Managerial Incentives and Corporate Cash Holdings

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We examine the impact of managerial incentive on firms' cash holdings policy. We find that firms with more equity-based compensation have more cash reserves. We also find that managers with equity-based compensation strongly prefer internal investment through R&D and capital expenditures. Furthermore, we find that firms with both high cash and high equity-based compensation subsequently experience higher operating performance. The results suggest that higher cash reserves in firms with higher equity-based compensation are the result of a decision by managers to provide flexibility to fund profitable projects, rather than wasting it, which improves firm value through increasing future profitability.

INTRODUCTION

Due to the separation of ownership and control, managers have incentives to take self-serving activities (Jensen, 1986). The decision of how to deploy internal funds is central to the conflict between shareholders and managers. Firms hold substantial and increasing amounts of cash reserves and the value of these cash holdings represents a significant fraction of all corporate wealth. In 2003, the sum of all cash and marketable securities represented more than 13% of the sum of all assets for large publicly traded US firms, reflecting a substantial increase from 5% in 1990. Although it is optimal for firms to hold some cash to finance day-to-day operations and to provide a buffer against the cost of externally financing their investments, holding excessive cash resources may have negative value implications if managers use these liquid resources inefficiently. Cash reserves are easily accessible by management with little scrutiny and much of their use is discretionary. Since executive compensation plays an important role in shaping managerial incentives and decision-making on firm policy, including how much cash to hold and how to use. An important question to ask is: how do managerial incentives impact the amount and eventual use of cash reserves?

Prior work on cash reserves in the U.S. provides mixed evidence on whether shareholders should be concerned about large reserves. For example, Opler et al. (1999) find that the transitional probabilities out of the high cash group were slow, suggesting that managers hold cash as part of a precautionary motive. Similarly, Mikkelson and Partch (2003) find that persistent extreme cash holdings do not lead to poor performance and do not represent conflicts of interests between managers and shareholders, evidence consistent with cash reserves enhancing firm value. Alternatively, Harford (1999) suggests that there is reason for shareholders to be concerned about managers' stewardship of large pools of internal funds. He shows that cash-rich firms are more likely to make acquisitions and their acquisitions are more likely to

be value-decreasing. The central tradeoff in cash policy is providing sufficient internal capital for managers to efficiently fund all good projects, while not providing excess internal capital as to allow managers to fund projects, acquisitions or perquisite consumption that benefit managers at the expense of shareholders. Without a control threat, it is difficult, if not impossible, to convince self-interested managers to disgorge cash reserves to shareholders. In this paper, we focus on the impact of executive compensation, especially equity-based compensation, such as option and stock holdings, on cash policy. We examine how equity-based compensation impacts this particular and important corporate asset: cash.

Using a sample of 1372 industrial firms in the Compustat and Execucomp database from 1992 to 2006, we examine the relation between cash holdings and firm managerial incentives. We find that firms with higher equity-based compensation have higher cash holdings. Furthermore, to explain the differences in cash holdings, we study the investment and payout behavior of our sample firms. In general, firms with more equity-based compensation tend to invest more and repurchase more. Managers with equity-based compensation strongly prefer internal investment through R&D and capital expenditures. The relevant question for shareholders is whether the investment decisions and resulting cash levels for firms with high equity-based compensation are suboptimal as lowering performance and reducing firm value. We investigate more directly whether firms with high equity-based compensation waste cash reserves. We find that firms with both high cash and high equity-based compensation subsequently experience higher operating performance. This positive impact of excess cash on operating performance indicate that either managers with more equity-based compensation invest their excess cash efficiently in projects with positive return.

Overall, we find evidence consistent with the hypothesis that shareholders expect that managers with equity-based compensation are less likely to take self-serving activities and thus allow them to hold more cash. More cash holdings provide managers flexibility to fund profitable projects and avoid costly external financing. Our tests show that this spending is primarily on internal investments, such as capital expenditures or R&D. The conclusion we draw from our study is that higher cash reserves in firms with higher equity-based compensation are the result of a decision by managers to provide flexibility to fund profitable projects, rather than wasting it. This will increase firm value through increasing future profitability.

The remainder of the paper is organized as follows. Section 2 develops the hypotheses. Section 3 describes the data, variables and control measures, and provides descriptive statistics for the sample. Section 4 presents methodology and results of our empirical tests and provides alternative specifications. Section 5 discusses the implication of this research and concludes.

