Equity agency costs in payouts, pension plan manipulation and firm performance

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Abstract

Purpose – The purpose of this paper is to present novel empirical findings regarding the shareholder-management agency problem.

Design/methodology/approach – The paper presents new evidence regarding the shareholder-management agency problem. It expands the set of factors that may cause agency problems to include both dollar value of management holdings and its fractional holdings.

Findings – First, the paper finds that this problem is better explained when management fractional holdings and management absolute equity wealth are considered simultaneously than separately. Second, it provides evidence that separation of control and ownership leads management to drive profits artificially upwards by overstating the anticipated long-term rate of return on pension plans (LTROR). The paper's findings point to the LTROR as a promising novel indicator for shareholder-management agency problem.

Research limitations/implications – Samples of 628 US firms during the period 1996-2005. Only 238 firms for pension plans as many firms do not have an internal pension fund.

Practical implications – The paper suggests practical ways to alleviate agency problems.

Social implications – The paper shows the strategic use of a change in the anticipated LTROR on pension plan assets that stems from an agency problem and affects the firm's reported net profits. The paper observes the strategic determination of LTROR in firms in which the pension funds are controlled by management. A possible social implication can be a risk for employees in firms in which the pension funds are controlled by management.

Originality/value – The paper aims to enrich the current literature using a novel indicator of the agency problem: the long-term change in the anticipated LTROR on pension plan assets.

Keywords Financial management, Corporate finance, Corporate governance, Management power, Pension funds

Paper type Research paper

I. Introduction

1. Literature review

Separation of ownership and control creates a potential shareholder-management agency problem in which managers pursue self-serving objectives at the shareholders' expense. In actual due to imperfect capital markets, this agency problem is inevitable; no enforceable contract can perfectly align the motivations of managers with those of their shareholders. The free-cash-flow theory (Jensen, 1986) suggests that agency problems drive managers to increase internal investments or acquisitions rather than distribute cash to shareholders, even when the expected return on an investment or acquisition is lower than the cost of capital. Such acquisitions presumably serve the manager by:

- increasing the empire the manager controls, which means more fringe benefits and better reputation;
- diversifying the industry risk the manager bears (Morck *et al.*, 1990); or
- doing both.

Consistent with the free-cash-flow theory, the literature provides empirical evidence that:

- firms retain significantly high liquidity (Kalay, 1982); and
- firms under management control are more involved in unrelated mergers and diversifications (Amihud and Lev, 1981).

In theory, managerial holdings should have a dual impact on the shareholder-management agency problem because equity-owning managers face a tradeoff between the value of the management absolute equity wealth (NEW) and the private benefits they derive from managing their firms. On the one hand, the higher the managers' fractional holdings are, the better-aligned their management interests are with those of their fellow shareholders. Indeed, Jensen and Meckling (1976) predict that firm value should increase with managerial holdings because sufficient equity mitigates the conflict between shareholders' and managers' interests.

On the other hand, for a given level of shareholder-management conflict of interests, the higher the managers' fractional holdings are, the more often they are able to divert the firm away from the shareholders' objectives (Morck *et al.*, 1988).

Indications of the shareholder-management agency problem may be found in a firm's payout policy of dividends and repurchases (Lang and Litzenberger, 1989), asset diversification (Denis *et al.*, 1997), capital structure (Kim and Maksimovic, 1990; Berger *et al.*, 1997) and cash holdings (Lie, 2000).

2. Management absolute equity wealth (MEW)

Whereas managerial fractional holdings have been used in prior research, MEW has not. MEW is the theoretical factor that motivates the agency problem. We expand the set of factors that may cause an agency problem to include both MEW (i.e. the dollar value of management holdings) and management fractional holdings. Because managerial equity wealth increases with managerial fractional holdings by definition and equity wealth and fractional holdings theoretically influence the agency problem in opposite directions, we use estimation equations that allow a nonlinear or inverse relation between fractional holdings and the agency problem.

Previous studies have focused on many specific positions of power and decision making under the general heading of "management", such as those of board members, the top two officers, managers and directors, CEOs and even block shareholders who are not insiders. Depending on the practices of different firms, board members may be regarded as either principals or agents. Categorizing board members together with agents such as executive officers may obstruct an investigation of the shareholder-management agency problem. Accordingly, we have adopted the Compustat Executive Compensation definition of "executive officers", which excludes board members who are not in the top management team.

Factors that affect the shareholder-management agency problem can be classified into two conceptually distinct sets:

(1) factors that affect the potential conflict between managers' interests and shareholders' interests; and

(2) factors that affect management's ability to control the firm.

We label the first set, which is comprised of MEW and compensation plans, as "Ownership factors". We label the second set, which is comprised of management fractional holdings and CEO's tenure, formal and informal control factors, respectively, as "Control factors". The severity of the shareholder-management agency problem depends on both sets of factors, ownership and control, which represent managerial incentives and abilities, respectively, to maneuver the firm away from solely serving shareholders' interests.

3. A novel indicator of an agency problem – the change in the anticipated long-term rate of return on pension plan (LTROR) assets

Many firms and states face challenges in balancing their pension system as people are living longer and the future US government bond yield is shrinking. The ten-year bond yield deceased from 7.82 percent in December 2004 to 4.39 percent in December 2005. This pressure may affect pension plan assumptions, with even small changes having large impact. The only two times in history that the Securities and Exchange Commission accused an American state in market fraud was with regard to pension plans.

For a firm that has its own defined-benefit pension, the management controls and determines the change in the LTROR. Each year, management states the LTROR independently, to some degree of the actual future rate of return on these assets. Hence, management may use the LTROR to create artificial extra income. This manipulation is plausible because differences between anticipated and actual returns on pension assets may be amortized over long periods of time (Bergstresser *et al.*, 2006). Bergstresser *et al.* (2006) show that firms with defined-benefit pension plans make particularly aggressive assumptions about the LTROR during periods in which their executives are exercising stock options. Changes in LTROR may be used as a measure for agency problems because managers may try to manipulate the LTROR to increase the net profit of the firm and its stock price.

We aim to enrich the current literature by using a novel indicator of the agency problem, the long-term change in LTROR.

