



# The nonlinear relation between agency costs and managerial equity ownership

## Evidence of decreasing benefits of increasing ownership

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### Abstract

**Purpose** – This paper aims to examine the impact of managerial equity ownership on return on assets as a measure of profitability and two financial statement-based agency cost measures, i.e. asset utilization and an expense ratio, which proxy for management's efficiency in use of assets and perquisite consumption, respectively.

**Design/methodology/approach** – Multivariate tests are constructed to examine the nonlinear relation between managerial equity ownership and both profitability and agency costs, using interaction terms to capture the relation at various levels of managerial ownership.

**Findings** – The paper documents that managerial equity ownership is nonlinearly and positively associated with return on assets and asset utilization, and nonlinearly and negatively associated with the expense ratio, after controlling for firm size, leverage, corporate diversification, institutional ownership, research intensity, firm age, and executive stock options.

**Research limitations/implications** – The results imply that the ability of managerial equity ownership to reduce agency costs decreases as levels of ownership increase. Further, the results indicate that, in some industries, high levels of ownership lead to increased expense ratios, suggesting increased perquisite consumption. Finally, these results suggest that, above a certain level in some industries, managerial equity ownership only marginally encourages efficient asset utilization but does not significantly deter excessive spending.

**Originality/value** – The paper provides a link between research that demonstrates a linear relation between managerial equity ownership and financial-statement based profitability and agency cost measures and research that finds a nonlinear relation between managerial equity ownership and Tobin's  $Q$ , a proxy for firm performance.

**Keywords** Corporate governance, Costs, Equity capital, Managers, Business performance

**Paper type** Research paper



## 1. Introduction

Recent accounting scandals have directed public attention to widespread incidents of opportunistic behavior by managers. The resulting negative consequences for the investing public gave rise to a movement to increase corporate executives' personal responsibility. Currently, corporations use a myriad of corporate governance mechanisms to motivate managers and discourage them from behaving opportunistically. Managerial equity ownership is one such mechanism used for the purpose of aligning managers' incentives with those of shareholders.

Traditional theory predicts that when managers hold less equity in a corporation, their incentives to shirk and consume perquisites rise; as their ownership stakes increase, they are less likely to engage in opportunistic behavior (Jensen and Meckling, 1976). Consistently, many firms require managers to own a minimum level of company stock, expressed either as a number of shares or as a percentage of salary (Core and Larcker, 2002)[1]. Related proxy statement disclosures document that the rationale behind these target managerial equity ownership levels is to align the interests of managers with those of shareholders. Therefore, target ownership plans appear to be a response to the assertion that current stock ownership levels of senior executives are inadequate to control agency costs (Jensen and Murphy, 1990; Jensen, 1993).

Core and Larcker (2002) provide evidence of increased accounting profitability, measured as return on assets, following adoption of target ownership programs. This result is consistent with the claim that managerial equity ownership is a means to align the interests of management and owners. However, while profitability should increase as agency costs decrease, agency costs are a subset of the factors that influence profitability. Profitability, therefore, is a less than ideal proxy for agency costs. Ang *et al.* (2000) and Fleming *et al.* (2005) demonstrate that both asset utilization and the ratio of operating expense to sales capture agency costs[2]. Their results and those of Singh and Davidson (2003) and Florackis (2008) suggest that increased managerial ownership is linearly associated with decreased agency costs, as proxied by asset utilization and the expense ratio.

Other research examines the relation between managerial equity ownership and firm performance as a proxy for agency costs (Morck *et al.*, 1988; McConnell and Servaes, 1990; Hermalin and Weisbach, 1991; McConnell and Servaes, 1995; Holderness *et al.*, 1999). Contrary to traditional theory, which predicts that agency costs decline steadily as managerial equity ownership increases, this stream of research theorizes that, at some levels, equity ownership aligns the interest of management with that of shareholders, reducing agency costs, but at other levels, managerial equity ownership leads to managerial entrenchment and increased agency costs. These studies find evidence that the relation between managerial equity ownership and firm performance, measured as Tobin's  $Q$ , is likely nonlinear. The results of these studies suggest that the impact of management's equity ownership on agency costs varies, depending upon the level of ownership.

Our study provides a link between research that demonstrates a linear relation between managerial equity ownership and agency costs (e.g. Ang *et al.*, 2000; Singh and Davidson, 2003) and research that finds a nonlinear relation between managerial equity ownership and Tobin's  $Q$  (e.g. Morck *et al.*, 1988). We first document the nonlinear association between managerial equity ownership and return on assets suggested by the results of Core and Larcker (2002). Relying on the results of Ang *et al.* (2000) and Fleming *et al.* (2005), we then extend Singh and Davidson (2003) and

Florackis (2008) by examining the nonlinear relation between management equity ownership and accounting-based measures of agency costs: asset utilization and the ratio of selling, general and administrative expense to sales.

Our empirical tests provide evidence of a nonlinear relation between managerial equity ownership and accounting-based performance measures for US firms. These results suggest that, above a certain level, managerial equity ownership becomes less successful as a corporate governance mechanism. Our results further suggest that, in some industries, increased levels of managerial equity ownership may not successfully increase deterrence of management behaviors that are contrary to the creation of shareholder value. Finally, these results suggest that different agency cost measures capture different dimensions of management performance.

The rest of the paper is organized as follows. Section 2 discusses prior related research and develops the research hypotheses. Section 3 describes data sources, variable measurements, and empirical tests. Section 4 discusses results of our hypothesis tests, and Section 5 concludes.

## 2. Related literature and hypothesis development

Agency costs result from the separation of ownership and control within an organization (Jensen and Meckling, 1976), and are characterized by opportunistic behavior such as investing in negative net present value projects, shirking, and consuming perquisites. Jensen and Meckling (1976) predict that increased managerial equity ownership will align the incentives of managers with shareholders and reduce agency costs, thereby improving firm performance[3]. Specifically, this theory predicts that at low levels of managerial equity ownership, managers enjoy personal gain from engaging in suboptimal behaviors. As managerial equity ownership increases, however, managers' and shareholders' interests become aligned; management begins to derive more personal benefit from creating value for the firm. Hence, Jensen and Meckling's agency theory suggests that managerial equity ownership and firm value are positively, linearly related.

Recent empirical research explores the impact of managerial equity ownership on agency costs, using accounting measures as proxies for agency costs. Core and Larcker (2002) use an accounting measure, i.e. return on assets, to proxy for firm performance. They find that increased managerial equity ownership resulting from the adoption of target management ownership plans is associated with increased return on assets in the two years after plan adoption, relative to a control group. Ang *et al.* (2000), Singh and Davidson (2003), Fleming *et al.* (2005) and Florackis (2008) employ a measure of asset utilization to examine management's efforts to generate sales from investment opportunities and a ratio of expense-to-sales to examine management's control of discretionary spending. In a study of small, non-publicly traded US firms, Ang *et al.* (2000) examine the relation between these measures and several variables that capture the extent to which these firms are managed by owners[4]. This study demonstrates that asset utilization and the expense ratio *are* measures of agency costs. Further, these results provide evidence that both measures of agency costs are inversely related to the owner-manager's equity share. In a study of Australian small and medium-sized firms, Fleming *et al.* (2005) also identify a base-case of 100 percent owner-managed firms and find results consistent with those of Ang *et al.* (2000). Singh and Davidson (2003) examine the relation between managerial equity ownership and both the asset

utilization and the ratio of selling, general, and administrative (SG&A) expense to sales in large, publicly traded firms[5]. These authors find that increased managerial equity ownership significantly improves asset utilization, consistent with Ang *et al.* (2000), but that managerial equity ownership generally does not deter excessive spending[6]. Finally, Florackis (2008) examines the role of corporate governance mechanisms in UK firms in mitigating agency costs, captured as asset utilization and the ratio of SG&A expense to sales. His univariate results provide some evidence for a nonlinear relation between asset utilization and managerial ownership. In contrast, he finds evidence of only a linear relation between managerial ownership and the proxies for agency costs in his multivariate tests.