HYPOTHESIS DEVELOPMENT

There is a growing literature on the determinants of cash-holdings and its implications for firm value (see Opler, Pinkowitz, Stulz and Williamson, 1999; Bates, Kahle and Stulz, 2006; Dittmar, Mahrt-Smith and Servaes, 2003; Hartzell, Titman and Twite, 2006; Dittmar and Mahrt-Smith, 2005). Earlier papers have focused on motivations such as cash flow risk, tax-based incentives and substitution between non-cash working capital and cash-balances to understand the time-series and cross-sectional variations in corporate cash holdings. We extend the literature on the determinants of cash-holdings by showing that managerial incentives, in addition to the firm-level variables, have strong explanatory power in explaining the cross-sectional distribution of cash-holdings. We develop the following hypotheses related to the impact of equity-based compensation on the level of firms' cash holdings and the value of cash holdings.

Hypothesis 1: Firms with higher equity-based compensation hold smaller cash reserves.

Under agency theory, self-interested managers tend to hold excessive cash because cash is the most secure asset. It is the asset that managers can misuse most easily and is the asset that can shield managers from the capital market discipline imposed when issuing securities (Jensen, 1986). By better aligning the interests of managers and shareholders, equity-based compensation would motive managers to reduce the

cash holdings that are accumulated due to managerial discretion. Firms with equity-based compensation would work toward maximizing shareholder wealth and hold less cash holdings. In addition, managerial risk preferences also impact firms' cash holding policy. Higher cash balance corresponds to a low-risk strategy as compared to low cash-balance. Based on option pricing model, option value increases with the increase in stock return volatility. Therefore, when managers are compensated with more options, they have more incentives to take more risk and tend to adopt riskier policies. Managers with higher risk-taking incentives tend to hold less cash.

Hypothesis 2: Firms with higher equity-based compensation hold larger cash reserves.

When shareholders observe that managers have equity-based compensation, they expect that these managers have higher incentives to act in the interests of shareholders. Shareholders will allow those managers to stockpile excess internal funds to prevent underinvestment due to potentially costly external funds (because of capital market frictions including, for example, information asymmetry). Also, when managers have more equity-based compensation, their personal wealth is more tied to company and less diversified. Managers with more equity-based compensation have lower risk preference and tend to take low risk projects. Therefore, managers with more equity-based compensation tend to hold more cash.

DATA DESCRIPTION

The Sample

We merge data from Standard & Poor's Compustat and ExecuComp databases and the Center for Research in Security Prices (CRSP) tapes from 1992 through 2006. Compustat is the source for firm characteristics. ExecuComp provides executive compensation data for firms in the S&P 500, S&P Midcap 400, and S&P Smallcap 600 indices and is the source for managerial stock incentive data. CRSP is the source for stock returns. We remove firms in financial industries, namely, banks (Compustat SIC 6000-6999) and utilities (Compustat SIC 4813, 4900-4999). These firms are not directly comparable with the remaining firms due to the nature of their businesses and regulatory reasons. We remove firms with missing data items on sales and assets. We also require the sample firms to have positive book-to-market ratio as of the fiscal year-end. The final sample consists of 1372 firms.

Cash Holdings

The primary ratio that we examine in our study is the ratio of cash to net assets, computed as total assets minus cash and marketable securities, similar to Opler et al. (1999). Though not tabulated, we also look at two alternative methods to measure cash holdings - the ratio of cash and marketable securities to sales and the log of cash and cash equivalents to total sales. The main results are similar.

Managerial Incentive Variables

To measure managerial incentives, we obtain compensation data of CEOs from COMPUSTAT's Execucomp database. We identify CEOs of the firm from the annual CEO flag of the Execucomp database. *Shares* is measured as the number of shares held by the firm's CEO as a percentage of total shares outstanding. *Option* is the product of two terms: the percentage of the outstanding shares in options held by the CEO times option delta (Δ) or the slope of the option valuation curve. Using the slope of the option value curve is one way to 'discount' the incentives from options which are deep-out-of-the-money. The calculation of the option delta is discussed in Appendix. *EBC* is the summation of *shares* and *option*.

