, Managerial Ownership, Firm Performance

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Wei Rowe would like to thank University Committee on Research of University of Nebraska, Omaha for the research support provided for this project.

I. Introduction

A substantial body of theoretical and empirical work has engaged in studying the ownership-performance relation. Presently, there is no theoretical or empirical consensus on how managerial ownership affects firm performance.

Since Berle and Means (1932), the research on principal-agent conflict has been growing intensively in corporate finance literature. When shareholders do not have the necessary information or skill to manager firm, they hire managers as agent to perform managing service on their behalf under certain contracts. This arrangement creates agency costs if appropriate incentives are not established for managers to act in the best interests of shareholders.

Jensen and Meckling (1976) develop a theoretical model which illustrates how the agency costs arise when the interests of firm's managers are not fully aligned with those of shareholders. This theory suggests that when managers do not have an ownership stake in the firm, they tend to deviate from shareholder wealth-maximization by consuming perquisites. One major form of agency costs lies in the managers' shirking or undertaking suboptimal investment projects that harm the principals' wealth. Jensen and Meckling's (1976) theory implies that given the separation of security ownership and control of the firm, the firm's value is an increasing function of managerial ownership.

Following Jensen and Meckling's agency theory, numerous researchers have empirically studied the relation between firm performance and managerial ownership. However, overall, studies have developed inconsistent results of the effect of ownership structure on firm performance.

Morck, Shleifer, and Vishny (1988) look at the relation between managerial ownership and performance in a cross-section firm set and find significantly non-monotonic associations between firm performance and the fraction of executives' stock holdings. McConnell and Servaes (1990), and Hermalin and Weisbach (1991) all apply piecewise linear regression and document similar findings on ownership-performance relationship.

Demsetz (1983) contends that the ownership structure of a corporation should be treated as an endogenous outcome of the shareholders' influence and from market trading forces for shares. After conducting a simultaneous equations test, Cho (1997) confirms the endogeneity of the firm ownership structure and argues that like a triangular effect, inside ownership determines investment, and investment in turn brings changes to performance, which finally has a positive influence on inside ownership. Demsetz and Villalonga (2001) conjecture that ownership is

made multi-dimensional. They treat ownership as an endogenous variable and find no statistically significant relation between ownership structure and firm performance.

As shown above, recent research has not found a significant relation between firm performance and ownership structure. However, considering the inconsistency in methodology used for these studies, more investigation in this matter is warranted. Further, there is no recognizable theoretical and empirical agreement on how firm ownership structure affects firm value. Therefore, we attempt to reexamine this issue using different approaches. The goal of our study is to extend the previous literature in the following ways.

First, most previous studies use the level of ownership and the straight value of Tobin's Q to examine the association between firm ownership structure and firm value. However, this approach may expose the results to substantial omitted variable bias, because how efficient the ownership concentration provides managers to work varies across firms due to idiosyncratic factor. For instance, the management team in one company may need 10 percent of aggregate stock holding to be motivated to work with due diligence for the shareholders, while in another company, it may only take 5 percent of managerial equity ownership to achieve the same incentive results. This incentive discrepancy is due to different dollar values represented by the same level of managerial ownership brought by different sizes of the firms; alternatively, the sensitivity to pecuniary incentive varies among individuals given their different positions along the utility curves. Failing to control controls for these factors is likely to create inconsistent results for the study of ownership-performance relation. If these factors differ from one firm to another and remain constant over time, we can in effect hold these factors constant even though we can not measure them. Specifying the regression in changes of ownership level and changes in firm value eliminates the effect of the unobserved variables.

Second, previous works have examined the effects of firm value by studying the levels of managerial ownership based on cross-sectional data. This approach tends to ignore the effect of firm specific characteristics and possible unobservable heterogeneities that correlate with managerial ownership across time. In this case, even though the incremental impact of managerial ownership on the firm value exists, it is hard to detect strong evidence for it.

In this paper, we use panel data with time and firm fixed effect models to analyze the ownership-performance relation. Changes in ownership structure may be caused by unobservable factors of corporate characteristics and complexity across time. Such as the merger and acquisition, the exercises of CEO's warrants and stock options, or the adoption of target stock ownership plan. Under these circumstances, even though a firm with higher level of managerial ownership as a result of above events, it may still has a lower firm value on average. This firm actually outperforms its competitors within its industry and has an improved firm value than if it had a lower ownership. In this case, we can hardly capture the positive relation between firm performance and firm value. Using a time fixed effect model allows us to compare the incremental firm value as the firms increase their managerial ownership over time. Specifically, we have the opportunity to compare a firm's performance with 20 percent of managerial stock holding to this firm's performance if its managerial ownership is only 15%. Using fixed effects panel regression model helps to eliminate omitted variables biases arising from both unobserved variables that are constant over time and from unobserved variable that are constant across firms. This method captures the incremental effects of ownership on firm performance on time series basis. Further, it allows the direction of causality to be identified rather than just showing a mutual relation between firm ownership structure and firm value.

Lastly, while many papers focus on the direct relation between ownership structures and firm Tobin's Q as proxy for firm performance, we attempt to decompose this relation into two sub-relations. (I.) Managerial ownership and firm operating efficiency. (II.) Operating efficiency and firm profitability.

Firm operating efficiency represents the most immediate and direct outcome of management's improved functioning if increasing the equity ownership can reinforce the motivation of managers to act in the best interests of the shareholders. The performance of management is the systematic process of planning work and setting expectations, overseeing operations of organization, assessing product market opportunities, managing financial and physical resources etc.. Managerial performance is critical to the success of its business. The most direct and immediate consequence of any additional efforts of top management results in improved operating efficiency of firm. Using measure of operating efficiency, the assets turnover ratio as a dependent variable, we find positive link between managerial ownership and operating efficiency.

In the context of DuPont system, ROA, the firm profitability ratio can be decomposed into an assets turnover and a profit margin. Considering that the firm turnover ratio is one of the two breakdown entities of firm profitability, we predict that change in turnover ratio is positively associated with changes in ROA. As expected, we find that increased managerial stock holding improve firm operating efficiency and which in turn has positive effect on firm profitability and firm value.

Earlier studies present evidence of endogeneity in the ownership-performance relation and conclude that ownership is periodically re-optimized. Therefore, we can find no association between ownership and firm performance in a cross-sectional regression that controls for the endogenous

determinants of firms' optimal ownership levels. However, based on "more is always better" theory, it is reasonable to assume that the reinforced incentives inherent from increased stock holding will keep tapping out management potentials in maximizing shareholder wealth. We conjecture that the ownership structure and firm value interact continuously which is explained by changes in managerial ownership will generally bring changes in firm value in the same direction, with the optimal ownership structure constrained by managers' individual wealth or other factors such as managers' personal investment preference. Thus one can view the managerial ownership change as both an endogenous variable and as a determinant in the ownership-performance system.