However, the relation between managerial equity ownership and agency costs may be nonlinear. At some level, equity ownership will cease to align the interest of management with that of shareholders, as managers will derive more benefit from the direct consumption of perquisites than from their share of firm profits. Stulz (1988) demonstrates a nonlinear relation between firm value and managerial voting control, and points out that voting control likely is a function of managerial equity ownership. In an often-cited study, Morck *et al.* (1988) examine the relation between managerial equity ownership and Tobin's  $Q$ [7]. They predict that, at some levels, managerial ownership will result in entrenchment, and will result in increased, rather than decreased, agency costs[8]. Results of this study suggest that the relation between managerial equity ownership and Tobin's  $Q$  is nonlinear. Specifically, the authors separate managerial equity ownership into the ranges of 0 to 5 percent, 5 to 25 percent and greater than 25 percent, and use piecewise regression to obtain coefficients that are significantly positive, negative, and positive, respectively. Further studies explore the relation between management equity ownership and Tobin's  $Q$ , with mixed results. Several subsequent empirical studies provide no strong support for any relation between managerial equity ownership and firm value (Demsetz and Lehn, 1985; Agrawal and Knoeber, 1996; Loderer and Martin, 1997; Cho, 1998; Himmelberg *et al.*, 1999; Demsetz and Villalonga, 2001). However, many studies' results do support the existence of some sort of nonlinear relation between managerial equity ownership and firm value (McConnell and Servaes, 1990; McConnell and Servaes, 1995; Hermalin and Weisbach, 1991; Holderness *et al.*, 1999)[9].

In summary, prior research has demonstrated:

- increased return on assets (ROA) following adoption of target ownership plans (Core and Larcker, 2002);
- a linear relation between managerial equity ownership and accounting-based measures of agency costs (Ang *et al.*, 2000; Singh and Davidson, 2003; Fleming *et al.*, 2005; Florackis, 2008); and
- a nonlinear relation between managerial equity ownership and Tobin's  $Q$  (Morck *et al.*, 1988; McConnell and Servaes, 1990, 1995; Hermalin and Weisbach, 1991; Holderness *et al.*, 1999).

If Tobin's  $Q$  captures some dimensions of profitability and agency costs, we expect to observe nonlinear associations between managerial equity ownership and both ROA and our more direct measures of agency costs[10]. Our agency cost measures are asset utilization and the ratio of selling, general and administrative expense to sales. Asset utilization reflects the extent to which management successfully seeks positive net

present value projects and generally uses assets efficiently. Higher asset utilization reflects lower agency costs. The expense ratio captures resources wasted on organizational inefficiencies due to managerial opportunism. A lower expense ratio reflects lower agency costs. Asset utilization will be lower in a high agency cost setting, while the expense ratio will be higher. Thus, our research hypotheses[11] are as follows:

- H1a.* Return on assets is positively and nonlinearly associated with managerial equity ownership.
- H1b.* Asset utilization is positively and nonlinearly associated with managerial equity ownership.
- H1c.* The expense ratio is negatively and nonlinearly associated with managerial equity ownership.

### 3. Data and variables

#### 3.1 Data

Our data are collected from three sources:

- (1) accounting data and segment information are collected from Compustat;
- (2) managerial equity ownership data are collected from Execucomp for the period 1992 through 2004[12]; and
- (3) institutional ownership data are collected from the Thomson Financial Spectrum 13F Institutional Holding database.

Our sample selection procedure is summarized in Table I. Because we are interested in the impact of managerial equity ownership on agency costs, our initial sample consists of every available firm-year during the sample period included in the Compustat database for which data on managerial equity ownership is available from Execucomp. Next, we exclude foreign firms as they are subject to different regulatory standards and incentives than are US firms, potentially altering the impact of managerial equity ownership on managers' opportunistic behavior. We also exclude firms that are not publicly traded on a major exchange or are subsidiaries of larger firms, because those firms may have different financial incentives from non-subsidiary firms traded on major exchanges. We consider firms that have undergone leveraged buyouts (LBOs) to be unique and exclude them because an LBO is often accompanied by increased

	Firm-years
Compustat firm-years with MEO data available	22,629
Less:	
Foreign firms	(334)
Firms not publicly traded on a major US exchange, subsidiaries, or firms that have undergone LBOs	(968)
Firms with 6000-6999 SIC codes	(3,032)
Firm-years missing financial variables from Compustat	(2,724)
Firm-years with MEO > 50 percent	(129)
Firm-years with an expense ratio < 0 or > 1	(156)
Final sample	15,186

**Table I.**  
Sample selection  
procedure

pressure on management to run the firm more efficiently (Gupta and Rosenthal, 1991). We also exclude financial institutions (i.e. firms with 6000-6999 SIC codes)[13]. Any observations missing assets, sales, SG&A expense, long-term debt, or short-term debt are also excluded from our sample. Additionally, we exclude observations where managerial equity ownership is greater than 50 percent; at such owner-managed firms, agency costs are limited. Finally, we exclude firms where the expense ratio is greater than one because these firms are likely to be companies where shareholders are more concerned with firm survival than agency issues. The final sample consists of 15,186 firm-year observations.

### 3.2 Variables

**3.2.1 Profitability and agency costs.** As our dependent variables, we use return on assets to measure profitability, which should improve as agency costs decrease, and two direct measures of agency costs:

- (1) an asset utilization ratio; and
- (2) an expense ratio.

Return on assets is computed as income before extraordinary items (Compustat item no. 18) divided by total assets (Compustat item no. 6). Following Ang *et al.* (2000), asset utilization (AssetUtil) is computed as sales (Compustat item no. 12) divided by total assets (item no. 6). Higher asset utilization is associated with lower agency costs.

Our second measure of agency costs, the expense ratio (Expense), is based on the measure employed by Ang *et al.* (2000), as modified by Singh and Davidson (2003). Consistent with Singh and Davidson, our measure uses only selling, general, and administrative (SG&A) expense (Compustat item no. 189) in the numerator[14]. SG&A expense includes items such as salaries, rents, insurance, utilities, lease payments, supplies and advertising costs, and thus captures managerial pay and perquisite consumption, since it reflects expenditures such as office furnishings and company cars. Furthermore, management may conceal expenditures on perquisites through advertising and selling expense accounts (Singh and Davidson, 2003). Thus, in a high manager-owner agency conflict setting, SG&A expense will be higher; lower agency conflict will result in lower SG&A expense.

**3.2.2 Managerial equity ownership.** The level of managerial equity ownership proxies for the extent to which management's objectives and incentives are aligned with shareholders' interests. Using Execucomp data, we compute managerial equity ownership (MEO) as the number of shares (excluding stock options) held by the company's top five executives divided by the number of common shares outstanding. As suggested by results in Morck *et al.* (1988), the relation between managerial equity ownership and agency costs is likely nonlinear. Based on the thresholds employed by Morck *et al.*, we create indicator variables for MEO between 5 percent and 25 percent and in excess of 25 percent. We then include interaction terms between MEO and each of these two indicators in the regression estimations[15].