To measure managers' risk preference, we estimate *Delta* and *Vega,* the manager's incentives to increase or decrease firm-risk arising out of their holdings of stocks and stock-options in the company. In general, when managers are under-diversified they prefer lower cash-flow variance if they hold large stocks in the firm (Fama, 1980; Amihud and Lev, 1981). On the other hand stock-options provide them with incentives to choose variance-increasing strategies (see Stulz, 1984 and Smith and Stulz, 1985). We follow Core and Guay (1999). The details of the variable construction are given in the Appendix. Delta

measures the sensitivity of a manager's wealth to a 1% change in the firm's stock price, while vega measures sensitivity with respect to a 1% change in firm stock return volatility. Vega captures the manager's incentive to increase the risk of the firm, whereas delta captures the incentive to decrease it. Apart from their ownership of stocks and options, managerial risk-preferences can also be influenced by other concerns such as job-security, their age, tenure in the firm (see Berger, Ofek and Yermack, 1997), and labor market signaling as in DeMarzo and Duffie (1995). One limitation of our study is that we do not explicitly account for such motivations. However, the advantage of our approach is that we are able to construct delta and vega measure for a large number of firms and these measures have relatively easier interpretation in terms of risk-preferences.

Each of the incentive variables is measured at fiscal year-end of the previous year. We use *ex-ante* managerial incentive structures to examine their impact on corporate cash holding policy.

Control Variables

The remaining variables are firm-specific controls (motivated by Opler et al., (1999)). These variables include firm size, leverage, market to book, cash flow to total assets, standard deviation of cash flow for the past five years, net working capital to total assets, research and development (R&D) to sales, capital expenditures to assets, acquisition spending to assets, a dividend dummy that takes a value of one if a company pays a dividend and zero otherwise, and a bond dummy that takes a value of one if the firm has S&P long term ratings and zero otherwise. For the purpose of this research, assets are defined as total assets net of cash and cash equivalents.

Firm size is measured as the natural log of total assets. Firm leverage, a proxy for financial health, is measured as the ratio of total debt (short and long term debt) to assets. The market to book ratio, a proxy for growth opportunities, is measured as (book value of assets - book value of equity + the market value of equity) / book value of assets. The cash flow ratio is measured as earnings after interest, dividend and taxes, but before depreciation divided by assets. The standard deviation of the firm's cash flows, a proxy for business conditions, is computed using the firm's standard deviation of the cash flow ratio for the past five years. Net working capital to total assets, a proxy for liquidity, is the ratio of current assets net of cash minus current liabilities divided by assets. The ratio of R&D to sales is used as a proxy for financial distress costs. The ratios of capital expenditures to assets and acquisition to assets indicate whether managers attempt to increase the size of their firms. Given a small number of extreme observations and to ensure that outliers are not driving any of our results, we winsorize the variables cash holdings, leverage, market to book, cash flow to assets, standard deviation of cash flow to assets, net working capital to assets, R&D to sales, capital expenditures to assets, and acquisition to assets at the 0.5 percent level on each tail. Given that cash holdings are time period specific as they are related to economic conditions, and that cash holdings are industry specific, we include indicator variables for both the time period and the industry.

Descriptive Statistics

Table 1 provides statistics for the sample. Included are the mean, median, standard deviation, and 25th and 75th percentiles. Our main variable in the analysis, cash holdings, has a mean of 17%, a median of 4.9% with a standard deviation of 42.8%. Because of the skewness of the variable, we use the log of cash holdings. On average CEOs directly own 3.0% of the shares in their firms. The average and median option (the percentage options held by CEOs × option delta) are 1.1% and 0.6%. Through the time, there is a rapid increase in option in the last decade, while shares directly held by CEOs decrease by about 50%. The means of Delta and Vega are 600.05 and 97.01. The average (median) CEO's wealth increases by $600,050 for a 1% increase in stock price and by $97,010 for a 1% increase in the firm's stock return volatility. The skewness in compensation data is evident from the differences in the mean and median of these numbers. These variables have considerable variations within the sample allowing us to draw meaningful cross-sectional inferences. In our regression analysis, we use log (1+delta) and log (1+vega) as our explanatory variables. This transformation removes the skewness in the compensation data and

makes sure that our results are not driven by the outliers. We add one dollar to all 'deltas' and 'vegas' to ensure that we do not lose observations that have zero values.

In terms of financial information, the average firm in the sample has size of 6.775, , in terms of the natural logarithm of total assets, leverage ratio of 31%, market to book of about 1.90, cash flows to assets of about 11%, capital expenditures to assets of about 5.9%, and acquisition to assets of about 2.0%.