4. Our findings

Using samples of US firms during the period from 1996 to 2005, we examine the degree to which the shareholder-management agency problem depends on management ownership and the formal and informal management control of a firm.

We offer new empirical insights into the shareholder-management agency problem by expanding the set of factors that may cause an agency problem to include both MEW and management fractional holdings. The theoretical model suggests the inclusion of only MEW. We use the firm performance (*MARKET_to_BOOK*) equation to present three models including:

(1) Fractional ownership.

(2) MEW.

(3) MEW and fractional ownership.

We find that the model that includes both variables is superior to the models that include only fractional holdings or MEW.

Consistent with the dual impact of managerial holdings, Morck *et al.* (1988), McConnell and Servaes (1990), Cho (1998) and Holderness *et al.* (1999), we find a U-shaped relationship between managerial holdings and firm performance, as measured by the market-to-book ratio or Tobin's Q. These studies consider managerial fractional holdings to be the only factor that influences the agency problem; however, we consider both fractional holdings and MEW as influencing factors[1].

Finally, we provide evidence that management manipulates reported profits by overstating the LTROR due to an agency problem. We suggest the change in the LTROR as a potential novel indicator of an agency problem.

The remainder of the paper is organized as follows. In Section II, we present the underlying theory and set for our empirical predictions. In Section III, we describe our data and the econometric models. In Section IV, we present the empirical results. In Section V, we report the results of our robustness checks. In Section VI, we present a summary and our conclusions.

II. Underlying theory and empirical predictions
Manager absolute equity wealth (MEW) and the agency problem: to summarize prior theoretical analyses of the agency problem regarding dispersed ownership, we begin with a simple (parsimonious) presentation of the tradeoffs managers face between MEW and the benefits they derive from managing a firm – the private benefits of control. Consider a firm with an investment opportunity set such that an investment of an amount I results in the firm's present value of $V(I)$. The investment is assumed to be positive, and $V(I)$ is assumed to be an increasing concave function of I, such that the firm's net present value, $V(I) - I$, is uniquely maximized at I^*:

$$V'(I^*) = 1 \qquad (1)$$

Managers are assumed to derive utility from:

- MEW, denoted by W in $W = \alpha \cdot [V(I) - I]$, where α is the portion of the firm held by managers and where $\alpha > 0$; and
- the private benefits of controlling the firm, denoted by $B(I)$, an increasing concave function of I.

Manager utility then takes the following form:

$$U\{W(I), \ B(I)\} \quad where \quad W(I) = \alpha \cdot [V(I) - I] \quad and \quad U_W > 0, \ U_B > 0 \qquad (2)$$

When an investment is determined exclusively by the manager, he maximizes his utility by setting the firm's investment level at I^{**} such that the following equation holds:

$$\frac{\partial U}{\partial W} \cdot \alpha \cdot [V'(I^{**}) - 1] + \frac{\partial U}{\partial B} \cdot B'(I^{**}) = 0 \qquad (3)$$

Rearranging the first-order condition, equation (3) yields the following:

$$V'(I^{**}) = 1 - \frac{U_B}{U_W} \cdot \frac{B'(I^{**})}{\alpha} \qquad (4)$$

Recall that firm value is maximized by setting investment equal to I^*, which satisfies $V'(I^*) = 1$.

It is fairly straightforward to empirically verify how managers too often choose to "over-invest" relative to the investment that would actually maximize firm value. As $B(I)$ increases in I, U increases in W and B and $\alpha > 0$, it follows from equations (1) and (4) that $V'(I^{**}) < V'(I)^*$. Because $V(I)$ is increasing and concave, it follows that $I^{**} > I^*$. The result of over-investment and the attendant lower firm value illustrates a shareholder-management agency problem in which managers pursue an "empire-building" objective that is not beneficial; such a policy may even be detrimental to the interests of the shareholders at large. Prior studies utilize the fractional holdings of managers in the firm's equity, α, as the factor that determines the extent of the shareholder-management agency problem. The underlying intuition is that I^{**} converges to I^* as α increases; the severity of the agency problem diminishes because manager interests are better aligned with those of shareholders. However, equation (4) illustrates that α is insufficient in characterizing managerial incentives. Specifically, it is insufficient in characterizing the importance that managers assign to MEW relative to that of private benefits, U_B/U_W, which depends on firm size, $[V(I) - I]$, and the managers' fractional holdings, α. Whereas managerial fractional holdings have been used in prior research, to the best of our knowledge, no previous study has used MEW with managerial fractional holdings and its square. Because MEW is the theoretical factor that motivates the agency problem, we consider MEW, $\alpha \cdot [V(I) - I]$, in addition to fractional holdings, α, as the factors that affect shareholder-management conflicts of interest.

Shareholder-management agency problems: cash payouts, either through dividends or repurchases, are hypothesized to indicate a lower-level agency problem because of managerial ability to fund negative NPV projects (Jensen, 1986). Consistent with this hypothesis is the documented positive relationship between unexpected increases in payouts and share prices (Gesser *et al.*, 2006) and positive revisions in analysts' earnings forecasts (Ofer *et al.*, 1987).

The extent to which managers may divert firm activity to serve their personal interests is bounded by their formal and informal powers. We examine how different proxies for the power of managers are related to agency problem indicators, which include payouts, changes in LTROR and firm performance.

Long-term payout yield
A higher long-term payout yield may reduce agency problems according to the free-cash-flow theory (Jensen, 1986).

Change in anticipated LTROR assets
The change in LTROR can be a measure for agency problems because managers may increase the LTROR to increase firm profits (Bergstresser *et al.*, 2006).

Firm performance
We measure the relationship between managerial holdings and firm value, as measured by the market-to-book ratio. The dual effect of managerial holdings: recall that the shareholder-management agency problem depends on "ownership factors" which determine the degree of conflict or concordance between managerial interests and

shareholders' interests in addition to "management control factors" that measure management's control of the firm. It follows that managerial holdings are theoretically expected to have a dual effect on the shareholder-management agency problem. On the one hand, managers face a tradeoff between MEW and the private benefits they derive from managing the firm. Consequently, the higher MEW is, the more their interests are aligned with those of other shareholders. On the other hand, the higher those managers' fractional holdings are for a given level of shareholder-management conflicts of interest, the more willing and able managers will be to divert the firm away from shareholders' interests.