**3.2.3 Control variables.** Consistent with prior research, we control for both firm size and leverage. Traditional agency theory (Fama and Jensen, 1983a, b) argues that agency costs increase incrementally with increases in firm size. Thus, we would expect firm size to be negatively related to asset utilization and positively related to the expense ratio. However, Singh and Davidson (2003) point out that SG&A expense, one of our agency

cost proxies, may decrease relative to firm size due to economies of scale. Additionally, because larger firms tend to be diversified, asset utilization may increase relative to firm size due to synergies across business segments. Because both asset utilization and the expense ratio are components of a decomposition of return on assets, we expect that other variables related to our agency cost measures will be similarly related to return on assets. Our size measure is the natural log of sales revenue, following Ang *et al.* (2000) and Singh and Davidson (2003). We do not predict a specific relation between firm size and our dependent variables, as any observed association could be induced through the inclusion of sales in the calculation of the dependent variables.

Leverage is measured as the sum of short-term and long-term debt (Compustat data item no. 9 plus item no. 34) scaled by total assets. Higher leverage may act as a control mechanism and deter opportunistic behavior to the extent that debt repayments limit management's access to cash (Jensen, 1986). Higher leverage may also proxy for increased levels of monitoring by debt holders. Consequently, we expect leverage to be positively related to asset utilization and negatively related to the expense ratio. Further, if asset utilization increases with firm size, then we may find that the debt level is actually positively related to asset utilization because larger firms are more diversified and better able to handle the costs of financial distress related to debt (Smith and Watts, 1992; Gaver and Gaver, 1993).

Other firm characteristics influence the relation between managerial equity ownership and firm value as well. Prior research suggests that corporate diversification is negatively related to firm valuation, measured as Tobin's *Q* (Lang and Stulz, 1994), and measured using imputed segment values (Berger and Ofek, 1995). Denis *et al.* (1997) propose that this relation occurs when managers obtain personal incremental benefit from diversification, irrespective of the costs to the firm. They document a negative relation between corporate diversification and managerial equity ownership, as well as support for the agency cost hypothesis they propose. Further, Chen and Steiner (2000) provide evidence of a nonlinear relation between diversification and managerial ownership that supports an agency explanation. Our diversification variable, which we denote as Complexity, is obtained from Compustat. For each firm-year, we count the number of segments for which the firm reports sales, and use this as a proxy for diversification.

Institutional ownership, another element of ownership structure, may proxy for reduced monitoring costs. Prior research suggests that institutional ownership is related to firm value, measured as Tobin's *Q*. McConnell and Servaes (1990, 1995) find evidence that Tobin's *Q* is both positively associated with institutional ownership and nonlinearly associated with managerial equity ownership. Steiner (1996) further demonstrates that managerial equity ownership, institutional ownership, and corporate diversification all statistically explain variation in Tobin's *Q*. Our institutional ownership variable, denoted InstOwn, is the percentage of shares held by institutional investors, based on the information in 13F filings, and is obtained from the Thomson Financial Spectrum 13F Institutional Holding database. The computation of the ratio involves three steps. First, institutional holdings for all institutional investors in each stock in December of each year are obtained. Next, for each year and each CUSIP, we aggregate shares held across all institutional investors. We then divide the result by the corresponding CUSIP's number of shares outstanding.

Another variable that may be related to our variables of interest, and particularly to return on assets and asset utilization, is intensity of research and development (R&D Intensity). Research and development expense directly reduces operating income, which in turn reduces return on assets. Research-intensive firms are more likely to have unrecorded or under-recorded intangible assets. Further, the actual value of these intangible assets may not be observable to owners, creating information asymmetry. We therefore control for R&D Intensity, measured as R&D expense divided by sales. While this measure is consistent with control variables used by Ittner *et al.* (2003), Hanlon *et al.* (2003) and Fleming *et al.* (2005), scaling by sales may also induce a negative association with asset utilization.

The level of managerial ownership may be influenced by compensation in the form of executive stock options, especially when firms are performing well or stock price is high. Because stock options are a source of executive ownership, we control for both exercisable and unexercisable stock options[16]. Our exercisable options variable is measured as the number of exercisable options held by the top five executives, divided by the number of common shares outstanding. Our unexercisable options variable is measured as the number of options that are not yet exercisable held by the top five executives, divided by the number of common shares outstanding.

Additionally, we control for corporate age and differences across industries. Corporate age is measured as the number of years of data available on Compustat, beginning in 1950[17]. Industry indicator variables are coded according to broad categories based on two-digit SIC codes[18]. The range of coefficients for those indicator variables are reported below. In supplementary tests, we provide analysis of several industries with respect to managerial equity ownership and its influence on agency costs. Finally, we include year indicator variables to control for dependency that arises from multiple observations for the same firms across time[19].

### 3.3 Regression models

Thus, to test the nonlinear relation between managerial equity ownership and both ROA and agency costs, we use ordinary least squares regression to estimate the following fixed effects models with indicator variables for year and industry:

$$\begin{aligned} \text{ROA} = & \alpha_0 + \beta_1 \text{MEO} + \beta_2 \text{MEO}_{5\% - 25\%} + \beta_3 \text{MEO} \\ & > 25\% + \beta_4 \text{Size} + \beta_5 \text{Leverage} + \beta_6 \text{InstOwn} + \beta_7 \text{Complexity} \\ & + \beta_8 \text{R\&D Intensity} + \beta_9 \text{Age} + \beta_{10} \text{ExercisableOptions} \\ & + \beta_{11} \text{UnexercisableOptions} + \varepsilon, \end{aligned} \quad (1)$$

$$\begin{aligned} \text{AssetUtil} = & \alpha + \phi_1 \text{MEO} + \phi_2 \text{MEO}_{5\% - 25\%} + \phi_3 \text{MEO} \\ & > 25\% + \phi_4 \text{Size} + \phi_5 \text{Leverage} + \phi_6 \text{InstOwn} + \phi_7 \text{Complexity} \\ & + \phi_8 \text{R\&D Intensity} + \phi_9 \text{Age} + \phi_{10} \text{ExercisableOptions} \\ & + \phi_{11} \text{UnexercisableOptions} + \varepsilon, \end{aligned} \quad (2)$$

and:



$$\begin{aligned} \text{Expense} = & \alpha + \varphi_1 \text{MEO} + \varphi_2 \text{MEO}_{5\% - 25\%} + \varphi_3 \text{MEO} \\ & > 25\% + \varphi_4 \text{Size} + \varphi_5 \text{Leverage} + \varphi_6 \text{InstOwn} + \varphi_7 \text{Complexity} \\ & + \varphi_8 \text{R\&D Intensity} + \varphi_9 \text{Age} + \varphi_{10} \text{ExercisableOptions} \\ & + \varphi_{11} \text{UnexercisableOptions} + \varepsilon. \end{aligned} \quad (3)$$

We expect positive estimates of  $\beta_1$  and  $\phi_1$ , and a negative estimate of  $\varphi_1$ . We also expect that the coefficient estimates of all of the MEO interaction variables will be significantly different from zero, indicating a nonlinear relation between managerial equity ownership and our dependent variables, ROA and our proxies for agency costs[20].

