CEO Turnover, Equity-Based Compensation And Firm's Investment Decisions

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ABSTRACT

This paper examines the impact of the newly appointed CEOs on firm's future investment decisions and whether the relation is affected by the equity-based compensation, corporate governance provisions and other CEO characteristics. Using CEO turnover data from 1992-2004, the results show that new CEOs with high options-based compensation, following forced turnover and with shorter organization tenure, are associated with high R&D and advertisement investments. These results are consistent with the managerial incentive effect and the dismissal effect.

Keywords: New CEO; executive compensation; investments

INTRODUCTION

Modern corporations are characterized by a separation of ownership and control. This raises the conflict of interest between shareholders and managers. Shareholders prefer that managers provide effort to improve output. If managers incur a personal cost for providing effort, and that managerial effort is not observable by shareholders, then managers have an opportunity to choose actions that benefit only themselves. The alignment of shareholders' and manager's interests has become the main task of corporate governance.

CEO turnover is an important ingredient of corporate governance. Prior studies have shown that CEO turnover can have a significant positive impact on shareholder wealth and on firm performance (Denis and Denis, 1995, Huson et al., 2004), and the degree of improvement can be influenced by corporate governance mechanisms such as institutional shareholdings, composition of board of directors, market for corporate control (Huson et al., 2004) and executive compensations (Blackwell et al., 2007). However, the consequences of CEO turnover on firm's investment decisions have not been fully explored. Only a few studies have examined the CEO turnover impact on firms' discretionary investments (Murphy and Zimmerman, 1993, and Weisbach, 1995). The current paper provides empirical evidence on how CEO turnover relates to firm-level investment decisions and the impact of CEO compensation structure, corporate governance provisions (such as the dual leadership and market for corporate control), as well as CEO characteristics (such as age and tenure with the firm before becoming CEO) on the relation between CEO turnover and firm's investment decisions. It adds to a large literature that investigates the impact of manager turnover on firms' outcomes.

The analysis is conducted using both univariate and multivariate analyses. We examine the change in R&D/sales, advertisement/sales, and capital expenditure/sales over various windows; for example, (-1, 1), (-1, 2), and (-1, 3) surrounding the event year (the year that firms change CEO). In addition, since the investments vary very much across industries, the industry-adjusted percentage changes in R&D/sales, advertisement/sales, and capital investment/sales are examined to provide more precise measures for the new CEOs' impacts on changes in investments. Following Huson et al. (2004), the multivariate regression is estimated by regressing the change in firm's investment for years (-1, +2) against the new CEO equity-based compensation measures, other corporate governance measures, CEO age and tenure, as well as the standard control variables.

The results show that the percentage of options-based compensation as total compensation is an important factor that affects the new CEOs' investment decisions. Higher percentage of options-based compensation of new CEOs leads to higher investment in R&D and advertisement. In addition, CEOs following forced turnover and CEOs with less organization tenure have a higher investment in R&D and advertisement investment, which are consistent with the prediction.

PRIOR RESEARCH AND HYPOTHESIS DEVELOPMENT

There have been extensive studies examining the impact of CEO turnover on firm's shareholder wealth and firm performance (Denis and Denis, 1995; Parrino, 1997; Huson, Malatesta, and Parrino, 2004; Fisman, Khurana, and Rhodes-Kropf, 2005; Clayton, Hartzell, and Rosenberg, 2005; Blackwell, Dudney, and Farrell, 2007; and Dezso, 2007). However, studies on firms' discretionary investments following CEO turnover have not been fully explored. Prior studies on the relation between CEO turnover and the firm's investment mainly focus on the firm's investments near CEO retirement; i.e., the horizon problem (Dechow and Sloan, 1991; Gibbons and Murphy, 1992; Murphy and Zimmerman, 1993; Bushee, 1998; and Cheng, 2004); and these studies have found different results.[1] Only a few prior researches study the discretionary investments following CEO turnover problems (Murphy and Zimmerman, 1993, and Weisbach, 1995).