To investigate such expected dual effects of management holdings, we use estimation equations that allow an opposing or nonlinear relationship between fractional holdings and the agency problem.

Managerial absolute equity wealth (MEW)
Managerial fractional holdings represent managers' control of the firm and their ability to pursue self-serving objectives at shareholders' expense. MEW represents the common interests of managers and shareholders. Accordingly, we expect an agency problem to decrease with MEW. That is, we expect the payouts ratio to increase and changes in the LTROR to decrease as MEW increases.

Managerial fractional holdings
We use the set of executive officers rather than all board members when calculating the percentage of shares owned by the management of the firm, as suggested by Demsetz and Villalonga (2001). Demsetz and Villalonga (2001) propose that the fractions of shares owned by outside shareholders and management should be measured separately to appropriately take care of ownership structure because the shares are owned by persons with different interests. We do not include board members in managerial holdings because they may represent large shareholders (Kapopoulos and Lazaretou, 2007).

We expect the agency problem to increase at a decreasing rate as management fractional holdings increases. That is, we expect the payout ratio to decrease at a decreasing rate as management fractional holdings increases. Additionally, we expect the change in the LTROR to increase at a decreasing rate as management fractional holdings increase.

Management compensation
Because theory suggests that compensation plans are used to align the interests of management with those of shareholders (Coughlan and Schmidt, 1985), we expand the set to include management compensation; thus, we expect the payout ratio to increase with management compensation. Concurrently, we also expect changes in LTROR to decrease as management compensation increases.

Informal managerial control of the firm
We expand the set of management control factors to include factors that measure managers' informal control of the firm's decision making in addition to its formal control. Specifically, whereas management fractional holdings determine formal voting rights, we consider CEO tenure and management size as factors measuring informal control. By definition, CEOs are expected to be the most influential executive officers.

CEO turnover (Longer CEO tenure implies lower CEO turnover)
Empirical studies find that the chief executive office is characterized by relatively low turnover. As an illustration, in a sample of 367 NYSE firms from the period between 1974 and 1983, Weisbach (1988) finds that the most common reasons for CEOs to leave office are death, illness and scheduled retirement and that a CEO becomes more influential as his tenure grows. As a result of the aforementioned factors, we hypothesize that CEO tenure is correlated with informal control of the firm. We assume that a CEO's informal control of a firm and, therefore, the CEO ability to promote self-serving decisions decreases as the turnover rate increases. We further expect that CEO turnover alleviates the agency problem. That is, we expect the payout ratio to increase with an increasing CEO turnover rate. Additionally, we expect changes in LTROR to decrease with an increasing CEO turnover rate.

The number of executive officers
Directors and executive officers are different types of shareholders, but they may assume the role of balancing the power of the CEO. As Crossan *et al.* (2011) examine how the influence of CEOs is moderated by power-balancing forces such as boards of directors, we contend that CEO power may also be balanced by other power-balancing forces, such as executive officers. We examine whether the number of executives alleviates the agency problem. Prior research examines the relationships between top management team characteristics (e.g. educational level, tenure, age, international experience and functional background) and firm decisions (Herrmann and Datta, 2005). We continue and extend this research by examining the size of top management. The rationale behind using management size as a measure of a management's informal control of a firm is intuitive; as management size increases, power is dispersed and conflicting interests within management arise. We expect that management size will be positively related to firm performance or reputation in the same way that firms with larger boards have better reputations than those with smaller boards (Musteen *et al.*, 2010). We expect the payouts ratio to increase as the number of executive officers increases, and we expect the change in LTROR to decrease as the number of executive officers increases.

Debt and the shareholder-management agency problem
Firms may be financed by equity and debt. Debt has important direct and indirect effects on payouts policy. A direct effect is making payouts subject to debt provisions (Fan and Sundaresan, 2000). An indirect effect occurs when debt financing improves the standing of external shareholders and worsens that of management. Debt can be used to monitor the agency problem between shareholders and management (Berger *et al.*, 1997) or as a signal when the problem of asymmetric information exists (Thomas and Michael, 1996; Johnson, 1995). Similarly to the role of debt, shareholder payouts either increase to reduce the free cash flow that remains under management control (Jensen, 1986) or function as a signal for a commitment to future cash payouts from expected or hoped-for proceeds (Ravid and Sarig, 1991). Financing a firm with large debt reduces the free cash flow and therefore may mitigate the agency problems of dispersed ownership. Accordingly, we control for debt as a percentage of the firm's market value at the beginning of the period. We expect the payout ratio to increase with debt, and we expect changes in LTROR to decrease with debt.

Firm age
Firm age may be related to a firm's efficiency because older firms can be more efficient than younger ones (Ang *et al.*, 2000).

Firm property, plant and equipment
Firm property, plant and equipment may affect payout policy, as suggested by Koch and Shenoy (1999) and Harris and Raviv (1991) and others.

Firm cash
Cash may increase agency problems because managers will have more cash to finance low-return investments (Jensen, 1986).

Firm cash and cash equivalents increase (decrease)
Cash flow may increase agency problems because managers have more cash to finance low-return investments (Jensen, 1986).

Industry classification
We control for sectors by utilizing the Fama and French (1997) industry classification that assigns four – digit SIC codes to firms representing 48 industries.

Long-term period
Our sample consists of all firms for which executive compensation and financial information is available from 1996 to 2005 in the Compustat Executive Compensation and Compustat files. We follow Howe *et al.* (2003), who focus on the short- and long-run effects of managerial ownership. We also explore the role that ownership plays and explain the payout policies for long-term periods.

III. Data, descriptive statistics and econometric models
Data
Our sample consists of all firms for which executive compensation and financial information is available from 1996 to 2005 in the Compustat Executive Compensation and Compustat files.

Appendix I report all variable definitions and the sources for all variables used in the paper and tables.