#### 4. Results

##### 4.1 Descriptive statistics

Descriptive statistics for our data are presented in Table II. All of our variables except return on assets are non-negative by definition, and hence we expect skewness in the

Variable	<i>n</i>	Mean	SD	Tenth percentile	Median	Ninetieth percentile
AssetUtil	15,186	1.223	0.782	0.466	1.063	2.137
Expense	15,186	0.246	0.164	0.068	0.215	0.462
ROA	15,186	0.044	0.142	-0.032	0.054	0.134
MEO	15,186	0.047	0.084	0.001	0.011	0.146
Size	15,186	3,579.240	10,809.090	145.227	873.806	8,245.150
Leverage	15,186	0.220	0.190	0.000	0.204	0.446
InstOwn	14,705	0.579	0.198	0.307	0.596	0.819
Complexity	13,981	3.793	4.253	1.000	1.000	10.000
R&D	14,575	0.042	0.079	0.000	0.006	0.142
Age	15,173	21.938	15.511	4.000	18.000	46.000
ExOptions	15,176	0.017	0.033	0.001	0.010	0.037
UnexOptions	15,176	0.014	0.026	0.001	0.009	0.030

**Notes:** Please refer to Table I for details regarding the sample; variables are defined as follows: AssetUtil, asset utilization, computed as the ratio of sales (Compustat item no. 12) divided by total assets (item no. 6); Expense, the expense ratio, computed as SG&A expense (Compustat item no. 189), scaled by sales; MEO, managerial equity ownership, from the Execucomp database, calculated as the aggregate number of shares held by the top five executives at a firm, excluding stock options, divided by the number of common shares outstanding; ROA, income before extraordinary items (Compustat item no. 18) divided by total assets (Compustat item no. 6); Size, sales in millions (Compustat item no. 12); Leverage, computed as the sum of long-term debt (Compustat item no. 9) and short-term debt (item no. 34) divided by total assets; InstOwn, the percentage of common shares outstanding held by institutional investors, from the Thomson Financial Spectrum 13F Institutional Holding database; Complexity, from the Segment file in Compustat, computed as the number of business segments reporting sales; R&D, research and development intensity, measured as research and development expense (Compustat item no. 46) divided by sales; Age: firm age, measured as the current year minus the first year in which the firm has assets on Compustat; ExOptions, unexercised exercisable stock options, from the Execucomp database, calculated as the aggregate number of unexercised exercisable stock options held by the top five executives at a firm, divided by the number of common shares outstanding; UnexOptions, unexercised unexercisable stock options, from the Execucomp database, calculated as the aggregate number of unexercised unexercisable stock options held by the top five executives at a firm, divided by the number of common shares outstanding

**Table II.**

Descriptive statistics for agency cost measures, managerial equity ownership, leverage, firm size, institutional ownership, and complexity

distributions. Asset utilization is, on average, 1.223 (median 1.063), the average expense ratio is 0.246 (median 0.215), and the average return on assets is 0.044 (median 0.054). While mean MEO is approximately 5 percent of total equity (median 1.1 percent), there are some firms in our sample with substantially higher proportions of managerial ownership[21]. Our sample contains a wide range of firms with respect to Size (total sales), and also with respect to Leverage.

The distribution of firms across industries is presented in Table III. The firms in our sample are predominantly manufacturing firms (57.1 percent), and over half the remaining firms are in either the retail (15.5 percent) or service (12.5 percent) industries. Transportation and utilities, another visible group of industries, is only 5.1 percent of our sample.

#### 4.2 Multivariate results

The main results of our hypothesis tests are presented in Tables IV-VI. We estimate these regressions in six variations, first omitting all control variables except size and leverage from the regression, then adding our other control variables in various combinations, and finally including all control variables in the regression estimation. The interaction terms allow us to examine potential differences in the impact of MEO on agency costs at various levels of ownership. The coefficients on these interaction terms are the incremental changes in slope coefficients, describing the nonlinear relation between agency costs and managerial equity ownership. Thus, the slope of the line within a given range of MEO is the sum of the coefficient on MEO and the interaction coefficient, and the appropriate test-statistic is the *F*-statistic of the summed coefficient. Summed coefficients and related *F*-statistics are presented at the bottom of each of the columns.

Table IV presents the results of regressions of return on assets on MEO, interaction terms, and our control variables. The inclusion of R&D Intensity in this regression is problematic because research and development expense is inherently part the computation of return on assets, while R&D Intensity is correlated with managerial equity ownership. Therefore, we discuss the results of estimating the full model, first without R&D Intensity, and then when R&D Intensity is included in the regression estimation.

The coefficient estimates on the managerial equity ownership variables are consistent with the expectation of nonlinearity. Specifically, the coefficient on MEO is 0.55 ( $p < 0.01$ ), while the coefficients on MEO\_5%-25% and MEO > 25% are  $-0.32$  and  $-0.43$ , respectively ( $p < 0.01$ ), and the summed coefficients are 0.26 and 0.12,

Industry	SIC code	<i>n</i>	Percent
Agriculture and extraction	01-14	814	5.36
Construction	15-17	167	1.10
Manufacturing	20-39	8,672	57.11
Transportation and utilities	40-49	768	5.06
Retail	50-59	2,346	15.45
Services	70-79	1,894	12.47
Not-for-profit and miscellaneous	80-99	525	3.46
Total		15,186	100

**Table III.**  
Distribution of firms  
across industries

**Table IV.**  
Results of ordinary least squares regressions of ROA on managerial equity ownership, size, leverage, institutional ownership, complexity, R&D, age, options, industry and year

Variables	1 (n = 15,186)	2 (n = 13,544)	3 (n = 12,966)	4 (n = 13,538)	5 (n = 13,531)	6 (n = 12,960)
Intercept	-0.008 (-0.70)	-0.050 (-3.87)**	-0.005 (-0.39)	-0.041 (-2.95)**	-0.037 (-2.71)**	0.005 (0.35)
MEO	0.532 (5.17)**	0.497 (5.01)**	0.234 (2.36)*	0.520 (5.31)**	0.548 (5.50)**	0.259 (2.64)**
MEO_5%-25%	-0.373 (-3.87)**	-0.281 (-3.07)**	-0.095 (-1.04)	-0.304 (-3.36)**	-0.323 (-3.54)**	-0.119 (-1.32)
MEO > 25%	-0.453 (-4.57)**	-0.382 (-3.97)**	-0.153 (-1.60)	-0.405 (-4.28)**	-0.428 (-4.47)**	-0.179 (-1.89)*
Size	0.026 (0.33)	0.024 (0.49)	0.014 (0.27)	0.022 (0.84)	0.018 (0.69)	0.012 (0.33)
Leverage	-0.149 (-7.00)**	-0.152 (-6.41)**	-0.185 (-7.44)**	-0.150 (-6.29)**	-0.151 (-6.32)**	-0.183 (-7.31)**
InstOwn	0.061 (7.86)**	0.061 (7.86)**	0.065 (8.19)**	0.063 (7.97)**	0.064 (8.01)**	0.067 (8.31)**
Complexity	-0.001 (-2.35)**	-0.001 (-2.35)**	-0.002 (-4.48)**	0.001 (2.41)	-0.001 (-3.10)**	-0.002 (-4.54)**
R&D			-0.399 (-13.20)**		-0.399 (-13.23)**	-0.399 (-13.23)**
Age			0.000 (0.38)		0.001 (3.53)**	0.000 (0.34)
ExOptions				-0.146 (-2.82)**	-0.150 (-2.86)**	-0.171 (-3.29)**
UnexOptions				-0.060 (-1.75)	-0.056 (-1.58)	-0.041 (-1.39)
Industry indicators		-0.007-0.010	-0.001-0.029	-0.008-0.010	-0.009-0.007	-0.002-0.029
Year indicators		-0.038-0.018	-0.032-0.024	-0.036-0.026	-0.034-0.026	-0.032-0.023
F-statistic	43.89	52.07	73.91	48.56	47.44	69.160
Adjusted R <sup>2</sup>	0.061	0.086	0.132	0.087	0.088	0.132
<i>Summed coefficients</i>						
MEO + MEO_5% - 25%	0.159 [44.30]**	0.216 [89.08]**	0.139 [34.69]**	0.216 [89.17]**	0.225 [95.84]**	0.140 [34.92]**
MEO + MEO > 25%	0.079 [25.04]**	0.116 [55.24]**	0.081 [25.49]**	0.115 [54.39]**	0.120 [58.63]**	0.080 [25.16]**