Our test result shows a significantly positive relation between managerial ownership and firm performance, consistent with the incentive alignment argument of Jensen and Meckling (1976).

In order to ensure explore this endogeneity concern, we use three-stage least squares estimation to simultaneous test regression. These results suggest that change in managerial ownership is, in one direction, a determinant influence on change in firm value.

In summary, our study contributes to the existing literature in following dimensions: (1) It represents the first attempt to test the marginal effect of managerial ownership on the firm performance using changed values of the subject variables. This approach facilitates a more effective method for detecting the linear relation between an ownership structure and firm performance. (2) This study connects the corporate finance and efficiency literature and provides explanation in further depth for the incremental ownership-performance relation. (3) This study applies empirical methods to account for endogeneity concern of managerial ownership. (4) The empirical evidence from this project will have important policy implications in assisting policy makers, regulators, shareholders, and investors in designing effective board compensation packages.

The paper is organized as follows. Section 2 will present a brief review on the development of literatures in this area. In Section 3, we will introduce our main testable hypotheses, followed with the description on data selections and methodology, as well as the interpretation of the results in Section 4. Finally this paper concludes with summary in Section 5.

II. Literature Review

According to Agency theory, the separation of ownership and management creates an incentive for the managers to use the firms' surplus resources for their own purpose.

The principal-agency issue has been under the spotlight ever since Berle and Means (1932) first propose an inverse relation between the diffuseness of shareholding and firm performance.

Jensen and Meckling (1976) provide a theoretical framework on the agency theory which involves the relationship between the ownership structure and corporate value. In this model, the alignment of ownership and management will minimize the agency costs in reaching, monitoring, and enforcing agreements. The minimization of agency costs is due to the absence of the difference in residual rights in a principle-agent partnership. Moreover, the conflicts of self-interest between the principal and agent are reduced because the managers/owners are the recipients of the rewards of their own actions. Therefore, increasing the managers' ownership of the firm will reduce managerial opportunism.

Agency theory also postulates that when the principal has access to information to monitoring and verifying agent behavior, it is likely that the agent will behave in the interests of the principle (Fama and Jensen, 1983; Eisenhardt, 1989). The owner's direct involvement in the management of the firm will prevent the managers from expropriating shareholder wealth through the consumption of perquisites and misallocation of resources in pursuit of their own interests (Jensen, 1998). Therefore, when the owner is involved in managing the firm, the opportunistic behavior of the agent will be reduced. The competitive nature of the capital, products, and factors of the markets provides information and serves as the external monitoring function for firm performance (Hansmann, 1996).

In empirical investigations, a considerable amount of documentations have been presented during the past decades. Stulz (1988) emphasizes that the fraction□ of the voting rights controlled by management is an important element of the ownership structure for publicly traded firms. This paper shows that the firm value rises and then drops as □ increases within a range and then reaches its maximum point of firm value when □ is beyond 50 percent.

An important paper by Morck, Shleifer, and Vishny (1988a) is among the first to find significant but non-monotonic associations between corporate values and different levels of managerial ownership. They posit that more equity ownership by the manager may decrease financial performance because managers with large ownership stakes may be so powerful that they do not need to consider other stakeholders' interests. They may also be so wealthy that they no longer intend to maximize profit but get more utility from maximizing market share or technological leadership. This leaves for low levels of managerial ownership, the performance effect associated with the incentive alignment dominates the performance effect associated the entrenchment.

McConnell and Servaes (1990), Hermalin and Weisbach (1991) take a different approach compared to that of Morck, Shleifer, and Vishny (1988a). Using Tobin's Q and managerial ownership for a large

sample of NYSE and ASE listed firms in two separate years, they report similar non-monotonic findings, but the breaking points for the levels of ownership are replaced by 40 to 50 percent instead of only 25 percent. Their results confirm Morck, Shleifer, and Vishny (1988a) show that, at relatively low levels of ownership, increases in managerial ownership help to align the interests of mangers and shareholders. At higher level of managerial stock holding, this bonding mechanism becomes less sensitive for mangers to exert full representation for shareholders as the wealth utility curve for managers reach an optimal point.

Kole (1995), tries to reconcile the findings of Morck, Shleifer, and Vishny (1988a) with those of McConnell and Servaes (1990) and concludes that the source of ownership data is not driving the different results in Morck, Shleifer, and Vishny (1998a) and McConnell and Servaes's (1990) studies. She argues that the difference in the incentive alignment effect of ownership by a firm's key decision makers is attributable to differences in the size of sample firms.

Himmelberg, Hubbard, and Palia (1999) take a different approach to study this relationship by using panel data, which are believed to help solve the firm heterogeneity problem. The results show that changes in managerial ownership seem to affect neither firm value nor firm performance.

Demsetz and Lehn (1985) and Holderness and Sheehan (1988) construct different methodology to investigate the ownership-performance relation. Demsetz and Lehn (1985) regress a firm's accounting rate of return on several variables, including the ownership level of the largest shareholders. Holderness and Sheehan (1988) use accounting rates of return of paired majority-owned and diffusely held corporations. They find no significant relation between the concentration of ownership and corporate value and conclude that the ownership concentration has no effect on corporate value. Or alternatively, the optimal ownership level varies across firms.

In contrast, Cho (1998) brings a reverse view after testing a simultaneous equation regression instead of OLS and finds that corporate value is a determinant of ownership structure. This finding raises important questions regarding the implicit assumption that ownership structure is exogenously determined. Cho's finding is consistent with the perception that the stronger the firm performance, the more the managers will obtain shares of the firm. Demsetz and Villalonga (2001) conduct similar test as Cho by treating ownership structure as an endogenous variable, and find no systematic relations between ownership structure and firm performance, which supports that ownership structure, whether diffuse or concentrated, maximizes shareholder expected returns `that emerge from the interplay of market forces.

According to Jensen and Meckling's agency theory, the incremental agency cost is associated with decreasing proportions of the managerial ownership. One should expect that a positive ownership-performance relation results from managers who are motivated to work harder and shirk less as their equity holding increases. The effects of managerial ownership on firm performance in empirical research remain ambiguous.

Researchers have started to examine this issue from many different angles and have provided all kinds of explanations. Loderer and Martin (1997) hypothesize that management is strictly disciplined by competition in product and labor markets. Therefore, it may not be necessary for top executives to own stock to be residual claimants. Fama (1980) provides a theoretical argument on the efficient monitoring of managerial performance by competitive labor market. Finally, Denis, Denis and Sarin (1997) state that higher ownership might multiply the opportunities to appropriate corporate wealth, since the probability of a top executive turnover is negatively related to the ownership stake of officers and directors, and is positively related to the presence of an outside block holder.