Descriptive statistics
In Table I, we provide descriptive statistics and a correlation matrix of the variables we use. In our sample, the average cash payouts during the period of 1996-2005 amount to 52.4 percent (5.24 percent annually) of a firm's 1996 market value. This finding is consistent with Grullon and Michaely (2002), who documented a 4.11 percent payout yield. Similar to Fama and French (2001), Grullon and Michaely (2002) and Sarig (2004), we find that payouts through open market stock repurchases considerably exceed payouts through dividends[2]. The average LTROR decreased by 0.72 percent during the period of 1996-2005, consistent with Lee and Yu (2007), who documented a 0.81 percent decrease occurring simultaneously with a 1.23 percent decrease in the ten-year bond during that same period. The average *MEW* in 1996 was $18 million (median $9.2 million). This figure is lower than the figures found by Denis *et al.* (1997),

Panel I – summary statistics

	Mean	Median	SD	Min.	Max.
%PAYOUT	52.399	44.975	40.703	0.0000	218.39
%LTROR_CHG	-0.7235	-0.7500	0.5145	-1.7500	0.4000
MEW	18.090	9.2033	22.356	0.0000	99.106
%OWN	3.5090	0.8104	6.7803	0.0000	54.827
%OWN²	58.214	0.6568	229.83	0.0000	3006.0
TDC1	0.7374	0.4497	1.2926	0.0122	23.877
EXEC_N	6.1114	6.0000	1.4804	1.0000	15.000
CEO_CHG	2.2643	2.0000	0.9832	1.0000	6.0000
%DEBT	36.982	21.553	44.417	0.0000	310.58
AGE	19.912	25.000	8.5895	1.0118	25.000
PROPERTY	0.5516	0.4888	0.3554	0.0122	1.6166
CASH	5.6141	2.6712	7.7842	0.0000	68.504
CASH_CHG	0.9193	0.1086	5.6854	-36.096	54.528

Panel II – correlation matrix

	%PAYOUTS	MEW	%OWN	%OWN²	TDC1	EXEC_N	CEO_CHG	%DEBT	AGE	PROPERTY	CASH	CASH_CHG
%PAYOUT	1.000											
MEW	0.013	1.000										
%OWN	-0.049	0.569	1.000									
%OWN²	0.009	0.441	0.905	1.000								
TDC1	-0.180	0.014	0.141	0.095	1.000							
EXEC_N	0.067	-0.032	-0.123	-0.106	0.054	1.000						
CEO_CHG	-0.083	0.011	-0.093	-0.066	0.039	0.072	1.000					
%DEBT	0.137	-0.168	-0.056	-0.058	-0.220	0.125	-0.107	1.000				
AGE	0.129	0.011	-0.118	-0.101	-0.156	0.111	0.028	0.121	1.000			
PROPERTY	0.091	-0.153	-0.147	-0.097	-0.145	0.111	-0.027	0.170	0.231	1.000		
CASH	-0.122	0.023	0.083	0.054	0.399	-0.122	0.014	-0.304	-0.179	-0.244	1.000	
CASH_CHG	-0.064	-0.016	0.005	0.003	0.126	-0.093	-0.001	-0.080	-0.155	-0.170	0.643	1.000

	%LTROR	MEW	%OWN	%OWN²	TDC1	EXEC_N	CEO_CHG	%DEBT	AGE	PROPERTY	CASH	CASH_CHG
%LTROR	1.000											
MEW	-0.079	1.000										
%OWN	0.082	0.413	1.000									
%OWN²	0.044	0.315	0.916	1.000								
TDC1	-0.038	-0.010	0.306	0.166	1.000							
EXEC_N	0.058	0.031	-0.005	0.028	0.140	1.000						
CEO_CHG	0.151	0.035	-0.208	-0.192	-0.002	0.170	1.000					
%DEBT	-0.036	-0.087	0.129	0.172	-0.207	0.168	-0.073	1.000				
AGE	-0.000	0.098	-0.034	0.016	-0.157	-0.036	0.078	0.057	1.000			
PROPERTY	0.078	-0.153	-0.109	-0.067	-0.278	0.005	-0.072	0.072	0.083	1.000		
CASH	-0.056	-0.056	0.076	0.030	0.351	-0.094	-0.086	-0.198	0.028	-0.146	1.000	
CASH_CHG	-0.023	-0.043	-0.027	-0.045	0.157	0.040	0.008	0.052	0.087	-0.072	0.587	1.000

Table I.
Data analysis

Notes: The sample consists of US firms for which information is reported in the Compustat Executive Compensation files during the period 1996 to 2005; for each firm, all financial statement data are taken from the Compustat files

Holderness *et al.* (1999) and Gesser *et al.* (2006), who documented average managerial holdings of $66, $73 and $74 million, respectively. These findings suggest that managers are substantially under-diversified with respect to their firms and that personal considerations are therefore expected to distort their managerial decisions. The average percentage holding of managers in 1996 (*%OWN*) was 3.5 percent. This finding is consistent with Hu and Kumar (2004), who document average CEO fractional holdings of 2.93 percent. However, our findings are not inconsistent with Holderness *et al.* (1999) or Gesser *et al.* (2006), who document average fractional holdings of 21.1 and 22.4 percent, respectively. The differences in the definitions among various databases may explain these inconsistencies. Gesser *et al.* (2006) and Holderness *et al.* (1999) use the Edgar data for "all directors and executive officers". However, we use the Compustat Executive Compensation data for "executive officers" here. The average total annual compensation divided by total assets (*TDC1*) is 0.74 percent with the average total annual compensation being $5.0 million, which is consistent with Hu and Kumar (2004), who document an average total CEO compensation of $4.3 million. It is important to note that the average *MEW* is three times higher than total compensation. The average number of executive officers (*EXEC_N*) is 6.1 (with a median of 6). The average (median) number of different persons who held the CEO position at some point between 1996 and 2005 *(CEO_CHG)* is 2.2 equation (2), consistent with Hermalin and Weisbach (1988), who document a median CEO tenure of 5.9 years. The average (median) debt ratio (*%DEBT*) is 37.0 percent (21.5 percent). The observations for a firm's property, plant and equipment as a proportion of total assets (*PROPERTY*) that exceed one are not errors or outliers because accountants only began to move to the "net approach" under the Real Estate Information Standards (REIS) in 2006. The "gross approach" includes two units of account within the operating model, one for the gross investment in real estate (i.e. the unleveraged property) and one for the mortgage liability.

The correlation matrix indicates a low correlation among the variables, which alleviates the problem of multicollinearity.