Murphy and Zimmerman (1993) examine whether the outgoing CEO's horizon problem, incoming CEO's big bath behavior, and outgoing CEO's cover-up problem are due to poor performance or managerial discretion using CEO turnover data from 1971–1989 Forbes annual compensation surveys. First, the authors do not find support for the turnover-related horizon problem; i.e., reduce R&D and advertising expenditures as they approach retirement. They find that departing CEOs do not reduce R&D and market-adjusted R&D in their final years (years 1 and 0). Instead, incoming CEOs cut R&D in years +1 through +4. They also find no drop in advertising and capital expenditures in year -1, the last full fiscal year of the outgoing CEO. In addition, after controlling for firm performance and endogeneity of CEO turnover using simultaneous equation models, the authors find that the CEO turnover dummy variable, which equals to one in year 0 and zero in years -5 to -1, is statistically insignificant related to R&D, advertising, and capital expenditures. This suggests that declines in R&D and advertising prior to CEO turnover are driven by poor performance rather than a horizon problem.

Second, by partitioning the sample based on firm performance or routine vs. non-routine turnovers (using CEO retirement age) or both criteria, the authors find that market-adjusted R&D and advertising are not significantly different in years -1 to +5 compared to years -5 to -2 for good performers, while they are significantly negative for poor performers. Capital expenditures are found to be significantly higher for good performers in year +1, but significantly lower for poor performers. These findings are inconsistent with the horizon problem predictions that routinely departing CEOs reduce R&D and advertising expenditures more as they approach retirement since it is anticipated by the CEO in advance.

Third, the authors find that market-adjusted accounting accruals are significantly negative in year 0 for non-routine, poor performers, but not for routine, good performers, which is consistent with the big bath prediction that income-reducing accruals should be larger for poor performers. However, the findings that accruals in year +1 remain negative, which shows no rebound and that R&D and advertising are significantly negative in year 0 for non-routine, poor performers but not for routine, good performers, which are inconsistent with big bath predictions.

Fourth, CEO cover-up problems predict that outgoing CEOs select income-increasing accruals as performance deteriorates. However, the authors find that accounting accruals for poor performers are income-reducing rather than income-increasing in year 0. In addition, although accruals are higher in years -5 to -2 for poor performers than good performers, accruals are not significantly higher in years -5 to -2 for non-routine than routine CEO turnover. The findings do not consistently support the outgoing CEO cover-up problem.

[1] Dechow and Sloan (1991) find that CEOs spend less on R&D during their final years. On the other hand, Gibbons and Murphy (1992) find that R&D investments are largest in CEOs' last year of office. Cheng (2004) finds that horizon has no impact on R&D investment.

Weisbach (1995) examines whether CEO changes within the acquiring firm are related to the probability that the acquirer will sell the acquisition using a sample of 270 acquisitions by 200 separate acquirers made between 1971 and 1982 that are divested during 1978-1989. The author finds that CEO changes tend to increase the divestiture probabilities of poorly performing acquisitions only, while the probability of divesting a successful acquisition actually decreases with a CEO change. The impact of a CEO change on the probability of divesting an unprofitable acquisition significantly increases regardless of the window used. In addition, both normal and forced turnover increase divestitures of poorly-performing acquisition, which suggests that it is not poor performance that determines both turnover and divestiture. The results also do not support that outsider and insider CEOs have any differences in making divestiture decisions. In conclusion, the author suggests that management changes are important events for corporations because they lead to reversals of poor prior decisions for both forced and normal turnovers.