Core and Larcker (2001) examine a sample of firms that adopt "target ownership plans" and find that the required increases in the level of managerial equity ownership result in improvements in firm performance.

The methodology in this paper coincides with the one used in Core and Larcker's (2001) study. Similar to Core and Larker, we examine the effect of changes in ownership on firm performance. However, our theoretical argument on this subject differs from theirs with respect to the following five dimensions: (1) Instead of focusing on a sample of firms that adopted target ownership plans, we generate more comprehensive sample with 4,822 observations for 1,384 firms, drawn from Compact Disclosure firms from 1990 to 2001. Results obtained from this sample set provide a broader coverage on the positive hypothesis for the ownership-performance relation. (2) This study connects the corporate finance and efficiency literature and provides explanation in further depth for the incremental ownership-performance relation. (3) This paper examines the potential endogeneity problem on the changes of ownership structure by running simultaneous equation tests, of case equity ownership increases in anticipation of performance improvements. (4) This paper uses fixed effects panel data to control for firm specific characteristics and various possible unobservable heterogeneities across time. In addition to ownership structure, controlled in the major models are other independent variables changes that can potentially impact the firm performance.

III. Data

The managerial ownership is defined as the total shares owned by officers divided by the number of total share outstanding within a firm. For managerial ownership data, we start with the entire population from Compact Disclosure 2001 version. Mismeasurement of management ownership in firms

with dual classes of outstanding stock is a major source of Compact Disclosure's reporting discrepancies. However, according to Anderson and Lee (1997), after examine the fit between the ownership data provided by Compact Disclosure database and the data collected from proxy statements, they find that reporting discrepancies in the Compact Disclosure data do not significantly influence any of the regressions that are in consideration and overall the evidence favors the use of the Compact Disclosure database (and Corporate Text) for management ownership data over its Value Line and Spectrum counterparts. Further, given the large enough sample size used in this study, the concern of using Compact Disclosure for management ownership is unnecessary.

The initial data set from Compact Disclosure consists of 122,102 observations for 34,805 firms from 1990 to 2001. We then merge this data set with Compustat for the accounting variables, eliminate all financial and utility firms due to their subject to special regulation from the government. There are 72,087 observations left.

To avoid the error raised in the Compact Disclosure, all the questionable observations are deleted. They include firms with bigger than 100 percent ownership, and other firms which appear to have lower than 5 percent of block share holdings.

Followingly, we use the sample selection criteria that require that each firm has at least two consecutive years of managerial ownership data between 1990 and 2001, with more than 1 percent of its annual ownership changes from one year lag, whether positive or negative. Based on the financial data from Compustat, we create new performance variables such as Tobin's Q, return on assets, leverage ratio etc. The annual changes of these variables are calculated as the difference from the values of lag years. For our OLS analysis, the sample consists of 5,562 observations for 2,124 firms from 1990 to 2001. For the panel data analysis, we have 4,822 observations for 1,384 firms, which remain from deleting the missing variables, and deleting firms with less than one year time series data.

One advantage of our sample is that it is larger than other dataset used in existing ownership structure studies. Previous studies generally focus on the Fortune 1000 firms or even smaller sample size. To eliminate any possible big firm bias, our sample includes 1,384 firms with available accounting data from Compustat. Rather in a single cross-sectional data set, this sample is constructed in the form of panel data ranging from 1990 to 2001,. This allows to control for firm and time level fixed effects.

Table 1 contains summary statistics for the managerial ownership and firm performance measures of the pooled sample. Panel A of Table 1 describes the level of managerial ownership, Tobin's Q, and other relevant firm characteristics. Panel B presents changes of those variables for the pooled sample. Change of dollar value variable is the percentage change of the variable from one-year lag value. Dif of ratio variable is the difference from one-year lag value. All variables are measured at the end of fiscal year unless otherwise specified.

Percent officer refers to managerial ownership. It is defined as the fraction of stock shares held by officers within a firm, reported at fiscal year end. TQ stands for Tobin's Q. Tobin's Q is the market value of assets divided by the replacement value of the assets. As such, the calculation of Q can be quite difficult with many assumptions. A recnet paper by Dadalt, Donaldson, and Garner (2003) finds that sometimes the better measure is the easier method. Simpler methods tend to be based on more readily available data and therefore are less biased. We use the market value of the equity plus book value of debt divided by the book value of the firm total physical assets to estimate Tobin's Q.

Leverage is firm total liability divided by total assets. MV stands for market value of equity; it equals the market value of common stock at the end of the fiscal year. ROA denotes return on assets; It is the ratio of net income to total assets. Sales refers to annual sales in 100 million dollar reported at the end of the fiscal year. Turnover ratio are used to measures firm operating efficiency. It is defined as the total sales divided by total assets. Profit Margin is the ratio of operating income before depreciation to the total sales. It estimates how much profit the business can makes out of the total revenue. Shtinv are Longinv represent short-term investment and long term investment respectively. Shtinv is the annul capital expenses, while R&D expenses are the proxy for long term investment. Cash includes the annual cash balance plus short-term investment. The average managerial ownership is 18 percent for the pooled sample, its average annual change -0.94 percent. The mean value of Tobin's Q is 13 with average 19 percent of an annual increase over the sample period.

To illustrate differences in the changes of subject variables, Table 2 presents average values of the subject variables by year. The number of firms decline from 410 in 1992 to 38 in 1993 and to 48 in 1994, and it rises to a range between 400 and 700 after 1995 till the last year. The managerial ownership varies from 14.76 percent to 19.70 percent. The annual changes in ownership ranges from negative 1.98 percent to a positive 0.88 percent.

Figure 1 plots the average level of managerial ownership and firm Tobin's Q over the sample period. Managerial ownership starts to drop from 1991, hitting the lowest point in 1993 and remains low until 1996. Since 1996, it has been increasing and reaches a maximum point in 1999 and starts to lower slightly till the last year. Tobin's Q shows a similar overall trend along the sample period. Generally, there is no dramatic change in officer ownership and Tobin's Q across time.

Figure 2 presents the mean annual changes in ownership and annual changes in Tobin's Q. Both variables demonstrate a continuous up and down pattern every other year. During the range from 1991

to 1996, it becomes clear that changes in ownership are followed by changes in Tobin's Q occurring in one-year pattern. It may suggest that changes in managerial ownership takes approximately one year to effect on changes in firm value, supporting the causality argument in the ownership-performance relation. However, the one-year lag between the changes of two variables disappears after 1996. Changes in ownership and Tobin's Q coincide with each other during 1996 and 2001 in the same direction, which indicate a simultaneously positive relation between changes of the two arguments

Table 3 shows the correlation matrix for managerial ownership and various firm performance measure variables. Previous research suggests that ownership concentration is related with firm characteristics (firm value, firm size, leverage, the firm's investment opportunity set). The data reported in Table 3 confirms these correlations for changes in managerial ownership within our sample, except a negatively relation with firm's changes in long term investment, R&D expenses. From the correlation matrix, there is a strong linear correlation between dif leverage and dif ROA, which is -0.64. To prevent the potential colliearity problem in OLS regression, we will treat these two variables as substitute in our major regression models.