TABLE 1
SUMMARY STATISTICS FOR DEPENDENT AND INDEPENDENT VARIABLES

This panel provides summary statistics for the sample. The descriptive statistics include; ratio of cash to assets(cash holdings), ratio of cash flow to net assets (CF), the natural log of total assets (size), firm leverage (Leverage), ratio of the market value to book value of assets (MTB), ratio of net working capital to net assets (NWC), standard deviation of cash flows for the past five years (CF volatility), ratio of research and development to sales (R&D), ratio of capital expenditures to net assets (Capex), and ratio of acquisition to sales (Acq). The term net assets indicate total assets minus cash holdings. Option is the percentage of the outstanding shares in options held by the CEO times option delta at the beginning of the year. Shares is CEO's holdings of stocks as a percentage of total shares outstanding at the beginning of the year. EBC is the summation of option and shares. Option delta and option vega are defined in the Appendix. The variables are winsorized at the 0.5 percent level on either tail.

Variables	Mean	Median	Standard deviation	25th Percentile	75th Percentile
Cash holdings	0.170	0.049	0.428	0.015	0.153
CF	0.108	0.067	0.016	0.038	0.087
MTB	1.90	1.35	1.17	1.025	2.128
Size	6.775	6.622	1.501	5.708	7.755
NW	0.066	0.048	0.152	-0.030	0.150
CF volatility	0.041	0.027	0.042	0.013	0.043
R&D	0.043	0.000	0.130	0.000	0.030
Leverage	0.307	0.256	0.214	0.142	0.430
Capex	0.059	0.045	0.045	0.028	0.076
Acq	0.020	0.000	0.051	0.000	0.018
Option	0.011	0.004	0.012	0.003	0.016
Shares	0.030	0.003	0.061	0.001	0.049
EBC	0.041	0.012	0.070	0.005	0.052
Delta	600.05	170.29	1420.09	40.28	1008.90
Vega	97.01	35.68	170.20	7.45	174.56

METHODOLOGY AND EMPIRICAL RESULTS

Managerial Incentives and the Level of Total Cash Holdings

We examine the relation between managerial incentives and the level of cash holdings in a multivariate setting using cross-sectional time series models. The specification follows:

$$cash\ holdings_{i,t} = \alpha_0 + \alpha_1 managerial\ incentives_{i,t-1} + \alpha_2 control\ \text{var}iables + \varepsilon_{i.t} \quad (1)$$

For estimation methods, we follow Petersen (2006) and report t-statistics for the pooled results using standard errors corrected for clustering at the firm level. For robustness, we control for industry and year fixed effects that capture the time trend in incentive grants as well as industry cash-flow risk and growth opportunities. The variables of interest in this study are the managerial incentive proxies discussed above. The coefficients on the managerial incentive variables will directly address the predictions of our hypotheses relating incentives to cash ratios.

Models 1 through 3 of Table 2 provide the analysis of the relation between corporate cash holdings and the managerial incentive variables. In model 1, we examine the relation between the option/shares and cash holdings separately by including both variables. Model 2 examines total equity-based compensation and cash holdings. Model 3 reports the result when using both managerial risk preference proxies (delta and vega).

The results in Models 1 and 2 suggest that the option and shares are positively related to cash holdings. The effect is more pronounced for option. The coefficient of option is statistically significant at 1% level while the coefficient of shares is statistically significant at 10% level. The coefficient of EBC is statistically significant at 10% level. The results suggest that firms with more equity-based compensation hold more cash. Model 3 of Table 2 presents the results of the impact of managerial risk preferences on the level of cash holdings. CEO's delta has a positive and significant effect on the firm's cash holdings, whereas CEO's vega has negative and significant effect. This indicates that CEOs with risk-avoidance incentives adopt safer corporate policy by keeping higher cash-balances, whereas CEOs with risk-increasing incentives have relatively lower cash-balances. These evidence suggest that CEO's risk incentives play an important role in firm's cash-holdings policy in a manner suggested by the risk-management theories.

Across the different models, the control variables have the expected signs. Firms with low cash holdings tend to be large in size, have high leverage and volatility, and are making significant investments in capital and acquisition expenditures. On the other hand, high cash holding firms are characterized with higher growth options (MTB and R&D), cash flows, and net working capital.