Econometric models
Equation (I)-(III) are designed for testing the empirical prediction that management ownership and control are jointly related to the shareholder-management agency problem. Specifically, the equations are designed to capture the predicted struggle between ownership and control; therefore, we expect management holdings to have a nonlinear or negative effect. Because we use the linear two-stage least squares (2SLS) fitting technique for equations (I) and (III) and TOBIT for equation (II), for a nonlinear expected relation, we use the variable and its squared term. For fractional holdings, we use (*%OWN*) and the square of fractional holdings ($\%OWN^2$). The dependent variables in equation (I)-(III) are, respectively, the long-term payouts yield (*%PAYOUTS)*, the change in the LTROR (*%LTROR_CHG*) and firm performance (*MARKET_to_BOOK*). The independent (or explanatory) variables in each of these equations are as follows: management absolute equity wealth (*MEW*), management fractional holdings (*%OWN*), the square of management fractional holdings ($\%OWN^2$), management compensation (*TDC1*), the number of executive officers (*EXEC_N*), management turnover (*CEO_CHG*), debt (*%DEBT*), industry *(SIC)*, cash holdings (*CASH*), cash flows (*CASH_CHG*), property, plant and equipment/total assets

(*PROPERTY*), age (*AGE*) and tax (*TAX*). The structure of the data is balanced because for each firm there is only one observation and both the long-term period and the beginning of the period are identical for all observations:

$$
\begin{aligned}
\%PAYOUT_i =\ & \beta_0 + \beta_1 MEW_i + \beta_2 \%OWN_i + \beta_3 \%OWN_i^2 + \beta_4 TDC1_i \\
& + \beta_5 EXEC\_N_i + \beta_6 CEO\_CHG_i + \beta_7 \%DEPT_i + \beta_8 AGE_i \\
& + \beta_9 PROPERTY_i + \beta_{10} CASH_i + \beta_{11} CASH\_CHG_i + \beta_{12} TAX_i \\
& + \beta_{13} SIC_i + \varepsilon_i
\end{aligned}
\tag{I}
$$

$$
\begin{aligned}
\%LTROR\_CHG_i =\ & \beta_0 + \beta_1 MEW_i + \beta_2 \%OWN_i + \beta_3 \%OWN_i^2 + \beta_4 TDC1_i \\
& + \beta_5 EXEC\_N_i + \beta_6 CEO\_CHG_i + \beta_7 \%DEPT_i + \beta_8 AGE_i \\
& + \beta_9 PROPERTY_i + \beta_{10} CASH_i + \beta_{11} CASH\_CHG_i \\
& + \beta_{12} TAX_i + \beta_{13} SIC_i + \varepsilon_i
\end{aligned}
\tag{II}
$$

$$
\begin{aligned}
\%MARKET\_to\_BOOK_i =\ & \beta_0 + \beta_1 MEW_i + \beta_2 \%OWN_i + \beta_3 \%OWN_i^2 \\
& + \beta_4 TDC1_i + \beta_5 EXEC\_N_i + \beta_6 CEO\_CHG_i \\
& + \beta_7 \%DEBT_i + \beta_8 AGE_i + \beta_9 PROPERTY_i \\
& + \beta_{10} CASH_i + \beta_{11} CASH\_CHG_i + \beta_{12} TAX_i \\
& + \beta_{13} SIC_i + \varepsilon_i
\end{aligned}
\tag{III}
$$

We present three models for each of the equations above, including equation (1) fractional ownership, equation (2) wealth, and equation (3) wealth and fractional ownership.

IV. Empirical results
Payout policy
As presented in Table II, the results demonstrate that cash payouts decrease with fractional holdings (*%OWN*) at a decreasing rate – as implied by the negative sign for the coefficient of the square of managerial fractional holdings (*%OWN* ^{2}). This negative relationship between fractional holdings (*%OWN*) and dividend yield is documented in Jensen *et al.* (1992) and Rozeff (1982) and other studies that focus on the linear influence of insider fractional holdings on dividend policy. We extend their work by:

 · focusing on managerial holdings;
 · considering the additional independent/explanatory variables of managerial absolute equity wealth (*MEW*) and the square of fractional holdings (*%OWN* ^{2}); and
 · considering, in addition to dividends, payout thorough repurchases.

We find that management absolute equity wealth (*MEW*) is a significant explanatory variable in addition to fractional holdings – a result that fundamentally differs from Hu and Kumar (2004), where the significance of management absolute equity wealth (*MEW*) disappears when fractional holdings are introduced in a linear model. This difference may be because the analysis of Hu and Kumar (2004) is limited to linear relations; the estimation function we use enables the detection of non-linear relations

Model Variable	Expected sign.	I	II	III
MEW	+		0.0604	0.1878*
			(0.0758)	(0.0837)
%OWN	−	−1.5311**		−2.1165**
		(0.5904)		(0.6094)
$\%OWN^2$	+	0.0448**		0.0521**
		(0.0162)		(0.0161)
TDC1	+	−4.1778**	−4.4159**	−3.8259**
		(1.1599)	(1.3458)	(1.0751)
EXEC_N	+	1.9871	2.1666	1.8733
		(1.1067)	(1.1088)	(1.1060)
CEO_CHG	+	−3.4580*	−3.2068*	−3.6853*
		(1.5698)	(1.5483)	(1.5692)
%DEBT	+	−0.0082	−0.0108	0.0071
		(0.0457)	(0.0459)	(0.0460)
AGE	+	0.2260	0.2158	0.1782
		(0.1951)	(0.1950)	(0.1944)
PROPERTY		−4.6482	−3.7271	−4.4879
		(5.3538)	(5.4153)	(5.3361)
CASH	+	0.1621	0.1267	0.1976
		(0.3518)	(0.3597)	(0.3542)
CASH_CHG	+	−0.3176	−0.2709	−0.3431
		(0.4160)	(0.4242)	(0.4171)
TAX		−0.0004	−0.0002	−0.0002
		(0.0025)	(0.0026)	(0.0025)
Adjusted R^2 (%)		15.2	14.4	15.7

Notes: Significant at: *5 and **1 percent levels; standard errors are in parentheses; this table presents cross-sectional regressions of payout yields for 628 firms; the estimated equation is as follows:

Model I:

$$\%PAYOUT_i = \beta_0 + \beta_1 \%OWN_i + \beta_2 \%OWN_i^2 + \beta_3 TDC1_i + \beta_4 EXEC\_N_i + \beta_5 CEO\_CHG_i + \beta_6 \%DEPT_i + \beta_7 AGE_i + \beta_8 PROPERTY_i + \beta_9 CASH_i + \beta_{10} CASH\_CHG_i + \beta_{11} TAX_i + \beta_{12} SIC_i + \varepsilon_i$$

Model II:

$$\%PAYOUT_i = \beta_0 + \beta_1 MEW_i + \beta_2 TDC1_i + \beta_3 EXEC\_N_i + \beta_4 CEO\_CHG_i + \beta_5 \%DEPT_i + \beta_6 AGE_i + \beta_7 PROPERTY_i + \beta_8 CASH_i + \beta_9 CASH\_CHG_i + \beta_{10} TAX_i + \beta_{11} SIC_i + \varepsilon_i$$

Model III:

$$\%PAYOUT_i = \beta_0 + \beta_1 MEW_i + \beta_2 \%OWN_i + \beta_3 \%OWN_i^2 + \beta_4 TDC1_i + \beta_5 EXEC\_N_i + \beta_6 CEO\_CHG_i + \beta_7 \%DEPT_i + \beta_8 AGE_i + \beta_9 PROPERTY_i + \beta_{10} CASH_i + \beta_{11} CASH\_CHG_i + \beta_{12} TAX_i + \beta_{13} SIC_i + \varepsilon_i$$

Table II.
Long-term payout policy

because we use management absolute equity wealth (*MEW*) together with fractional holdings (*%OWN*) and the square of managerial fractional holdings (*%OWN*^{2}). The negative relationship between payouts and fractional holdings is consistent with our prediction of the dual effect of management holdings. On the one hand, the greater MEW is, the more their interests are aligned with those of their fellow shareholders. On the other hand, the higher the managers' fractional holdings are, the more they find themselves able to divert the firm's strategy and resources away from the shareholders' natural objectives.

Whereas theory predicts that the shareholder-manager agency problem is driven by managerial absolute equity wealth, previous empirical studies focus on managerial fractional holdings. In this study, we use both factors, MEW and %OWN separately and jointly as explanatory variables. The results presented in Table II indicate that using both variables together yields a better fit (higher adjusted R^2) than using them separately. Moreover, when using both variables together, MEW becomes significant, which further supports our hypothesis that these two variables represent the dual effect managerial holdings has on shareholder-manger agency problem.

Whereas manager compensation is predicted to better align managers' interests with those of shareholders, our findings suggest otherwise. Specifically, we find that *%PAYOUT* significantly decreases with *TDC1*. One possible explanation is that manager compensation reflects managers' ability to extract benefits at shareholders' expense. The significant coefficient of *TDC1* represents managers' control power not captured by the other explanatory variables. Recall that CEO turnover is used as a proxy for managers' informal control of the firm and, accordingly, that *%PAYOUT* is predicted to increase with a higher turnover. However, we find a significantly negative relation between *%PAYOUT* and *CEO_CHG*. One possible explanation, left for future research, is that higher payouts lead to better performance and, accordingly, to lower turnover (Coughlan and Schmidt, 1985; Warner *et al.*, 1988).

LTROR

As shown in Table III, long-term changes in the LTROR decrease with *MEW* and increase with management fractional holdings (*%OWN*) at a decreasing rate – as implied by the negative coefficient of *%OWN*^{2}. Namely, we find a non-linear relationship between managerial fractional holdings and long-term changes in the LTROR (*%LTROR*). These findings point at a long-term change in the LTROR as a novel indication of the shareholder-manager agency problem. The results presented in Table III indicate that using both *%OWN* and *MEW* together yields a better fit (higher adjusted R^2) than using them separately. Again, when using both variables together MEW becomes significant.

Table III documents additional potential evidence of how management control is linked to the agency problem. If *%LTROR* is an indication of an agency problem, then management compensation may be related to the shareholder-management agency problem. This finding is consistent with Coughlan and Schmidt (1985), who find that boards control top management by linking compensation to the firm's stock price. The significant negative coefficient of *TDC1* presented in Table III suggests that higher management compensation – which usually comprises substantial option grants – leads to lower future potential manipulation of LTROR, as predicted.

Model Variable	Expected sign.	I	II	III
MEW	−		− 0.0004	− 0.0049*
			(0.0019)	(0.0020)
%OWN	+	0.0956**		0.1239**
		(0.0236)		(0.0252)
%OWN²	−	− 0.0039**		− 0.0047**
		(0.0011)		(0.0011)
TDC1	−	− 0.1352	0.0382	− 0.2210*
		(0.0981)	(0.0916)	(0.1017)
EXEC_N	−	0.0386	0.0237	0.0455
		(0.0265)	(0.0279)	(0.0266)
CEO_CHG	−	0.0957*	0.0809	0.1070*
		(0.0430)	(0.0438)	(0.0429)
%DEBT	−	− 0.0013	− 0.0009	− 0.0017*
		(0.0007)	(0.0007)	(0.0006)
AGE	−	− 0.0049	− 0.0050	− 0.0028
		(0.0047)	(0.0050)	(0.0048)
PROPERTY		0.0176	0.0336	0.0126
		(0.1233)	(0.1245)	(0.1228)
CASH		− 0.0038	− 0.0050	− 0.0057
		(0.0089)	(0.0099)	(0.0090)
CASH_CHG		0.0114	0.0094	0.0126
		(0.0118)	(0.0132)	(0.0120)
TAX		− 0.0001	− 0.0001	− 0.0001
		(0.0003)	(0.0003)	(0.0003)
Adjusted R^2 (%)		11.5	6.6	13.1

Notes: Significant at: *5 and **1 percent levels; white heteroskedasticity consistent standard errors are in parentheses; the table presents cross-sectional regressions of the long-term changes in the LTROR for 238 firms; the estimated equation is as follows:

Model I:

$$\%LTROR\_CHG_i = \beta_0 + \beta_1\%OWN_i + \beta_2\%OWN_i^2 + \beta_3 TDC1_i + \beta_4 EXEC\_N_i + \beta_5 CEO\_CHG_i + \beta_6\%DEPT_i + \beta_7 AGE_i + \beta_8 PROPERTY_i + \beta_9 CASH_i + \beta_{10}CASH\_CHG_i + \beta_{11}TAX_i + \beta_{12}SIC_i + \varepsilon_i$$