IV. Empirical analysis

(i) Ownership and Operating Efficiency

Managerial ownership represents a useful force that reduces agency costs. Assuming that the increased managerial holding of equity motivates managers to act in the best interests of shareholders, we expect that managers can increase shareholder value at least in three ways if they choose to. First, they can reduce excess perquisite consumption. Second, managers can take better control firm free cash flow and make rational decisions for investing in projects with high probability of positive returns. Third, mangers can invest in higher risk assets effecting wealth transfers for shareholders from creditors.

The direct measure of the first two of above realizations is to look at the firm efficiency ratios. Following Ang, Cole, and Lin (JF, 2001 or 2002) method, this paper uses efficiency ratios to measure the decrease in the agency cost resulting from enhanced incentives brought about by increased manager ownership. The firm efficiency ratios include (i) operating expenses divided by total sales multiplied by total assets, (ii) operating revenue divided by total assets, (iii) earnings before interest and taxes divided by total assets, (iv) operating profit after tax divided by total assets. Our first hypothesis is:

Hypothesis I: Changes in managerial ownership is positively related with changes in firm operating efficiency.

Firm turnover ratio measures how well a business can turn its assets into revenue. It serves a good proxy to measure management operating efficiency. To investigate whether managerial ownership influences firm operating efficiency, we calculate the ordinary least squares regressions with changes in the firm turnover ratio as the dependent variable.

Table 4 shows the results of the OLS regression of managerial ownership on firm turnover ratio. Since there is no widely accepted structure model for firm operating efficiency, we first calculate the turnover ratio regression including only managerial ownership. The regressions reported in the first column strongly suggest that there is a significantly positive relation between changes of ownership and changes of firm turnover ratio. After controlling for other firm performance measure, the coefficient on managerial ownership change drops but remains to be significant at 10 percent level.

(ii) Ownership and Firm Value

Next we estimate the corporate value regression to test whether the well-attended relation between ownership structure and corporate value hold with our data. Tobin's Q is considered to reflect a firm's real power to make profits and its use is a pervasive practice in the research of corporate governance. It is defined as the ratio of market value of firm assets to its replacement cost of physical assets after adjusting inflation, real depreciation ratios, capital expenditures and the method of inventory valuation used by each company. An increase in Tobin's Q is considered a sign of good firm performance.

The key explanatory variable is the changing level managerial. The level of managerial ownership is denoted by the total fraction of stock shares held by firm officers. The change in managerial ownership is estimated by the annual change relative to that of one year lag. In addition to changes in the level of insider ownership, our regressions include controls for other variables that are expected to influence firm value. All variable values are changed values lagged one year unless otherwise indicated. Finally, we will control for other major explanatory variables that have appeared in conventional models of previous research.

Usually, when a line of business first enters the market, the firm that dominates the market share will impose the highest profit margin. As the market saturates, the profit margin will gradually be forced to drop until it reaches a steady level. In addition, we include the profit margin as a proxy for market competitiveness in the regression model. Profit margin ratio measures market competitiveness and helps to control for the product market's influence on firm value. The resulting model is as follows:

ΔTobin's Q $_{it}$ = $\square_0$ + $\square_1$ Δ(percent_officers $_{i,t}$)+ $\Delta\square_{\square}$(Sales $_{i,t}$) + $\square_{\square}\Delta$Log (MV $_{i,t}$) + $\square_{\square}\Delta$ (ROA $_{i,t}$) + $\Delta\square_{\square}$(shtinv$_{i,t}$) /$\Delta\square_{\square}$(longinv$_{i,t}$) + $\Delta\square_{\square}$(Profit margin $_{i,t}$)

Around this model, our second hypothesis is:

Hypothesis II: The changes in managerial ownership will be positively related with changes of firms' Tobin's Q.

Table 5 shows a series of OLS model testing that show how changes in managerial ownership affect changes in firm value. We substitute capital expenses as short term investment with R & D as long term investment to control for firm growth opportunities in model 5 and 7. From model 1 through model 7, the regression reports an increasing better fit model with increasing adjust R square. Taken together, the results strongly suggest that changes in managerial stock holding positively influence changes in firm value.

(iii) Ownership Endogeneity

Thus far, doubt arises in existing literature on whether managerial ownership is exogenous in regression attempting to measure the ownership-performance relation. In this section, We use panel data techniques to investigate more directly the question of whether changes in managerial ownership can be treated as an exogenous in the performance regressions. Our empirical analysis of the effects of managerial ownership and firm value is summarized in model 1 and model 2 on Table 6. We note that the changes in managerial ownership variables are statistically significant for both models when long term investment and short term investment substitute one another.

As Cho (1998) suggests, other things being equal, managers may prefer equity compensation when they expect their firm to perform well and, consequently, the value of the firm to increase. As a result, higher levels of insider ownership are expected at firms with high corporate values. The ownership structure is actually not exogenously determined and is decided by corporate value endogenously. It is possible that insiders can foresee changes in firm performance and, therefore, change their holdings accordingly.

In model 3 and model 4 on Table 6, using changes in percent officers as dependent variable, We also find that changes in Tobin's Q are significantly associated with changes in ownership, suggesting that increased firm value may drive up managerial ownership.

To explore the potential endogeneity effect, we include a simultaneous equation system of ownership structure, and firm performance using three-stage least squares method. Specifically, we estimate the following simultaneous equations system:

ΔTobin's Q $_{it}$ = $\square_0$ + $\square_1$ Δ(percent_officers $_{i,t}$)+ $\Delta\square_{\square}$(Sales $_{i,t}$) + $\square_{\square}\Delta$Log (MV $_{i,t}$) + $\Delta\square_{\square}$(Leverage $_{i,t}$)+ $\Delta\square_{\square}$(shtinv$_{i,t}$) /$\Delta\square_{\square}$(longinv$_{i,t}$) + $\Delta\square_{\square}$(Profit margin $_{i,t}$)

Δ(percent_officers $_{i,t}$) = $\square_0$ + $\square_1$ Δ(Tobin's Q $_{it}$)+ $\Delta\square_{\square}$(Sales $_{i,t}$) + $\square_{\square}\Delta$Log (MV $_{i,t}$) + $\square_{\square}\Delta$ (ROA $_{i,t}$) + $\Delta\square_{\square}$(shtinv$_{i,t}$) /$\Delta\square_{\square}$(longinv$_{i,t}$)+ $\Delta\square_{\square}$(Profit margin $_{i,t}$)

Table 7 reports the three-stage least squares estimation result of the simultaneous regression model. The first two columns contain the regression estimates obtained by using Tobin's Q as a dependent variable with short term and long term investment in place of growth opportunities control respectively. Column 3 and column 4 contain regression estimates using managerial ownership as different dependent variables. In contrast with Cho's (1998) finding, the changes in managerial ownership reported in column 1 and column 2 are significantly related with Tobin's Q. It is consistent with the agency theory that managerial ownership is a determinant force for changes in firm value.