Managerial Incentives and Use of Cash

Managerial Incentives and Internal Investment Decisions

In this section, we examine how the managerial incentive variables are related to firms' investment decisions. To implement this analysis, we focus on cash-rich (unconstrained) firms, where the potential for agency problems associated with their cash holdings is highest. We define cash-rich firms as those with (i) significant cash reserves, and (ii) increasing cash flows. Since firm cash holdings are related to industry competitive dynamics (Haushalter, Klasa and Maxwell (2006)), we define significant cash reserves as above industry median cash holdings at time t. Increasing cash flow firms are those that, when compared to the prior period, are experiencing an increase in their operating cash flow relative to sales. We also define constrained and unconstrained firms as in Almeida, Campello, and Weisbach (2004). However, we find that using their definition, most ExecuComp firms are considered to be unconstrained. This is especially apparent until the time that ExecuComp was expanded to a larger cross-section of firms starting in 1998.

TABLE 2
MANAGERIAL INCENTIVES AND CASH HOLDINGS

	(1)	(2)	(3)
Option	0.410		
	(2.01)[b]		
Shares	0.201		
	(1.67)[c]		
EBC		0.213	
		(1.82)[c]	
Delta			0.018
			(3.62)[a]
Vega			-0.005
			(-1.72)[a]
CF	0.420	0.612	0.460
	(4.21)[a]	(5.30)[a]	(3.67)[a]
MTB	0.022	0.016	0.019
	(1.81)[c]	(1.79)[c]	(1.68)[c]
Size	-0.011	-0.023	-0.045
	(-0.15)	(-0.13)	(-0.72)
Leverage	-0.213	-0.481	-0.271
	(-11.09)[a]	(-6.21)[a]	(-12.41)[a]
NWC	-0.312	-0.633	-0.367
	(-12.67)[a]	(-7.21)[a]	(-13.21)[a]
R&D	0.486	0.940	0.527
	(10.91)[a]	(9.41)[a]	(12.36)[a]
Capex	-0.643	-0.720	-0.503
	(-12.23)[a]	(-11.88)[a]	(-11.04)[a]
Acq	-0.231	-0.461	-0.246
	(-11.54)[a]	(-10.53)[a]	(-11.59)[a]
CF volatility	0.812	0.934	0.671
	(2.13)[b]	(2.17)[b]	(1.87)[c]
Divpayer	-0.031	-0.083	-0.026
	(-5.12)[a]	(-3.62)[a]	(-4.76)[a]
Bond	-0.002	-0.007	-0.005
	(-0.31)	(-0.22)	(-0.57)
R-squared	0.61	0.58	0.60
N	8847	8847	8847

This table reports the results of regressing corporate cash holdings on various managerial incentive variables. The data covers the period 1992 through 2006. The dependent variable is the natural log of the cash/assets ratio (*cash holdings*). The managerial incentive independent variables are defined as follows: *Shares* is the number of shares held by the firm's CEO as a percentage of total shares outstanding. *Option* is the product of the percentage of the outstanding shares in options held by the CEO and option delta (Δ). *EBC* is the summation of *shares* and *option. delta* is the natural logarithm of (1+delta of CEOs' compensation) lagged by a year. *Vega* is the natural logarithm of (1+vega of CEOs' compensation) lagged by a year. Other independent variables are defined in Table 1. We also include indicator variables for firms that pay dividends (*divpayer*) and for firms with long term S&P ratings (*bond*). Standard errors are estimated with clustered errors at the firm level. T-statistics are reported in parenthesis. Superscripts a,b and c indicate significance at the 1%,5% and 10% levels, respectively. Though not reported, all models include industry and year indicators and an intercept term.

In the spirit of Almeida et al. (2004), we use this sample of cash-rich firms to examine how managerial incentive variables are related to internal investment decisions of the firm. We begin by tracking the use of cash for firms in this sample and examine whether firms' equity-based compensation are related to changes in these variables during this tracking period. We focus on two measures to examine typical internal investment decisions that a firm makes: (i) capital expenditures, and (ii) R&D expenditures.

We are interested in how managerial incentive variables are related to future decisions, so the managerial incentive variables reflect their lagged values. The firm specific variables include a measure of current cash flow because of its high correlation with current investment. We include market-to-book ratio as a measure of firm's growth options as firms with higher growth opportunities invest more than those with low growth. We also include firm size since it provides economies of scale. Both market-to-book and size are lagged to reduce endogeniety concerns. We continue to estimate the models with clustered standard errors as in Peterson (2006) with the year effect captured in the yearly industry adjustment.