Although there are only limited researches on managerial discretionary investment after CEO turnover, there have been extensive studies on firm's shareholder wealth and firm performance following CEO turnover. Studies have shown that the degree of improvement in performance following CEO turnover is influenced by executive compensations and other corporate governance mechanisms (Denis and Denis, 1995; Parrino, 1997; Huson *et al.*, 2004; Fisman *et al.*, 2005; Clayton *et al.*, 2005; and Dezso, 2007). Denis and Denis (1995) examine the effectiveness of boards of directors in removing poorly-performing CEOs using 908 non-takeover-related top-management changes (CEO, chairperson, and president) announced in the *Wall Street Journal (WSJ)* between 1985 and 1988. They find that forced turnovers are preceded by significantly large declines in operating performance and followed by large improvements in performance. On the other hand, normal retirements do not exhibit performance declines prior to the management changes, but do exhibit small performance improvements following the changes. The findings that forced turnovers are followed by large improvement in performance and are consistent with the effective board monitoring of top management. However, they find the forced turnovers are rare and are due more often to large block holders, other shareholders, creditors, and potential acquirers than to normal board monitoring. The findings suggest that boards of directors may not function effectively in isolation.

Huson *et al.* (2004) examine the CEO turnover and firm performance using new CEOs listed in the Forbes annual compensation surveys for the 1971-1995 period. They find that in addition to industry-adjusted operating rate of return on total assets (OROA), the control group-adjusted OROA increases following CEO turnover. The control group-adjusted OROA is calculated by subtracting median OROA for a control group matched by two-digit industry and by prior OROA performance, which controls mean-reversion of industry and firm-specific factors. The result implies the effectiveness of internal control mechanisms in removing poorly-performing executives and selecting new CEOs. In addition, simple pair-wise comparisons suggest that board composition, institutional shareholdings, takeover pressure, and outside successor CEOs positively affect performance change. Further analysis using multivariate regression analysis shows that among these variables, institutional shareholdings are positively related to performance change and the outsider-dominated board is positively related to performance change for the sub-period 1988-1994.

Most recently, using 125 new CEOs listed in the Forbes annual compensation surveys between 1982 and 1991, Blackwell *et al.* (2007) examine the compensation package of newly appointed CEOs and the changes in compensation structure following CEO turnover and their impact on future performance. The authors find that new CEOs obtain significantly higher percentage of total compensation from equity-based compensation, including both new options grants and new stock grants, for both voluntary and forced turnover and for different ages of the incoming and outgoing CEO. CEO's total compensation is proxied as the sum of the salary and bonus, value of options granted, and the value of new stock grants.

The results from regressions of future performance on percentage of new stock grants and percentage of options granted after controlling for firm size, CEO's total stockholdings, asset in place, financial leverage, business risk, CEO age, and forced or voluntary turnover dummy show that new stock grants, as a percentage of total compensation, are positively related to future performance for both voluntary and forced turnover. Firm's future performance is measured as unadjusted and industry-adjusted operating income before depreciation and unadjusted and industry-adjusted Tobin's Q in years t+2 and t+3. The percentage of new option grants is found to be positively related to future operating income for the forced turnover subsample. In addition, the authors regress changes in

firm performance from t-1 to the average of t+1 and t+2 on changes in the restricted stock granted and options granted as a percentage of total compensation from the outgoing CEO to incoming CEO, after controlling for the change in total stockholdings from outgoing CEO to incoming CEO, change in assets-in-place, change in long-term debt to assets, and change in firm size. The results show that the change in new stock grants is positively related to changes in unadjusted and industry-adjusted operating income for the full sample, voluntary turnover sample, and inside replacement sample. In summary, the results suggest that greater new stock grants are associated with improved operating performance after turnover, especially following voluntary turnover.

The above studies have examined the consequences of CEO turnover as well as the impact of corporate governance and CEO compensation structure on firm's future performance. However, the consequences of CEO turnover on firm's investment decisions have not been fully explored.