**Notes:** Please refer to Table I for details regarding the sample, for variable definitions, please see Table II; MEO\_5%-25%, MEO if 0.05 < MEO < 0.25, and otherwise 0; MEO > 25%: MEO if MEO > 0.25, and otherwise 0; White's (1980) *t*-statistic in parentheses; *F*-statistic in brackets; \* Significant at  $p < 0.01$ ; \*\* Significant at  $0.05 > p > 0.01$

Variables	1 (n = 15, 186)	2 (n = 13, 544)	3 (n = 12, 966)	4 (n = 13, 538)	5 (n = 13, 531)	6 (n = 12, 960)
Intercept	0.235** (5.28)	0.377** (7.56)	0.637** (12.59)	0.300* (5.54)	0.284* (5.20)	0.566* (10.28)
MEO	7.510** (13.99)	7.465** (13.15)	5.325** (9.98)	7.249** (12.74)	7.123** (12.56)	5.124** (9.59)
MEO_5%-25%	-5.892** (-11.99)	-6.168** (-11.78)	-4.569** (-9.28)	-5.958** (-11.35)	-5.870** (-11.19)	-4.374** (-8.88)
MEO > 25%	-6.538** (-12.49)	-6.762** (-12.21)	-4.928** (-9.47)	-6.546** (-11.78)	-6.439** (-11.61)	-4.730** (-9.06)
Size	0.267** (23.79)	0.300** (24.08)	0.261** (18.71)	0.316** (23.68)	0.329** (22.08)	0.276** (18.72)
Leverage	-0.462** (-9.21)	-0.470** (-8.48)	-0.641** (-10.61)	-0.485** (-8.69)	-0.484** (-8.70)	-0.655** (-10.77)
InstOwn						
Complexity						
R&D						
Age						
ExOptions						
UnexOptions						
Industry indicators						
Year indicators						
F-statistic	-0.455-0.787 -0.010-0.224	-0.429-0.793 0.015-0.164	-0.414-0.829 0.018-0.121	-0.415-0.793 0.014-0.182	-0.407-0.800 0.012-0.183	-0.402-0.829 0.017-0.134
Adjusted R <sup>2</sup>	284.11 0.300	244.86 0.310	256.66 0.355	228.10 0.312	220.85 0.313	248.56 0.357
Summed coefficients						
MEO + MEO_5% - 25%	1.618** [201.69]	1.297** [117.38]	0.755** [40.30]	1.290** [116.28]	1.253** [108.59]	0.749** [39.66]
MEO + MEO > 25%	0.972** [168.09]	0.704** [74.72]	0.387** [24.24]	0.703** [74.45]	0.684** [70.08]	0.394** [23.81]

Notes: Please refer to Table I for details regarding the sample; for variable definitions, please see Table II; MEO\_5%-25%, MEO if 0.05 < MEO < 0.25, and otherwise 0; MEO > 25%; MEO if MEO > 0.25, and otherwise; White's (1980) *t*-statistic in parentheses; *F*-statistic in brackets; \* significant at *p* < 0.01; \*\* significant at 0.05 > *p* > 0.01

**Table V.** Results of ordinary least squares regressions of asset utilization on managerial equity ownership, size, leverage, institutional ownership, complexity, R&D, age, options, industry and year

**Table VI.**  
Results of ordinary least squares regressions of expense on managerial equity ownership, size, leverage, institutional ownership, complexity, R&D, age, options, industry and year

Variables	1 (n = 15, 186)	2 (n = 13, 544)	3 (n = 12, 966)	4 (n = 13, 538)	5 (n = 13, 531)	6 (n = 12, 960)
Intercept	0.473 (47.06)*	0.485 (40.05)*	0.366** (31.18)	0.463 (35.96)*	0.459 (35.44)*	0.342 (28.30)*
MEO	-1.350 (-11.98)*	-1.273 (-10.79)*	-0.557 (-5.28)*	-1.332 (-11.36)*	-1.364 (-11.65)*	-0.626 (-6.00)*
MEO_5%-25%	1.067 (10.16)*	0.964 (8.78)	0.454 (4.66)	1.023 (9.39)	1.044 (9.61)*	0.522 (5.42)
MEO > 25%	1.200 (10.95)*	1.098 (9.59)*	0.500 (4.89)*	1.158 (10.18)*	1.185 (10.43)	0.5659 (5.63)*
Size	-0.069 (-32.31)*	-0.059 (-25.20)*	-0.038 (-16.73)	-0.054 (-21.51)*	-0.050 (-18.82)	-0.033 (-13.94)*
Leverage	-0.138 (-17.79)*	-0.152 (-18.93)*	-0.069 (-8.68)	-0.156 (-19.24)*	-0.155 (-19.14)	-0.074 (-9.25)*
InstOwn		-0.036 (-4.64)	-0.039 (-5.68)	-0.040 (-5.03)*	-0.041 (-5.21)	-0.042 (-6.17)*
Complexity		-0.004 (-11.07)	-0.002 (-6.43)*	-0.004 (-10.91)*	-0.003 (-9.77)	-0.002 (-6.30)*
R&D			1.102 (18.80)*			1.103 (18.86)*
Age			0.001 (4.97)		0.001 (4.12)*	0.001 (5.13)*
ExOptions				0.337 (4.68)	0.340 (4.73)	0.426 (6.87)
UnexOptions				0.200 (1.88)	0.190 (1.86)	0.145 (3.13)
Industry indicators	-0.102-0.147	-0.102-0.145	-0.103-0.078	-0.099-0.144	-0.096-0.145	-0.010-0.077
Year indicators	-0.027-0.013	-0.033-0.027	-0.011-0.016	-0.030-0.027	-0.030-0.025	-0.008-0.017
F-statistic	220.00	192.92	447.64	181.06	175.19	421.56
Adjusted R <sup>2</sup>	0.249	0.262	0.482	0.264	0.265	0.485
<i>Summed coefficients</i>						
MEO + MEO_5% - 25%	-0.284 [131.12]**	-0.309 [136.84]*	-0.103 [19.55]	-0.309 [137.22]*	-0.319 [144.97]*	-0.104 [20.05]*
MEO + MEO > 25%	-0.151 [85.39]*	-0.175 [94.52]*	-0.058 [13.34]*	-0.174 [93.64]*	-0.179 [98.91]*	-0.058 [13.37]*

**Notes:** Please refer to Table I for details regarding the sample; for variable definitions, please see II; MEO\_5%-25%: MEO if 0.05 < MEO < 0.25, and otherwise 0; MEO > 25%: MEO if MEO > 0.25, and otherwise 0; White's (1980) *t*-statistic in parentheses; *F*-statistic in brackets; \*Significant at  $p < 0.01$

respectively ( $p < 0.01$ ). The two interaction coefficients are also significantly different from each other at  $p < 0.01$ , providing further support for the hypothesis of a nonlinear relation between return on assets and MEO. With the exception of unexercisable options, the coefficients on all control variables are significant at  $p < 0.01$ . When we include R&D Intensity in the regression estimation, however, the coefficient estimates on our MEO variables are influenced by the correlation between MEO and R&D Intensity. Only the coefficient on MEO of 0.26 is significant at  $p < 0.01$ ; the coefficients on MEO\_5%-25% and MEO > 25% are  $-0.12$  ( $p < 0.10$ ) and  $-0.18$  ( $p < 0.05$ ). The summed coefficients of 0.14 and 0.08, however, are both significantly different from zero at  $p < 0.01$ , and are significantly different from each other at  $p < 0.02$ . Further, when R&D Intensity is included in the regression, corporate age is no longer a significant explainer of return on assets.