The analysis of internal investment by cash rich firms is reported in Table 3. To account for industry specific factors that may drive investment decisions, we calculate the investment variables relative to the industry median value on a yearly basis. To mitigate a selection bias, we follow Core et al. (2006) and calculate the industry averages to all firms in COMPUSTAT, again defining industry at the Fama and French 48 industry level. We also include the lagged investment variable to account for the long-term nature of investment decisions, that is, investments are often multi-year commitments. Hence, the analysis reflects how investment decisions evolve over time.

The results examining industry-adjusted capital expenditures are reported in Model 1. When studying the control variables, we find that lagged capital expenditures and profitability are positively related while size is negatively related to capital expenditures. For the managerial incentive variables, we find that equity-based compensation is positively related to capital expenditures.

Model 2 examines the relation between R&D expenditures and managerial incentive. Since close to half the firms in the sample do not report R&D expenditures, we focus on firms for which R&D investments are meaningful investment decisions by restricting the sample to only firms with lagged R&D greater than zero. For the control variables, we find that lagged market-to-book is positively related and firm size is negatively related to current R&D expenditures. Cash flow is also negatively related to current R&D. For the managerial incentive variables, EBC is positively related to R&D.

After controlling for profitability and growth options, we find that firms with higher equity-based compensation as measured by EBC make higher internal investments. One explanation is that firms with equity-based compensation rely more on internal funds for internal investment to avoid high costs of external financing.

Managerial Incentives and Payout Policy

In this section, we investigate how the managerial incentive are related to a firm's payout policy, specifically dividends and repurchases. To be consistent with our analysis for internal investment decisions in prior section, we focus on cash-rich (unconstrained) firms, where the potential for agency problems associated with their cash holdings is highest.

Our control variables are similar to those in the prior section. In addition, we included the lagged payout ratio (dividends or repurchases) to capture the slowly changing level of dividends caused by conservative dividend policy (see e.g., Brav, et al. 2005). The results are reported in Table 3. The dependent variables are industry-adjusted dividends (Model 3) and industry-adjusted repurchases (Model 4). For the dividend model, we find that the lagged dividend coefficient is significant at the 1% level. We also find that smaller, more profitable, higher market-to-book firms are more likely to increase dividends. This is consistent with smaller growth firms starting at lower levels of dividends and then increasing their payout as they mature. We find the managerial incentive variable (EBC) is negative in the dividend regression and positive in the repurchase regression. Both of the coefficients are significant.

TABLE 3
MANAGERIAL INCENTIVES AND FIRMS' INVESTMENT AND PAYOUT DECISIONS

	Model			
	(1)	(2)	(3)	(4)
	Capital expenditure	R&D	Dividends	Repurchase
EBC_{t-1}	1.75	2.52	-0.64	0.81
	(1.98)[c]	(2.33)[b]	(-4.167)[a]	(2.71)[b]
$Investment_{t-1}$	0.512	0.230	0.620	0.421
	(10.43)[a]	(4.12)[a]	(5.28)[a]	(7.94)[a]
CF	0.21	-0.56	0.062	0.141
	(6.79)[a]	(-2.71)[a]	(3.88)[a]	(5.75)[a]
MTB_{t-1}	0.001	0.034	0.005	0.003
	(1.04)	(2.47)[b]	(4.31)[a]	(1.52)
$Size_{t-1}$	-0.021	-0.011	-0.002	0.001
	(-1.82)[c]	(-4.62)[a]	(-3.86)[a]	(0.24)
N	1721	930	1697	1418
R-squared	0.35	0.52	0.49	0.22

This table examines the relation between investment and payout decisions and managerial incentive variables for cash rich firms (firms with increasing cash flows and cash holdings greater than the industry average). The dependent variables include: capital expenditures, R&D expenditures (for firms with R&D expenditures), dividends, and repurchases. The proxy of managerial incentive is EBC, the total number of equity-based compensation held by CEOs, which are lagged one period. The control variables include: firm profitability, lagged market-to-book ratio, and firm size. The models also include the lagged capital expenditures, lagged R&D, lagged dividends and lagged repurchases. T-statistics are reported in parenthesis below the coefficient. Superscripts a, b and c indicate significance at the 1%, 5%, and 10% levels, respectively.