However, the coefficient estimates, in model 3 and model 4, where changes of managerial ownership are dependent variables do not show any evidence that corporate value affects managerial ownership. In short, possible endogeneity bias is not a concern with our data set.

(iv) Robustness Check

Given that changes in managerial ownership will improve firm performance; one may wonder the extent to which managers fully exert their capability of generating wealth driven by equity incentives. According to previous corporate finance literature, firm performance could be nonlinearly related to managerial ownership. Himmelberg, Hubbard, Palia (1999) find a quadratic form of the effect of ownership on performance. McConnell and Servaes (1990) suggest that the ownership-performance relation first increases and then decreases. We hypothesize that managers potential asymptotically approache certain maximum point as the managerial ownership increases. We present the model results with changes of ownership variable and the squares of the changes of ownership variable on Table 8. However, the coefficient for the quadratic term is insignificant at the .1 percent level. We conclude that in our sample this concave relation does not apply.

V. Conclusion

This paper examines the relation among managerial ownership, firm efficiency and corporate value. Jensen and Meckling's agency theory suggests that managerial ownership may influence firm performance. An important indicator of the firm performance is firm efficiency. Firm efficiency represents the most immediate and direct outcome of management effort if increased equity ownership serves as forces motivating managers to act in the best interests of shareholders. This paper uses changes in managerial ownership as an argument to evaluate the changes in firm efficiency, and in turn how firm efficiency affect changes in firm profitability and in firm value. Using a comprehensive sample, the OLS regression results show evidence that managerial ownership changes are significantly positively related with changes in firm efficiency, which in turn leads to changes in firm profitability and positively changes firm values. After conducting panel data analysis, which is stronger in testing ownership-performance relation with potential omitted variable bias, our test result show a significantly positive relation between

managerial ownership and firm performance, consistent with the incentive alignment argument of Jensen and Meckling (1976).

In order to ensure that an endogenous regressor does not affect the results, we use a three-stage least squares estimation for simultaneous regression testing. These results indicate that change in managerial ownership is a determinant influence on change in firm value but not vice versa.

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Figure 1 – Average level of managerial ownership and Tobin's Q by year

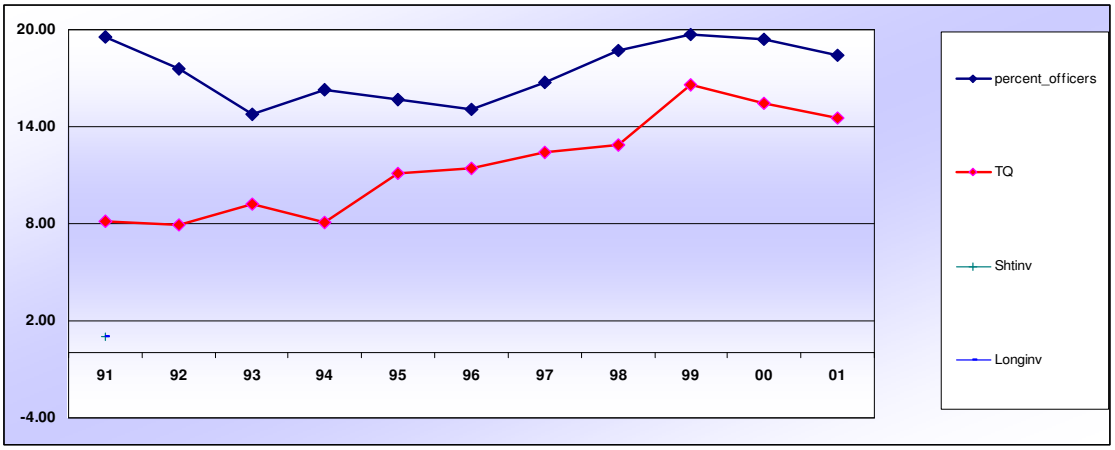

Figure 2 – Average changes of managerial ownership and changes of Tobin's Q by year

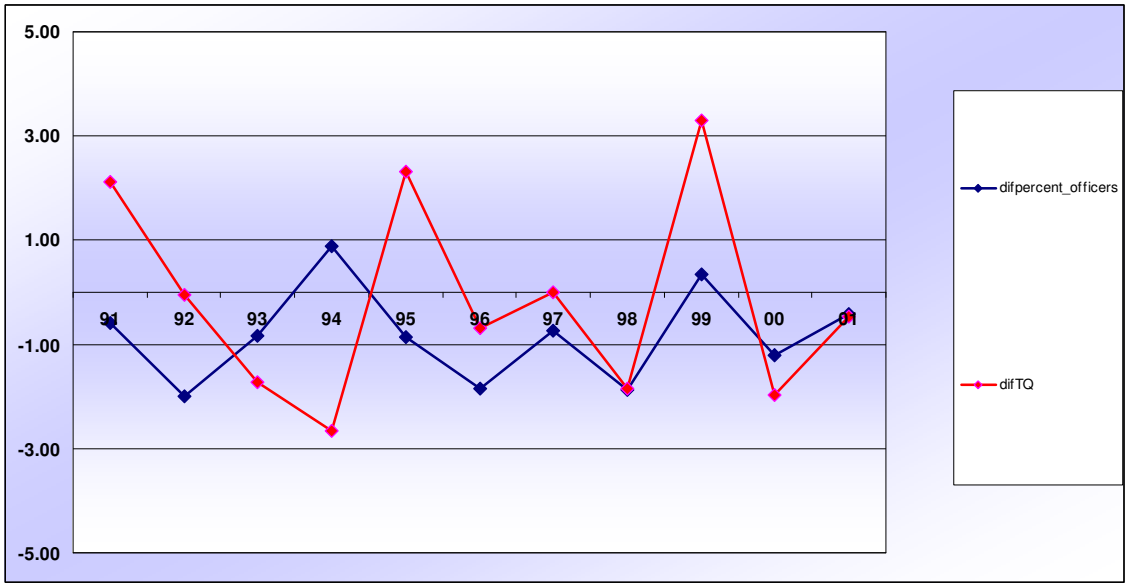

Table 1 - Summary statistics for a pooled sample of 4,822 observations for 1,384 firms during 1990 to 2001

The sample is drawn from Compact Disclosure 2001 for managerial ownership data and firm financial data from Comustat. It contains 4,822 observations for 1,384 firms during 1990 to 2001. Variable definitions and when their Compusat item numbers are given as follows: Percent officer = shares held by officers / total number of shares outstanding. TQ = Tobin's Q, (market value of equity + book value of debt) / by book value of total physical assets. Leverage = firm total liability / total assets. MV = market value of equity; ROA = return on assets; net income / total assets. Sales = annual sales in million dollar. Turnover ratio = the total sales / total assets. Profit Margin = the ratio of operating income before depreciation / total sales. Shtinv = annul capital expenses. Longinv = R&D expenses. Cash = the annual cash balance plus short term investments. Chg of variable is the percentage change of the variable from one year lag value. Dif of variable is the difference from one year lag value. All variables are measured at the end of fiscal year unless otherwise indicated.