Tables V and VI present the results of regressions of our two agency cost measures, asset utilization (AssetUtil) and the expense ratio (Expense), on managerial equity ownership (MEO), interaction terms, and our control variables. Table V contains the results of the regressions of asset utilization on our MEO variables and control variables. As the results of all six of the regression estimations are similar, our discussion focuses on the estimation with all control variables included. The coefficient estimates on the managerial equity ownership variables are consistent with the expectation of nonlinearity. Specifically, the coefficient on MEO is 5.12 ( $p < 0.01$ ), while the coefficients on MEO\_5%-25% and MEO > 25% are  $-4.37$  and  $-4.73$ , respectively ( $p < 0.01$ ), and the summed coefficients are 0.75 and 0.39, respectively ( $p < 0.01$ ). The two interaction coefficients are also significantly different from each other at  $p < 0.01$ , providing further support for the hypothesis of a nonlinear relation between asset utilization and MEO. Taken together, the MEO coefficients indicate that, when MEO is less than 5 percent of total equity ownership, each additional 1 percent of MEO is associated with a 5.1 percent increase in asset turnover. However, for ownership above 5 percent, gains in asset utilization are 0.75 percent for each 1 percent increase in MEO between 5 percent and 25 percent, and 0.39 percent for each 1 percent increase in MEO above 25 percent. These results support the notion that increases in managerial equity ownership are associated with improved asset utilization at a decreasing rate above 5 percent MEO[22]. The coefficients on all control variables are significant at  $p < 0.01$ , except for the coefficient on Unexercisable options, which is significant at  $p < 0.05$ . Additionally, the coefficient on Complexity of  $-0.01$  suggests that at least part of the diversification discount observed in prior research arises from lower operating efficiency with respect to asset utilization. Finally, the coefficients on our three MEO variables are substantially lower when R&D Intensity is included in the regression estimation, compared to the regression model that includes all control variables except R&D Intensity, demonstrating that R&D Intensity is associated with both asset utilization and managerial equity ownership.

Table VI presents the results of the regression of the expense ratio on our variables of interest. As the results of all six of the regression estimations are similar, our discussion again focuses on the estimation with all control variables included. In this regression estimation, the coefficient on MEO is  $-0.63$  ( $p < 0.01$ ) and the coefficients on MEO\_5%-25% and MEO > 25%, i.e. 0.52 and 0.57, respectively, are significantly positive at  $p < 0.01$ [23]. Further, the summed coefficients, i.e.  $-0.10$  and  $-0.06$ , respectively, are significantly negative, and are significantly different from each other

at  $p < 0.01$ . These results also support the hypothesis of a nonlinear association between managerial equity ownership and the expense ratio. Specifically, SG&A expense as a percentage of sales decreases 0.6 percent for each 1 percent increase in MEO up to 5 percent. However, as managerial equity ownership continues to increase above that level, the incentive alignment effect only marginally curbs management spending relative to sales. Coefficients on size, leverage, institutional ownership, and Complexity are negative and significant at  $p < 0.01$  in all estimations of the regression. Coefficients on R&D Intensity, Age, and both option variables are positive and significant at  $p < 0.01$  in all estimations of the regression. The negative coefficient on Complexity indicates lower SG&A expense as a percentage of sales for diversified firms. Once again, the coefficients on all three MEO variables are affected by inclusion of R&D Intensity in the regression estimation.

Our sample is predominantly composed of manufacturing firms, which are capital-intensive compared to firms in other industries. Further, expense structures may differ by industry. We therefore partition our data into manufacturing, transportation and utilities, retail, and service firms, and estimate our agency cost regression models for each of those industry groups. Table VII contains the results of estimating the regressions of asset utilization on our managerial equity ownership variables and control variables by industry group. For each industry group, the coefficient estimates of all MEO variables are in the same direction as those of the full sample, and are significant at  $p < 0.05$ . However, the relationships described by these coefficients differ to some degree across the four industry groups. For manufacturing firms, the coefficient on MEO of 3.26 is smaller than that for any of the other groups, as well as for the full sample, perhaps reflecting the greater capital-intensity of manufacturing firms, and the summed coefficients, though slightly smaller in magnitude, are similar to those of the full sample in direction. Similarly, the regression estimation for service firms is consistent with the full sample, although the coefficient estimate for our MEO variable (7.23) and the summed coefficients of 1.52 and 0.80, respectively, are larger than the estimates for the other industries. For retail firms, the coefficient estimate of MEO of 4.37 is consistent with the full sample, but the summed coefficient for ownership between 5 percent and 25 percent of 0.10 is not significantly different from zero and the summed coefficient for ownership in excess of 25 percent of 0.38 is significant at  $p < 0.05$ . In contrast, in the regression estimation using only the transportation and utilities firms, the coefficient on MEO (7.36) and the summed coefficient for ownership between 5 percent and 25 percent (1.42) are slightly larger than for the sample as a whole, but the summed coefficient for ownership in excess of 25 percent is not significantly different from zero, possibly because there are few firms in this industry with managerial equity ownership in excess of 25 percent[24].

Table VIII contains the results of estimating the regression of the expense ratio on our variables of interest, partitioned by industry group[25]. This analysis provides evidence of differences across industries in the relation between management equity ownership and the expense ratio. In the regression estimation for manufacturing firms, all three MEO variables are consistent with those from the regression employing the full sample ( $p < 0.01$ ), as are the summed coefficients ( $p < 0.01$ ). In contrast, in each of the regressions based on firms in the other three industry groups, the observed relation deviates from that observed with the full sample. In the regression for transportation and utilities firms, the coefficient estimates of MEO variables are in the predicted

Variables	Manufacturing ( <i>n</i> = 7,593)	Transportation and utilities ( <i>n</i> = 615)	Retail ( <i>n</i> = 1,869)	Service ( <i>n</i> = 1,625)
Intercept	0.884 (16.94)**	0.894 (4.44)**	0.011 (0.07)	0.788 (4.86)**
MEO	3.257 (6.05)**	7.364 (2.63)**	4.369 (2.12)**	7.234 (4.72)**
MEO_5%-25%	-2.720 (-5.43)**	-5.947 (-2.15)*	-4.268 (-2.18)**	-5.715 (-4.16)**
MEO > 25%	-2.934 (-5.61)**	-7.259 (-2.61)**	-3.986 (-1.96)*	-6.434 (-4.31)**
Size	0.170 (12.94)**	0.135 (3.50)**	0.852 (18.68)**	0.180 (2.49)**
Leverage	-0.535 (-12.05)**	-1.074 (-5.44)**	-1.055 (-5.01)**	-0.855 (-4.19)**
InstOwn	-0.305 (-9.05)**	0.193 (1.09)	-0.783 (-7.47)**	-0.242 (-2.61)*
Complexity	-0.009 (-6.05)**	-0.037 (-4.20)**	0.004 (0.68)	-0.012 (-1.50)*
R&D	-2.292 (-17.82)**	-2.349 (-3.13)	-8.597 (-3.14)*	-2.073 (-5.67)**
Age	-0.001 (-3.56)**	-0.007 (-2.98)**	-0.011 (-6.57)**	0.007 (2.37)**
ExOptions	2.073 (5.78)**	-2.406 (-1.24)	-1.151 (-0.99)	-1.214 (-1.78)
UnexOptions	2.479 (4.43)**	9.001 (2.94)**	6.615 (3.90)**	-0.243 (-2.51)
Year indicators	0.016-0.182	-0.292-0.235	-0.027-0.207	0.019-0.207
<i>F</i> -statistic	91.63	6.23	24.80	10.62
Adjusted <i>R</i> <sup>2</sup>	0.215	0.164	0.227	0.120
<i>Summed coefficients</i>				
MEO + MEO_5% - 25%	0.537 [18.06]**	1.417 [5.61]**	0.100 [0.08]	1.519 [14.01]**
MEO + MEO > 25%	0.322 [12.93]**	0.105 [0.08]	0.382 [2.67]*	0.800 [8.37]**