Model II:

$$\%LTROR\_CHG_i = \beta_0 + \beta_1 MEW_i + \beta_2 TDC1_i + \beta_3 EXEC\_N_i + \beta_4 CEO\_CHG_i + \beta_5\%DEPT_i + \beta_6 AGE_i + \beta_7 PROPERTY_i + \beta_8 CASH_i + \beta_9 CASH\_CHG_i + \beta_{10}TAX_i + \beta_{11}SIC_i + \varepsilon_i$$

Model III:

$$\%LTROR\_CHG_i = \beta_0 + \beta_1 MEW_i + \beta_2\%OWN_i + \beta_3\%OWN_i^2 + \beta_4 TDC1_i + \beta_5 EXEC\_N_i + \beta_6 CEO\_CHG_i; + \beta_7\%DEPT_i + \beta_8 AGE_i + \beta_9 PROPERTY_i + \beta_{10}CASH_i + \beta_{11}CASH\_CHG_i + \beta_{12}TAX_i + \beta_{13}SIC_i + \varepsilon_i$$

Table III.
Long-term change
in the LTROR

Firm performance

As shown in Table IV, firm performance decreases with managerial fractional holdings (*%OWN*) at a decreasing rate – as implied by the negative coefficient of *%OWN*^{2}. Additionally, we find that firm performance increase with managerial absolute equity wealth (*MEW*). These findings are consistent with our prediction of the dual effect of management holdings in which management ownership and management control are positively correlated, by definition, yet are expected to affect the agency problem in opposite directions. Our findings are consistent with Morck *et al.* (1988), McConnell and Servaes (1990), Cho (1998), and Holderness *et al.* (1999), who find a U-shaped relationship between managerial holdings and firm performance, as measured by the market-to-book ratio or Tobin's Q.

Unlike previous work, our findings show that both managerial *absolute* equity wealth and managerial *fractional* holdings are instrumental in capturing the dual effect of managerial holdings on the shareholder-manager agency problem. The results presented in Table IV indicate that using both variables together yields a better fit (higher adjusted R^2) than using them separately. Moreover, using both variables together increases the significance of *MEW* from the 5 percent level to the 1 percent level.

V. Robustness

In this section, we subject our original estimations to various robustness checks involving changes in sampling restrictions and variable definitions.

Robustness to sampling restrictions

In this paper, we perform and present all of the regressions while eliminating the outliers. To examine the effect of outliers, we perform (but do not present) all the regressions with outliers present after truncating extreme observations such that the 1 percent extremes of the dependent variables are omitted from the sample. Thus, in the robustness check, we eliminate any observation in the top (or bottom, when applicable) 1 percent of the dependent variable's distribution. The results that we observe in our tests after using the truncation rule are robust in a range from 0.5 to 5 percent.

Robustness to definitions of variables

Our results are robust to replacing the independent variable of managerial absolute equity wealth *MEW*, with *Log* (1 + *MEW*). Our results are also robust to alternative control variables representing compensation, leverage and cash.

Robustness to firm size

Firm size, *MEW* and *TDC1* are highly correlated, which may cause multicollinearity problems and may be the reason why firm size becomes insignificant. The correlation between total compensation (*TDC1*) and firm size is 0.46, which is consistent with Gabaix and Landier (2008), who predict such a high correlation.

VI. Summary and conclusions

We examine the degree that the shareholder-management agency problem depends on management ownership and formal and informal management control of a firm. Using samples of US firms from the period 1996 to 2005, we find evidence of a significant

Model Variable	I MARKET_to_BOOK	II MARKET_to_BOOK	III MARKET_to_BOOK
MEW		0.0040^{*} (0.0016)	0.0121^{**} (0.0021)
%OWN	-0.0327^{**} (0.0105)		-0.0723^{**} (0.0125)
$\%OWN^{2}$	0.0004 (0.0002)		0.0009^{**} (0.0002)
TDC1	0.1664^{*} (0.0740)	0.1253 (0.0649)	0.2155^{**} (0.0777)
EXEC_N	0.0080 (0.0219)	0.0221 (0.0221)	-0.0014 (0.0206)
CEO_CHG	0.0266 (0.0356)	0.0425 (0.0365)	0.0103 (0.0346)
%DEBT	-0.0072^{**} (0.0007)	-0.0071^{**} (0.0007)	-0.0061^{**} (0.0007)
AGE	-0.0089^{*} (0.0042)	-0.0090^{*} (0.0043)	-0.0116^{**} (0.0041)
PROPERTY	-0.0290 (0.1175)	-0.0079 (0.1185)	-0.0079 (0.1136)
CASH	0.0244^{**} (0.0074)	0.0248^{**} (0.0080)	0.0264^{**} (0.0075)
CASH_CHG	-0.0137 (0.0105)	-0.0115 (0.0107)	-0.0162 (0.0106)
TAX	-0.0003 (0.0002)	-0.0003 (0.0002)	-0.0002 (0.0002)
Number of observations	623	623	623
Adjusted R^{2} (%)	37.3	36.5	41.7

Notes: Significant at *5 and **1 percent levels; white heteroskedasticity consistent standard errors are in parentheses; this table presents cross-sectional regressions of the market-to-book ratio; the sample consists of 623 firms; the estimated equations are as follows:

Model I:

$$MARKET\_to\_BOOK_i = \beta_0 + \beta_1\%OWN_i + \beta_2\%OWN_i^2 + \beta_3 TDC1_i + \beta_4 EXEC\_N_i \\ + \beta_5 CEO\_CHG_i + \beta_6\%DEBT_i + \beta_7 AGE_i + \beta_8 PROPERTY_i \\ + \beta_9 CASH_i + \beta_{10} CASH\_CHG_i + \beta_{11} TAX_i + \beta_{12} SIC_{i_i} + \varepsilon_i$$