Variable	N	Mean	Std Dev	Minimum	Maximum
Panel A - Level of firm performance measures					
Percent_officers %	4822	18	18	0.0	99
TQ	4822	13	15	1	99
Sales (M)	4822	2,088	9,101	0.0	180,557
Leverage	4822	0.5	0.4	0.0	11
MV (M)	4822	2,402	13,646	0.2	474,522
ROA	4822	-0.1	0.4	-10	1
Turnover	4822	1.1	0.6	0.0	5
Profitmargin	4822	-3	77	-4,791	1
Shtinv	4822	166	1,116	-0.1	31,605
Longinv	4822	93	434	0	8,900
Cash (M)	4822	174	795	0	18,555
Panel B - Annual changes in the level of firm performance measures					
Difpercent_officers	4822	-0.94	9	-81	85
DifTQ	4822	0.19	12	-91	87
Chgsales	4822	0.28	4	-1	137
ChgMV	4822	0.44	1	-1	24
Difleverage	4822	0.02	0	-7	4
DifTurnover	4822	0.01	0	-3	4
DifROA	4822	-0.03	0	-7	9
Difprofitmargin	4822	-1.01	79	-4,682	1,300
Chglonginv	4822	0.20	1	-1	40
Chgshtinv	4822	0.38	2	-20	68
Chgcash	4822	2.86	83	-1	5,400

Table 2 Summary statistics for firm performance measure by year.

The sample is drawn from Compact Disclosure 2001 for managerial ownership data and firm financial data from Comustat. It contains 4,822 observations for 1,384 firms during 1990 to 2001. Variable definitions and when their Compusat item numbers are given as follows:
Percent officer = the fraction of stock shares held by officers within a firm, reported at fiscal year end. TQ = Tobin's Q, the market value of equity plus book value of debt divided by book value of firm total physical assets. Leverage = firm total liability divided by total assets. MV = market value of equity; the market value of common stock at the end of fiscal year. ROA = return on assets; the ratio of net income to total assets. Sales = annual sales in million dollar reported at the end of fiscal year. Turnover ratio = the total sales divided by total assets. Profit Margin = the ratio of operating income before depreciation to total sales. Shtinv and Longinv represent short term investment and long term investment respectively. Shtinv = annul capital expenses. Longinv = R&D expenses. Cash = the annual cash balance plus short term investments. In Panel B, Chg of variable is the percentage change of the variable from one year lag value. Dif of variable is the difference from one year lag value. All variables are measured at the end of fiscal year unless otherwise indicated.

Variable	N	Percent officers %	TQ	Sales (M)	Leverage	MV(M)	ROA	Turnover	Profit Margin	Shtinv	Longinv	Cash(M)
Panel A Average level of firm performance measure												
91	377	19.54	8.19	2,204	0.47	770	0.01	1.23	-4.49	172.98	92.79	122
92	410	17.60	7.95	1,959	0.47	811	0.00	1.23	-0.89	136.59	82.72	123
93	38	14.76	9.24	9,063	0.55	3442	-0.03	1.20	0.05	575.42	386.86	747
94	48	16.31	8.06	7,749	0.53	3089	-0.05	1.06	-0.27	564.94	308.97	711
95	494	15.70	11.14	2,309	0.45	1400	0.03	1.19	-3.74	170.05	106.45	183
96	481	15.07	11.43	2,479	0.44	1890	0.01	1.19	-0.55	201.80	110.58	215
97	440	16.70	12.43	2,580	0.47	2939	-0.04	1.10	-1.44	233.17	111.28	184
98	511	18.73	12.89	1,682	0.47	2872	-0.08	1.05	-0.47	136.18	78.78	123
99	664	19.70	16.59	1,545	0.49	3041	-0.09	1.04	-0.61	128.65	70.35	163
00	733	19.37	15.44	1,870	0.53	3633	-0.14	1.04	-1.93	159.98	80.05	170
01	620	18.37	14.55	1,582	0.54	2610	-0.19	1.04	-9.09	121.67	75.44	176
Panel B Average annual changes in the level of firm performance measure												
91	377	-0.58	2.12	0.08	0.61	-0.01	-0.02	0.00	-4.47	0.16	0.15	1.86
92	410	-1.98	-0.04	0.09	0.44	0.01	0.00	-0.02	3.16	0.16	0.37	0.97
93	38	-0.85	-1.73	0.05	0.19	0.03	0.02	-0.04	-0.04	0.20	0.21	3.00
94	48	0.88	-2.65	0.16	0.10	0.02	-0.05	-0.01	0.55	0.09	0.34	0.04
95	494	-0.86	2.31	0.26	0.80	-0.01	0.01	0.02	-3.23	0.28	0.44	4.11
96	481	-1.84	-0.70	0.44	0.49	0.00	-0.01	-0.01	1.97	0.21	0.62	2.42
97	440	-0.74	0.01	0.51	0.50	0.04	0.01	-0.04	-0.70	0.26	0.35	1.34
98	511	-1.88	-1.86	0.44	0.10	0.04	0.00	-0.03	1.05	0.18	0.45	0.93
99	664	0.36	3.31	0.22	0.66	0.03	0.02	0.00	0.75	0.15	0.22	0.90
00	733	-1.21	-1.96	0.45	0.29	0.04	0.01	-0.06	-0.43	0.27	0.59	2.10
01	620	-0.42	-0.47	0.04	0.26	0.05	0.02	-0.09	-6.88	0.14	0.17	9.96

Table 3. Pearson correlation matrix for managerial ownership and various firm performance measure variables

The sample is drawn from Compact Disclosure 2001 for managerial ownership data and firm financial data from Comustat. It contains 4,822 observations for 1,384 firms during 1990 to 2001. Variable definitions and when their Compusat item numbers are given as follows: Percent officer = shares held by officers / total number of shares outstanding. TQ = Tobin's Q, (market value of equity + book value of debt) / by book value of total physical assets. Leverage = firm total liability / total assets. MV = market value of equity; ROA = return on assets; net income / total assets. Sales = annual sales in million dollar. Turnover ratio = the total sales / total assets. Profit Margin = the ratio of operating income before depreciation / total sales. Shtinv = annul capital expenses. Longinv = R&D expenses. Cash = the annual cash balance plus short term investments. Chg of variable is the percentage change of the variable from one year lag value. Dif of variable is the difference from one year lag value. All variables are measured at the end of fiscal year unless otherwise indicated.