**Table VII.**  
Results of ordinary least squares regressions of asset utilization on managerial equity ownership, size, leverage, institutional ownership, complexity, R&D, age, options, industry and year partitioned by industry

**Notes:** Please refer to Table I for details regarding the sample; for variable definitions, please see Table II; MEO\_5%-25%, MEO if  $0.05 < \text{MEO} < 0.25$ , and otherwise 0; MEO > 25%, MEO if  $\text{MEO} > 0.25$ , and otherwise 0; White's (1980) *t*-statistic in parentheses; *F*-statistic in brackets; \*\*significant at  $p < 0.01$ ; \*significant at  $0.05 > p > 0.01$

direction ( $p < 0.01$ ), as is the summed coefficient for MEO\_5%-25% ( $p < 0.01$ ). However, the summed coefficient for MEO > 25% is positive and not significantly different from zero, which may arise because, in our sample, there are so few firms in this industry with managerial equity ownership above 25 percent[26]. In the regression for retail firms, the coefficient estimates of MEO, MEO\_5%-25%, and MEO > 25% are -1.40, 1.32, and 1.47, respectively. However, the summed coefficient for MEO\_5%-25% is not significantly different from zero at conventional levels, and the



Variables	Manufacturing ( <i>n</i> = 7, 550)	Transportation and utilities ( <i>n</i> = 585)	Retail ( <i>n</i> = 1, 821)	Service ( <i>n</i> = 1, 588)
Intercept	0.310 (22.01)**	0.225 (5.69)**	0.361 (15.89)**	0.511 (13.05)**
MEO	-1.096 (-9.30)**	-2.470 (-5.98)**	-1.395 (-6.70)**	-1.509 (-4.94)**
MEO_5%-25%	0.990 (9.20)**	2.189 (5.73)**	1.321 (6.82)**	1.328 (4.61)**
MEO > 25%	1.046 (9.17)**	2.536 (5.98)**	1.471 (7.25)**	1.218 (4.12)**
Size	-0.030 (-9.77)**	0.011 (1.30)	-0.043 (-8.31)**	-0.046 (-6.26)**
Leverage	-0.080 (-8.03)**	0.074 (2.74)**	-0.071 (-4.77)**	-0.189 (-5.68)**
InstOwn	-0.028 (-3.18)**	-0.131 (-4.56)**	-0.014 (-0.98)	-0.068 (-3.52)**
Complexity	-0.002 (-4.81)**	-0.004 (-3.00)**	-0.003 (-4.45)**	-0.004 (-4.21)**
R&D	0.978 (18.92)**	2.074 (4.23)**	2.482 (3.75)**	1.278 (6.12)**
Age	0.001 (5.31)**	-0.001 (-3.91)**	0.001 (7.61)**	-0.002 (-2.92)**
ExOptions	0.254 (3.89)**	1.324 (2.63)**	0.055 (0.28)	0.560 (3.25)**
UnexOptions	0.527 (4.45)**	0.725 (1.26)	-0.833 (-4.08)**	0.099 (3.85)**
Year indicators	-0.006-0.014	-0.020-0.063	-0.010-0.018	-0.039-0.047
<i>F</i> -statistic	250.98	8.49	11.23	106.92
Adjusted <i>R</i> <sup>2</sup>	0.432	0.228	0.115	0.606
<i>Summed coefficients</i>				
MEO + MEO_5% - 25%	-0.107 [12.29]**	-0.281 [7.72]**	-0.073 [2.58]	-0.182 [6.98]**
MEO + MEO > 25%	-0.050 [5.46]**	0.066 [1.08]	0.076 [6.76]**	-0.291 [38.59]**
<b>Notes:</b> Please refer to Table I for details regarding the sample; for variable definitions, please see Table II; MEO_5%-25%, MEO if 0.05 < MEO < 0.25, and otherwise 0; MEO > 25%. MEO if MEO > 0.25, and otherwise 0; White's (1980) <i>t</i> -statistic in parentheses; <i>F</i> -statistic in brackets; **significant at <i>p</i> < 0.01; *significant at 0.05 > <i>p</i> > 0.01				

**Table VIII.**  
Results of ordinary least squares regressions of expense on managerial equity ownership, size, leverage, institutional ownership, complexity, R&D, age, options, industry and year partitioned by industry

summed coefficient for MEO > 25% of 0.08 is significantly positive. This implies that, in the retail industry, managerial equity ownership deters excessive spending only up to 5 percent ownership, has no impact on spending between 5 percent and 25 percent, and is related to increased expenses above 25 percent ownership. Finally, in the regression based on service firms, the coefficients on our MEO variables (-1.51, 1.33, and 1.22, respectively) are each significant at *p* < 0.01, as are the summed

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coefficients ( $-0.18$  and  $-0.29$ ), but unlike the full sample, the summed coefficient estimate for MEO<sub>5%-25%</sub> is smaller in magnitude than that for MEO  $> 25\%$ .

## 5. Summary and conclusion

We explore the impact of managerial equity ownership on agency costs. Based on two streams of prior research, one that documents a linear relation between agency costs and managerial equity ownership (Ang *et al.*, 2000; Singh and Davidson, 2003; Fleming *et al.*, 2005; Florackis, 2008), and a second that demonstrates a nonlinear relation between firm valuation and managerial equity ownership (e.g. Morck *et al.*, 1988), we examine whether the relation between managerial equity ownership and agency costs is a nonlinear one. We alternatively use one measure of profitability – i.e. return on assets – and two measures of agency costs – i.e. asset utilization, a measure of the extent to which management seeks positive net present value projects and generally uses assets efficiently, and the ratio of SG&A expense to sales, which likely includes management perquisite consumption.

We construct multivariate tests to examine the hypothesis that agency costs decrease nonlinearly with increases in managerial equity ownership. We also examine whether this nonlinear relation is consistent across industries. Specifically, we find that the ability of managerial equity ownership to reduce agency costs decreases as levels of ownership increase. Further, our results indicate that, in some industries, high levels of ownership are associated with increased expense ratios, suggesting increased perquisite consumption. These results imply that, above a certain level, managerial equity ownership becomes less successful as a corporate governance mechanism, and at higher levels may even be counter-productive in some industries. Though disturbing, these results are consistent with incidents in which executives with substantial equity ownership have engaged in lavish personal spending of corporate funds.