Model II:

$$MARKET\_to\_BOOK_i = \beta_0 + \beta_1 MEW_i + \beta_2 TDC1_i + \beta_3 EXEC\_N_i + \beta_4 CEO\_CHG_i \\ + \beta_5\%DEBT_i + \beta_6 AGE_i + \beta_7 PROPERTY_i + \beta_8 CASH_i \\ + \beta_9 CASH\_CHG_i + \beta_{10} TAX_i + \beta_{11} SIC_i + \varepsilon_i$$

Model III:

$$MARKET\_to\_BOOK_i = \beta_0 + \beta_1 MEW_i + \beta_2\%OWN_i + \beta_3\%OWN_i^2 + \beta_4 TDC1_i \\ + \beta_5 EXEC\_N_i + \beta_6 CEO\_CHG_i + \beta_7\%DEBT_i + \beta_8 AGE_i \\ + \beta_9 PROPERTY_i + \beta_{10} CASH_i + \beta_{11} CASH\_CHG_i \\ + \beta_{12} TAX_i + \beta_{13} SIC_i + \varepsilon_i$$

Table IV.
The relationship between managerial holdings and firm performance

and robust relationship between factors that are hypothesized to drive the agency problem and long-term cash payouts, an indicator of such agency problems.

We find that a long-term change in LTROR increases with fractional holdings (%OWN) at a decreasing rate. We interpret the results to suggest that the change in a LTROR may be a novel measure for agency problems because managers may increase the LTROR to increase firm profits, as documented by Bergstresser *et al.* (2006) in the case of promoting corporate decisions and by Lee and Yu (2007) in the case of meeting analyst analysts' expectations.

We find evidence supporting the dual effect that managerial holdings are expected to have on cash payouts. First, we find a significant positive correlation between cash payouts and MEW. Second, consistent with previous work, we find a distinctly negative correlation between cash payouts and managerial fractional holdings. Finally, we find that the latter relationship is inverse or nonlinear; specifically, cash payouts decrease with an increase in managerial holdings at a decreasing rate, as suggested by Morck *et al.* (1988). These results are robust to several modifications of the estimation equations and to the inclusion of additional control variables.

The negative relationship between fractional holdings and cash payouts, in addition to the change in the LTROR, is consistent with our prediction of the dual effect of management holdings. We find that when management fractional holdings fall below approximately 20 percent for a payout policy and 13 percent for an LTROR policy, the agency problem increases; however, the problem decreases as these holdings exceed these levels.

Notes

1. Holderness *et al.* (1999) use managerial equity wealth as a control variable on a linear model.

2. The average yearly *PAYOUTS_P* is 5.24 percent, representing a combination of cash dividends (2.07 percent) and repurchases (3.17 percent).

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Appendix

Panel A: dependent variables

Variable	Abbreviation	Definition
		Panel A: dependent variables
Long-term payouts yield	*%PAYOUT$_i$*	The cash paid out by firm i through dividends or repurchases during the period of 1996 to 2005 as a proportion of the firm's market value at the beginning of the period
Change in LTROR	*%LTROR_CHGi*	The change in the expected rate of return of firm i's pension plan assets (Compustat data item 336) between 1996 and 2005
		Panel B: control variables
Managerial fractional holding	*%OWN$_i$*	The aggregated number of shares held by executive officers of firm i divided by the total number of outstanding shares of this firm at the beginning of the period. We define "management" as "executive officers" as defined in the context of COMPUSTAT EXECUTIVE COMPENSATION. The number of shares held by an individual is retrieved from the Compustat Executive Compensation database (data item SHROWN). Executive officers are as defined by the Compustat Executive Compensation database
Managerial absolute equity wealth	*MEW$_i$*	The dollar value of shares held by the executive officers of firm i, that is, %OWN/100 times the market capitalization of firm i's equity at the beginning of the period in millions of dollars
Management total compensation	*TDC1$_i$*	Consists of the salaries, bonuses, other annual fees, total value of restricted stock granted, total value of stock options granted (using Black-Scholes) and long-term incentive payouts received in 1996 by firm i's executive officers as defined in the Compustat Executive Compensation database divided by total assets
The number of executive officers	*EXEC_N$_i$*	The number of firm i's executive officers in 1996 as defined and recorded in the Compustat Executive Compensation database following the TMT members definition approach of Crossan et al. (2011)
CEO turnover	*CEO_CHG$_i$*	The number of people who served as CEOs of firm i during the ten-year period from 1996 to 2005 as documented in the Compustat Executive Compensation database. Longer CEO tenures imply smaller CEO turnover
Debt ratio	*%DEBT$_i$*	Firm i's sum of Compustat data items 9 and 34 as a percentage of the firm's market value at the beginning of the period
Firm age	*AGE$_i$*	The time in years from the initial public stock offering of firm i (Compustat variable name "ipodate") to 1996. If the date of a company's initial public stock offering is not available, the first trading date in the major exchange is used. If the company is senior, then AGE is 25

(*continued*)

Table AI.
Variable definitions
and sources

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Table AI.

Variable	Abbreviation	Definition
Firm total assets	$ASSETS_i$	Firm i's total assets (Compustat data item 6) at the beginning of the period in millions of dollars
Firm property, plant and equipment	$PROPERTY_i$	Firm i's total property, plant and equipment (Compustat variable name "ppegt") divided by the firm's total assets (Compustat data item 6) at the beginning of the period
Firm cash	$CASH_i$	Firm i's cash (Compustat variable name "ch") at the beginning of the period divided by total assets
Firm cash and cash equivalents increase (decrease)	$CASH\_CHG_i$	Firm i's change in cash and cash equivalents (Compustat variable name "chech") at the beginning of the period divided by total assets
Tax ratio	$\%TAX_i$	The income tax of firm i, Compustat data item 16, as a proportion of the firm's income before extraordinary items, Compustat data item 18, at the beginning of the period
Industry classification	SIC_i^j	A dummy variable that takes the value of "1" when firm i is classified to industry j according to the Fama and French (1997) four digit SIC classifications and "0" otherwise
Market-to-book	$MARKET\_to\_BOOK_i$	Firm i's market-to-book ratio at the beginning of the period

Notes: The Appendix reports variable definitions and sources for all variables used in the paper and tables; the first column reports the variable name, the second column gives the variable abbreviation in the text and the tables, and the third column reports detailed variable definition and source; panel A reports the dependent variables; Panel B reports the control variables