NAME	difpercent_ insiders	difTQ	chgMV	chgtot_ assets	dif leverage	chg cash	dif Turnover	dif ROA	dif profit margin	chg longinv	chg shtinv	chg sales
difpercent_ insiders	1											
difTQ	0.03	1.00										
chgMV	0.01	0.48	1.00									
chgtot_ assets	0.00	0.13	**0.30**	1.00								
dif leverage	0.02	-0.06	-0.10	-0.11	1.00							
chg cash	0.02	0.01	0.03	0.04	-0.03	1.00						
dif Turnover	0.00	-0.05	-0.06	**-0.32**	0.06	-0.02	1.00					
dif ROA	0.01	0.15	0.13	0.17	**-0.64**	0.01	-0.03	1.00				
dif profit margin	0.00	-0.04	0.00	-0.02	0.00	0.00	0.01	0.00	1.00			
chg longinv	-0.02	-0.05	0.03	**0.17**	0.05	0.00	-0.02	-0.07	0.00	1.00		
chg shtinv	0.01	-0.11	0.08	**0.24**	0.00	0.01	-0.03	0.01	0.00	0.06	1.00	
chg sales	0.00	-0.01	0.03	0.07	0.01	0.00	0.09	0.04	0.10	0.03	0.03	1.00

Table 4. Ordinary Least-square regressions analysis of managerial ownership on firm operating efficiency. Dependent Variable - Turnover Ratio

The sample is drawn from Compact Disclosure 2001 for managerial ownership data and firm financial data from Comustat. It contains 4,822 observations for 1,384 firms during 1990 to 2001. Variable definitions and when their Compusat item numbers are given as follows: Percent officer = shares held by officers / total number of shares outstanding. TQ = Tobin's Q, (market value of equity + book value of debt) / by book value of total physical assets. Leverage = firm total liability / total assets. MV = market value of equity; ROA = return on assets; net income / total assets. Sales = annual sales in million dollar. Turnover ratio = the total sales / total assets. Profit Margin = the ratio of operating income before depreciation / total sales. Shtinv = annul capital expenses. Longinv = R&D expenses. Cash = the annual cash balance plus short term investments. Chg of variable is the percentage change of the variable from one year lag value. Dif of variable is the difference from one year lag value. All variables are measured at the end of fiscal year unless otherwise indicated.

Model	**1**		**2**		**3**		**4**	
Intercept	0.019	***	0.032	***	0.028	***	0.027	***
	(4.58)		(7.92)		(6.69)		(6.55)	
difpercent_officers	0.001	**	0.001		0.001	*	0.001	*
	(2.08)		(1.37)		(1.68)		(1.67)	
Dif TQ			0.000		-0.001	**	-0.001	**
			(-0.02)		(-1.93)		(-2.11)	
Dif Tot Assets			-0.183	***	-0.191	***	-0.192	***
			(-24.43)		(-24.73)		(-24.77)	
chgsales			0.005	***	0.005	***	0.005	***
			(7.48)		(7.44)		(7.45)	
chgshtinv			0.004	***	0.004	***		
			(2.47)		(2.16)			
chg longinv							0.009	***
							(2.65)	
dif leverage			0.165	***	0.169	***	0.167	***
			(11.19)		(11.47)		(11.29)	
difpro fitmargin								
chgMV					0.013	***	0.013	***
					(4.15)		(4.27)	
Adj R^2	0.0006		0.1371		0.1396		0.140	
N	5626		5626		5626		5626	
F	4		150.02		131.42		131.81	

* significant at 10%
** significant at 5%
*** significant at 1%

Table 5. Ordinary Least-square regressions analysis of managerial ownership on firm value. Dependent Variable – Tobin's Q

The sample is drawn from Compact Disclosure 2001 for managerial ownership data and firm financial data from Comustat. It contains 4,822 observations for 1,384 firms during 1990 to 2001. Variable definitions and when their Compusat item numbers are given as follows: Percent officer = shares held by officers / total number of shares outstanding. TQ = Tobin's Q, (market value of equity + book value of debt) / by book value of total physical assets. Leverage = firm total liability / total assets. MV = market value of equity; ROA = return on assets; net income / total assets. Sales = annual sales in million dollar. Turnover ratio = the total sales / total assets. Profit Margin = the ratio of operating income before depreciation / total sales. Shtinv = annul capital expenses. Longinv = R&D expenses. Cash = the annual cash balance plus short term investments. Chg of variable is the percentage change of the variable from one year lag value. Dif of variable is the difference from one year lag value. All variables are measured at the end of fiscal year unless otherwise indicated.

Model	1		2		3		4		5		6		7	
Intercept	-0.03 (-0.16)		0.27 (-1.49)		0.27 (1.49)		-1.52 (-9.18)	***	-1.64 (-9.78)	***	-1.38 (-8.4)	***	-1.51 (-9.06)	***
difpercent_officers	0.05 (2.52)	** *	0.04 (-2.06)	**	0.04 (2.07)	**	0.08 (5.08)	***	0.08 (5.27)	***	0.07 (4.59)	***	0.08 (4.82)	***
chgsales			-0.09 (-2.99)	***	-0.08 (-2.75)	***	-0.09 (-3.29)	***	-0.09 (-3.4)	***	-0.09 (-3.51)	***	-0.09 (-3.59)	***
chgshtinv			-0.56 (-7.58)	***	-0.56 (-7.58)		-0.73 (-11.29)	***			-0.74 (-11.44)	***		
chglonginv									-0.67 (-4.77)	***			-0.63 (-4.52)	***
dif leverage			-1.93 (-2.86)	***	-1.93 (-2.86)	***	0.84 (1.41)		1.06 (1.76)	*				
difprofitmargin					-0.001 (-1.04)		-0.001 (-1.03)		-0.001 (-0.93)		-0.001 (-0.86)		-0.001 (-0.78)	
chgMV							4.33 (41.21)	***	4.28 (40.39)	***	4.24 (40.49)	***	4.19 (39.64)	***
difROA											1.51 (5.19)	***	1.38 (4.72)	***
Adj R^2	0.001		0.01		0.01		0.24		0.229		0.25		0.232	
N	5606		5606		5606		5606		5606		5606		5606	
F	6		20		16		301		278		306		282	