This study contributes to both research and practice. We contribute to the literature on ownership and performance by providing a link between research that demonstrates a linear relation between management equity ownership and agency costs (e.g. Ang *et al.*, 2000; Singh and Davidson, 2003) and research that finds a nonlinear relation between managerial equity ownership and Tobin's  $Q$  (e.g. Morck *et al.*, 1988). We find that return on assets, asset utilization, and the expense ratio each exhibit a nonlinear relation with managerial equity ownership. Unlike Singh and Davidson (2003), we observe a significant and negative relation between the expense ratio and managerial ownership. Finally, because our two agency cost measures yield slightly different results, our research suggests that researchers must be cognizant that different measures may capture different dimensions of management performance.

Our results also have implications for practice, particularly with respect to corporate governance policies. The nonlinear relations we observe indicate that the incremental benefit of established target ownership levels for management decreases as ownership levels increase. Further, our results suggest that, beyond a certain point, managerial equity ownership may not provide enough incentive to stop management from consuming perquisites. Hence, boards of directors might consider structuring management incentives that more closely link rewards to expense control relative to a benchmark.

## Notes

1. Proxy statement disclosures related to target ownership plans typically indicate that the ownership requirement must be satisfied by real ownership of common stock and that stock options do not qualify as ownership (Core and Larcker, 2002).
2. Asset utilization and the expense ratio are both elements of the DuPont decomposition of return on assets.
3. Agency costs not included in the theory developed by Jensen and Meckling may also include incentives to report falsely in an attempt to manipulate perceptions of managerial performance. Managerial equity ownership may actually provide incentives for this behavior.
4. Ang *et al.* (2000) indicate that a benefit of examining small, privately held firms is that this group includes firms which are 100 percent manager-owned, and therefore provides a no agency-cost base case.
5. Singh and Davidson (2003) define large firms as having sales revenues greater than \$100 million.
6. Singh and Davidson's failure to find a significant association between equity ownership and the expense ratio may be due to the functional form of the relation, rather than the lack of an association.
7. Tobin's  $Q$  is the ratio of market value of a company to replacement cost of its assets. In this stream of literature, Tobin's  $Q$  proxies variously for firm performance, firm value and agency costs.
8. Specifically, they predict that, as managerial equity ownership first increases, managers' interests are better aligned with shareholders', and agency costs decrease. As managerial equity ownership further increases, managers become more entrenched and agency costs increase. When managerial equity ownership increases beyond a certain threshold, interests are realigned and agency costs decrease.
9. The relation between measures of firm performance and managerial equity ownership exhibits endogeneity, as does much of the empirical accounting and finance research (Larcker and Rusticus, 2007; Chenhall and Moers, 2007). Demsetz (1983) theorizes that, in equilibrium, shareholders will trade their shares to establish an optimal ownership structure for value maximization. Following this paper, several studies find no significant association between firm performance and managerial equity ownership after controlling for potential endogeneity (Demsetz and Lehn, 1985; Loderer and Martin, 1997; Cho, 1998; Himmelberg *et al.*, 1999; Demsetz and Villalonga, 2001). However, results in Morck *et al.* (1988) suggest that the positive relation between firm performance and managerial equity ownership exists because managerial equity ownership levels are sub-optimally low at most firms. As Core and Larcker (2002) point out, recontracting between the firm and management is costly, and in the absence of continuous recontracting, managerial ownership will diverge from the optimum. Empirical research suggests that, in the absence of equilibrium conditions, increases in managerial equity ownership will result in improved firm performance. Consistently, McConnell and Servaes (1990) find a positive association between firm performance and managerial equity ownership when managerial ownership is less than 50 percent.
10. Our paper differs from Morck *et al.* (1988) in several important ways. First, their sample period ends in 1980, while ours is from 1992 through 2004. The economic climate has changed considerably, with respect to both corporate governance issues and equity markets in general. Next, their measure of management equity ownership is based on shares owned by the board of directors, while ours is constructed from ownership by executives. Even though there may be overlap between executives and directors, agency issues and incentives differ between these two groups. Executives are more likely to be appropriately cast in the

role of agents, while directors are often principals. Finally, their sample is limited to *Fortune* 500 companies, while our sample includes a much broader group of firms, as we include all firms for which data is available from both Execucomp and Compustat. Thus, we may find results that differ from those reported in Morck *et al.* (1988).

11. Because managerial equity ownership and our measures of profitability and agency costs may or may not be simultaneously determined, we predict an association rather than a causal relationship.
12. The initial sample consists of data beginning with the year 1992 because managerial equity ownership data is available from the Execucomp database for the years 1992 and after. The Execucomp database contains information for approximately 2,500 firms, far fewer than does Compustat.
13. We conducted additional tests omitting regulated firms (SIC 4900-4999), following Singh and Davidson (2003). The results of all regressions are qualitatively similar to those reported in Tables IV-VIII, and lead to identical inferences.
14. Ang *et al.* (2000) compute the ratio as operating expenses divided by sales.
15. Using the method recommended by Griffiths *et al.* (1993), we also capture this nonlinear relation between managerial equity ownership and agency costs by including the square (MEO<sup>2</sup>) and cube (MEO<sup>3</sup>) of managerial equity ownership in regression analysis. The results from those tests are qualitatively similar to the results presented in Tables IV-VIII.
16. Habib and Ljungqvist (2005) include both ownership and options as independent variables, and scale both measures by common shares outstanding.
17. Since this variable may be biased downward, we also conduct all our tests omitting firms with 1950 data. The results of those tests are similar to the results found in Tables IV-VIII, and lead to identical inferences.
18. We also created indicator variables coded according to the 43 Fama and French (1997) industry groupings and used those as control variables in our regression estimations. The results of those tests are consistent with the results reported in Tables IV-VI.
19. We also estimated regressions of all three models by year. The results of those regression estimations are consistent with the results reported in Tables IV-VI and lead to identical inferences.
20. Our coefficient estimates may contain bias arising from endogeneity inherent in the relationships we examine. We therefore are cautious in our interpretation of the magnitude of the coefficient estimates.
21. Because these potential outliers may affect our results, we examined all highly influential observations, and re-estimated our regressions excluding those observations. Those results are similar to those reported including these influential observations, with the exception of results for the expense ratio regression by industry, and lead to identical inferences. For the expense ratio regression by industry (Table VIII), we report the results of regressions with highly influential observations omitted.
22. To further examine the nonlinear relation between agency costs and managerial equity ownership, we re-estimate both the asset utilization and expense ratio regressions replacing the interaction terms with MEO<sup>2</sup> and MEO<sup>3</sup>. Results of those tests are consistent with reported results, but cannot be as readily interpreted. We also estimated these regressions using piecewise regression, and results are also consistent with reported results.
23. Our results differ from those of Singh and Davidson (2003), who did not find support for a relation between managerial ownership and deterrence of excessive spending. Our paper differs from theirs in several ways. First, their measure of managerial ownership includes board members, while ours is limited to ownership by executives. Next, their sample period

is limited to 1992 through 1994, while ours extends to 2004. Finally, they do not allow for nonlinearity in their tests. Our results provide evidence of nonlinearity in the functional form of the relationship.

24. Of the 615 observations included in this regression estimation, only 36 (5.9 percent) are for firm-years with MEO in excess of 25 percent.
25. These results are based on a reduced sample from which highly influential observations have been removed. When those observations are included in the regression, all of the MEO coefficients, although in the predicted directions, are smaller in magnitude, and in several cases, are only marginally significant.
26. Of the 585 observations included in this regression estimation, only 34 (5.8 percent) are for firm-years with MEO in excess of 25 percent.

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