HYPOTHESES

The alignment of shareholders' and managers' interests has been the main task of corporate governance. One of the most important internal monitoring mechanisms is the decision of the board of directors to replace poorly-performing CEO. Prior research has examined three hypotheses on CEO turnover's effect on financial performance - the scapegoat hypothesis, the improved management hypothesis, and the earnings management hypothesis (see Murphy and Zimmerman, 1993; Huson *et al.,* 2004; and Clayton *et al.,* 2005). These hypotheses are extended to the firm's discretionary investments. First, the scapegoat hypothesis assumes that all managers have the same ability and that the availability of manager pool can serve as a credible threat to ensure optimal exertion of effort by the incumbent CEO. The poor financial performance is due to chance and the CEO appears to be a "scapegoat". Khanna and Poulsen (1995) find that managers of Chapter 11 firms and the control firms matched by industry and size make very similar decisions and that, on average, neither set of managers is perceived to be taking value-reducing action, suggesting that when managers are blamed for financial distress, they are only the scapegoat. Since managers have the same quality, CEO turnover does not affect the firm's future performance and strategy. The scapegoat hypothesis predicts that there is no change in investments from the prior CEO after controlling for other effect.

The improved management hypothesis suggests that managers possess different abilities and management styles because of different career paths and personal backgrounds, and a board selects a specific CEO to match the firm's expected strategy. The hypothesis predicts that CEO turnover will impact the firm's future performance and strategies. Weisbach (1995) finds that management changes increase the divestiture probabilities of poorly-performing acquisitions for both forced and normal turnovers. Denis and Denis (1995) find that forced turnovers are followed by large improvement in operating, although forced turnovers are rare and are due more often to large block holders, other shareholders, creditors, and potential acquirers than to normal board monitoring. In a recent paper, Bertrand and Schoar (2003) find that individual managers do matter in the determination of firm policy, including capital expenditure, acquisition, R&D, advertisement, leverage, SG&A, dividend, ROA, and operating cash flows using data from 1992-1999. The improvement hypothesis suggests that there will be changes in long-term investments after CEO turnover. In addition, following Clayton *et al.* (2005), an outsider new CEO is chosen in order to initiate a change in corporate strategy. Therefore, larger changes in R&D, advertisement, and capital expenditures are expected to follow the appointment of outsider CEOs than insider CEOs.

The earnings management hypothesis argues that managers have discretion over the firm's strategy and that they may manipulate long-term investments to accrue benefits for themselves only. Prior research has examined incoming CEOs' taking a big bath behavior; i.e., they prefer to reduce earnings in the year of change to blame the predecessor and to establish a lower benchmark for subsequent performance evaluation. Pourciau (1993) argues that to manage expectations and set achievable performance goals, the new CEO has strong incentives to engage in initial income-reducing earnings management with subsequent income-increasing earnings management. Murphy and Zimmerman (1993) argue that the big bath behavior is more likely to occur if the outgoing CEO is forced out because it is more credible to blame the predecessor under these situations. They find that accounting accruals are significantly negative in the transition year for non-routine, inferior departing CEOs, which partially supports the big

bath hypothesis.[2] However, they did not find the rebound of the accruals in the following year. Lasalle, Jones, and Jain (1993), on the other hand, find that firms with changes in CEOs are more likely to make both income-decreasing and income-increasing changes than firms without such change in CEOs. This suggests that new CEOs are not adopting income-decreasing accounting early in their tenure.

Long-term investments, such as capital expenditure, R&D, and advertisement, have similar features that the benefits from current investment are not fully realized until many years following the investment. However, managers may have different incentives to invest in different types of long-term investments because of the differences in accounting treatment. Capital expenditures for long-lived assets are long-term investments that are capitalized as assets and expensed gradually over time. The revenues and expenses related to capital expenditure are spread over the life of the underlying assets. On the other hand, unlike long-term capital expenditures, U.S. GAAP requires that firms uniformly expense R&D expenditures, acquired in-progress R&D, and advertising costs when incurred. This treatment is based on the presumption that the future economic benefits created by R&D and advertising are too uncertain to justify asset recognition. In addition, R&D investments have a longer horizon than do advertising expenditures. Hirschey and Weygandt (1985) conclude that the life of advertising is one to five years, while the life of R&D is 5-10 years. This suggests that the benefit from investment in R&D has a longer period than advertising costs before it is realized. Therefore, if the incoming CEOs take a big bath, they will make higher long-term investments in their first year of office to reduce income and make lower long-term investments to increase earnings in the following year. In addition, because of the different treatment in R&D, advertising, and capital investments, they will make higher investments in R&D and advertising than in capital expenditures. Furthermore, Murphy and Zimmerman (1993) argue that forced CEO turnovers will have higher income-reducing activity than normal turnovers since, in these situations, it is more credible for the new CEO to "blame" the old CEO for a poor situation.