* significant at 10%
** significant at 5%
*** significant at 1%

Table 6. Panel Data for managerial ownership and firm value relation analysis. Dependent variables – Tobin's Q & Percent_officers

The sample is drawn from Compact Disclosure 2001 for managerial ownership data and firm financial data from Comustat. It contains 4,822 observations for 1,384 firms during 1990 to 2001. Variable definitions and when their Compusat item numbers are given as follows: Percent officer = shares held by officers / total number of shares outstanding. TQ = Tobin's Q, (market value of equity + book value of debt) / by book value of total physical assets. Leverage = firm total liability / total assets. MV = market value of equity; ROA = return on assets; net income / total assets. Sales = annual sales in million dollar. Turnover ratio = the total sales / total assets. Profit Margin = the ratio of operating income before depreciation / total sales. Shtinv = annul capital expenses. Longinv = R&D expenses. Cash = the annual cash balance plus short term investments. Chg of variable is the percentage change of the variable from one year lag value. Dif of variable is the difference from one year lag value. All variables are measured at the end of fiscal year unless otherwise indicated.

Model	1		2		3		4	
	Dependent Variable							
	Tobin's Q				Percent_Officers			
Intercept	-0.07		-0.14		-0.99		-1.01	
	(-0.02)		(-0.03)		(-0.26)		(-0.27)	
difpercent_officers	0.059	***	0.065	***				
	(2.89)		(3.15)					
Dif TQ					0.042	***	0.045	***
					(2.89)		(3.15)	
chgsales	0.04		0.03		-0.21		-0.21	
	(0.7)		(0.59)		(-4.36)		(-4.42)	
chgshtinv	-0.77	***			-0.09			
	(-8.65)				(-1.22)			
chglonginv			-0.58	***			0.13	
			(-3.2)				(0.86)	
difpro fitmargin	-0.003		-0.003		0.002		0.002	
	(-1.18)		(-1.18)		(0.96)		(0.97)	
chgMV	4.50	***	4.48	***	-0.70	***	-0.71	***
	(34.39)		(33.93)		(-5.49)		(-5.65)	
difROA	2.17	***	2.02	***	2.16	***	2.19	***
	(4.21)		(3.86)		(4.99)		(5.03)	
Adj R^2	0.4602		0.450		0.28		0.28	
DFE	3422		3422		3422		3422	
F for No Fix	0.87		0.90		0.87		0.87	

* significant at 10%
** significant at 5%
*** significant at 1%

Table 7. Simultaneous Equation Model tesing for endogeniety of ownership-performance relation. Dependent variables – Tobin's Q & Percent_officers

The sample is drawn from Compact Disclosure 2001 for managerial ownership data and firm financial data from Comustat. It contains 4,822 observations for 1,384 firms during 1990 to 2001. Variable definitions and when their Compusat item numbers are given as follows: Percent officer = shares held by officers / total number of shares outstanding. TQ = Tobin's Q, (market value of equity + book value of debt) / by book value of total physical assets. Leverage = firm total liability / total assets. MV = market value of equity; ROA = return on assets; net income / total assets. Sales = annual sales in million dollar. Turnover ratio = the total sales / total assets. Profit Margin = the ratio of operating income before depreciation / total sales. Shtinv = annul capital expenses. Longinv = R&D expenses. Cash = the annual cash balance plus short term investments. Chg of variable is the percentage change of the variable from one year lag value. Dif of variable is the difference from one year lag value. All variables are measured at the end of fiscal year unless otherwise indicated.

Model	**1**		**2**		**3**		**4**	
	Dependent Variable							
	Tobin's Q				**Percent_Officers**			
Intercept	-0.19		0.09		-0.43	***	-1.11	***
	(-0.53)		(0.17)		(-2.63)		(-3.95)	
difpercent_officers	1.73	***	1.83	***				
	(3.51)		(3.96)					
Dif TQ					**0.12**		**-0.11**	
					(1.05)		**(-0.7)**	
chgsales	0.02		0.03		-0.07	**	-0.09	***
	(0.37)		(0.53)		(-2.41)		(-3.14)	
chgshtinv	-0.29	***			0.04			
	(-5.83)				(0.91)			
chglonginv			-0.50	***			-0.17	
			(-2)				(-1.04)	
dif leverage	3.49	***	4.36	***				
	(4.11)		(3.32)					
difpro fitmargin	-0.002		-0.002		0.001		0.001	
	(-1.04)		(-1.07)		(0.85)		(0.75)	
chgMV	4.52	***	5.13	***	-1.06	***	-0.07	
	(13.22)		(17.32)		(-2.68)		(-0.1)	
difROA					0.82	***	1.56	***
					(3.6)		(4.66)	
Adj R^2	0.025		0.06		0.025		0.06	
N	22816		11454		22816		11454	
System Wghted MSE	4.48		1.51		4.48		1.51	

* significant at 10%
** significant at 5%
*** significant at 1%

Tabel 8. Panel data testing for duadratic specification. Dependent variable - Tobin's Q

The sample is drawn from Compact Disclosure 2001 for managerial ownership data and firm financial data from Comustat. It contains 4,822 observations for 1,384 firms during 1990 to 2001. Variable definitions and when their Compusat item numbers are given as follows: Percent officer = shares held by officers / total number of shares outstanding. TQ = Tobin's Q, (market value of equity + book value of debt) / by book value of total physical assets. Leverage = firm total liability / total assets. MV = market value of equity; ROA = return on assets; net income / total assets. Sales = annual sales in million dollar. Turnover ratio = the total sales / total assets. Profit Margin = the ratio of operating income before depreciation / total sales. Shtinv = annul capital expenses. Longinv = R&D expenses. Cash = the annual cash balance plus short term investments. Chg of variable is the percentage change of the variable from one year lag value. Dif of variable is the difference from one year lag value. All variables are measured at the end of fiscal year unless otherwise indicated.

Model	**1**		**2**	
Intercept	-0.07		-0.14	
	(-0.02)		(-0.03)	
difpercent_officers	0.06	***	0.06	***
	(2.89)		(3.14)	
Dif OF SQ	0.0002		0.0002	
	(0.42)		(0.39)	
chgsales	0.04		0.03	
	(0.71)		(0.59)	
chgshtinv	-0.77	***		
	(-8.65)			
chglonginv			-0.58	***
			(-3.21)	
difpro fitmargin	0.00		0.00	
	(-1.19)		(-1.19)	
chgMV	1.00	***	4.48	***
	(4.50)		(33.9)	
difROA	2.19	***	2.03	***
	(4.22)		(3.87)	
Adj R^2	0.4602		0.4501	
DFE	0.87		0.9	
F for No Fix	3421		3421	

*** significant at 1%
** significant at 5%
* significant at 10%