Managerial Incentives on Profitability

Overall, in prior section, we find that the equity-based compensation is positively related to firms' capital expenditure and R&D. Also equity-based compensation is negatively related to firms' dividend payout but positively related to repurchase. While these relations are instructive, they tell us nothing about their effect on shareholder wealth. In next section, we turn to the impact of these relations on firm performance. That is, we ask whether the internal investment and payout decision adopted firms with high equity-based compensation is suboptimal.

This type of analysis is subject to endogeneity concerns as compensation and profitability may be jointly determined. Thus, we examine whether predetermined executive compensation are related to how firms' profitability evolves over time. By doing this, we answer the question of whether executive compensation are related to future changes in firms' competitive position.

Specifically, we calculate the dependent variable, profitability, as the ratio of operating profit over lagged total asset relative to the industry's median values on a yearly basis. Recognizing the selection bias noted in Core, Guay and Rusticus (2006), we calculate the industry medians relative to all firms in the COMPUSTAT database, and by calculating the industry-adjusted ratios yearly, we capture the industry and yearly fixed effects. To account for the fact that firm-level characteristics may be jointly determined, we include the lagged industry-adjusted profitability in our regression models and estimate the models

using firm-level fixed effects. In addition, as noted above, we lag managerial incentive variable by one period.

We begin by examining how a firm's managerial incentives are related to its future profitability in Table 4. First, we note that in all of our models the lagged industry profitability variable describes a significant portion of the firm's current profitability. Through all models, lagged equity-based compensation significantly positively predicts future profitability. Thus, overall we find that managerial incentives are related to the evolution of a firm's profitability.

In earlier sections of the paper, we document that firms' equity-based compensation affects investment decisions. However, we have not tested whether these decisions are beneficial or harmful. In Models 2 and 3 of Table 4, we present evidence on this question. The models explain future profitability using lagged investment decisions, lagged equity-based compensation and the interaction of the two. Our main interest will be on the effect of investment on profitability and how this effect varies with executive compensation structure (the interaction variables). We include the control variables found in Core, Guay and Rusticus (2006), firm size (lagged market capitalization), and sales growth as our proxy for firm growth options.

Our investment variables are capital expenditures and R&D. Specifically, we calculate the average investment in these categories over the prior two years (t-1 and t-2) relative to lagged total assets during those time periods. We exclude the investment in the current year, time t, as current profitability and current investment decisions would be simultaneously determined. We then interact these variables with the lagged compensation variable.

The results for the interaction analysis are displayed the columns 2 and 3 of Table 4. In column 2, we present the effect of historical capital expenditures decisions on current profitability. We find the interaction between EBC and capital expenditure is positive and significant. When looking at the subsample of firms which make R&D investments (R&D>0) in column 3, we find a similar pattern as the interaction terms for firms with higher equity-based compensation has a positive and significant coefficient. Thus, while firms with higher equity-based compensation tend to invest more of their cash internally, when they do so, it is with better results.

In summary, we show that managers with high equity-based compensation hold more cash and use more on internal investments, but it is nondestructive. Instead, the profitability and operating performance is higher. One explanation is that shareholders allow managers with more equity-based compensation to hold more cash. They have confidence that these managers are less likely to waste cash reserves. Managers with equity-based compensation are more likely to hold and use cash optimally.

CONCLUSION

Jensen (1986) argues that self-interested managers may waste free cash flows. We extend this argument to cash reserves and provide empirical evidence by examining the effect of equity-based compensation on firms' cash holding policy. Our results provide a comprehensive picture of how managerial incentives affect the amount of cash holdings and how firms use cash. We start by establishing that U.S. firms with higher equity-based compensation tend to hold more cash reserves. We then ask how managerial incentives impact the use of cash. The results show that firms with more equity-based compensation actually invest more internally through capital expenditures and R&D, tend to pay less dividends and repurchase more. Furthermore we examine the impact of managerial incentives on firm profitability and the use of cash on firm profitability. We find that firms with more equity-based compensation has positive impact on firm profitability. The results imply that firms with equity-based compensation tend to hold more cash but are less likely to waste them. They tend to use cash reserves to improve firm value. That may explain why shareholders allow managers with equity-based compensation to hold more cash.

The findings in this paper contribute to our understanding of both the role of managerial incentives and cash policy. A large and growing literature documents that equity-based compensation mitigates firms' agency theory. However, much less is understood about how equity-based compensation impact

cash policy and enhances firm value. We provide fresh insight into this question by providing a direct link between equity-based compensation and the value of an important asset of the firm: cash holdings. Specifically, we find that equity-based compensation increases firm value by improving the use of cash holdings. The results also shed light on the role of managerial incentives in cash policy. We show that equity-based compensation has a greater influence on the use, rather that the accumulation, of cash holdings. This implies that managerial incentives impacts operating and investment decisions (how to use cash) more than financing decisions related to cash policy (how much cash to amass). It would be interesting to investigate further on how managerial incentives affect the allocation of firms' cash flow.

TABLE 4
MANAGERIAL INCENTIVES AND PROFITABILITY

Dependent variable: industry adjusted profitability in year t			
	(1)	(2)	(3)
		Capital expenditure ×incentive	R&D ×incentive
Industry adj profit$_{t-1}$	0.48	0.520	0.44
	(31.98)[a]	(22.33)[a]	(14.16)[a]
EBC$_{t-1}$	0.062	0.083	0.042
	(3.43)[a]	(4.32)[a]	(3.28)[a]
EBC$_{t-1}$×interaction variable		0.16	0.102
		(2.61)[a]	(2.88)[a]
interaction variable		-0.034	0.045
		(-2.47)[b]	(2.31)[b]
Size$_{t-1}$	0.001	0.002	0.001
	(0.82)	(1.13)	(0.76)
Sales growth$_{t-1}$	-0.001	-0.003	-0.004
	(-0.31)	(-0.63)	(-0.58)
N	7782	6850	3410
R-squared	0.65	0.62	0.59

The table reports the results of the impact of the managerial incentive variables on firms' profitability relative to industry peers. Due to endogeneity concerns, we include firms' lagged profitability in the models. We estimate the models using firm-level fixed effects, and lag all the incentive variables. The dependent variable is industry adjusted profitability, defined as operating profit over total assets. To control for selection bias, industry median profitability is calculated using all firms with COMPUSTAT data. In models 2 and 3, lagged investment choices are interacted with managerial incentive controls, EBC. The lagged investment choices are capital expenditures and R&D relative to lagged total assets. Additional control variables representing lagged firm size and sales growth are included. The models are estimated using firm-level fixed effects and the t-statistics are reported in parenthesis below the coefficient. Superscripts a, b and c indicate significance at the 1%, 5% and 10% levels, respectively.

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APPENDIX

CALCULATION OF OPTION DELTA (Δ) AND OPTION VEGA

We use the Core and Guay (2002) procedure to estimate the option delta (Δ), which is the partial derivatives of the Black-Scholes option price with respect to stock price and option Vega, which is the sensitivity with respect to a 1% change in stock return volatility, as follows:

(A.1) $$\Delta = \partial C / \partial S = e^{-dT} N([\ln(S/X) + (r - d + \sigma^2/2)T]/\sigma\sqrt{T})$$

(A.2) $$vega = \partial C / \partial \sigma = e^{-dT} N'([\ln(S/X) + (r - d + \sigma^2/2)T]/\sigma\sqrt{T}) * S * \sqrt{T}$$

Where

C = the black-Scholes value of a European call option as modified to account for dividends by Merton (1973)
S = price of the underlying stock
X = exercise price of the option
σ = expected stock return volatility over the life of the option
r = annual risk free interest rate
T = time to maturity of the option in years
d = expected annual dividend yield over the life of the option.
N = cumulative probability function for the normal distribution

The option delta of the current year's grant can be computed using the number of options, exercise price, and time to maturity from *Execucomp* for the most recent year's grant (new grants). However, for previously granted options, data on each series of grants are not available in *Execucomp.* Core and Guay (2002) provides an approximation technique based on the data from the most recent proxy statement. Their procedure estimates the average strike price using the information including the number and current realizable value of exercisable and unexercisable options held by the managers. For unexercisable options, they estimate the maturity as one year less than the maturity of new options. For exercisable options, they estimate the maturity as four years less. Core and Guay (2002) provide evidence that the measures of sensitivities estimated using their procedures are very highly correlated with value calculated using the complete time series of proxy statement. Using Core and Guay (2002) procedure, We estimate the option delta, equation (A.1), for all three series of options (newly granted options, unexercisable options and exercisable options). We then multiply option delta by the percentage of options held by CEOs within each series and aggregate across the three to get the measure of *option* variable.