Based on the above arguments, the hypotheses are stated as follows:

Hypothesis 1: Ceteris paribus, a newly appointed CEO will not affect the firm's discretionary investment.

Hypothesis 2: Ceteris paribus, a newly appointed CEO will change (increase or decrease) the firm's discretionary investments.

Hypothesis 3: Ceteris paribus, a newly appointed CEO will increase the firm's discretionary investments in the first year of office and decrease the firm's discretionary investments in later years. Further, a newly appointed CEO will increase the firm's R&D and advertising investments more than capital expenditure investment in the first year of office.

In addition, the following hypotheses are stated when incoming CEOs are outsiders and when outgoing CEOs are forced.

Hypothesis 4: Ceteris paribus, a newly appointed outsider CEO will make a larger change (increase or decrease) in the firm's discretionary investments than an insider CEO.

Hypothesis 5: Ceteris paribus, a newly appointed CEO following a forced turnover will increase discretionary investments more than a normal turnover in the first year of office.

The agency theory argues that managerial discretion problems can be reduced if managerial incentive compensation or other corporate governance mechanisms are used to effectively induce and monitor the manager's behavior. Equity-based compensation can be used to align managers' and shareholders' interests so that managers can act for the interests of shareholders (Jensen and Meckling, 1976). More recently, studies have shown that options and stock ownership provide different incentives to CEOs in terms of riskiness of long-term investment. Stock ownership forces managers to bear both upside and downside risk, while options-based compensation

[2] Murphy and Zimmerman (1993) did not find an increase in long-term investment, such as R&D and advertising, as an income-reducing technique. On the other hand, they find that newly appointed CEOs invest less in R&D and advertising investments.

provides CEOs with protection from downside risk. The option pricing theory indicates that the option value increases with the volatility of the underlying stock. Therefore, the use of stock options can lead managers to select more risky projects. Prior studies argue that capital expenditure, R&D, and advertising are different in terms of riskiness, and R&D and advertising are more risky than capital expenditures (Kothari, Laguerre, and Leone, 2002; Shi, 2003; and Ghosh, Moon, and Tandon, 2007). This implies that stock-based compensation will increase investment in capital expenditures and options-based compensation will increase long-term R&D and advertising investments. The empirical results are mixed. For example, studies have shown that stock-based compensation increases R&D (Barker and Mueller, 2002; Coles, Daniel, and Naveen, 2006; and Ghosh *et al.,* 2007) decreases R&D (Ryan and Wiggins, 2002); unrelated to R&D (Sanders and Hambrick, 2007); increases long-term capital expenditure (Aggarwal and Samwick, 2006; Kang, Kumar, and Lee, 2006); and unrelated to capital expenditure (Coles *et al.*, 2006; Ghosh *et al.*, 2007). Prior research also finds that options-based compensation increases R&D (Ryan and Wiggins, 2002; Coles *et al.,* 2006; Ghosh *et al.*, 2007; Sanders and Hambrick, 2007); decreases R&D (Defusco, Zorn, and Johnson, 1991); increases long-term capital expenditure (Larcker, 1983; Sanders and Hambrick, 2007; decreases capital expenditure (Coles *et al.,* 2006); and unrelated to capital expenditure (Defusco *et al.,* 1991; Gaver and Gaver, 1993; Eng and Shackell, 2001; Sanders and Hambrick, 2007; Ghosh *et al.*, 2007).

Based on the above argument, the hypothesis is stated as follows:

Hypothesis 6: Ceteris paribus, a newly appointed CEO with stock-based compensation will increase the firm's investment in capital expenditures.

Hypothesis 7: Ceteris paribus, a newly appointed CEO with options-based compensation will increase the firm's investment in R&D and advertising.

In addition to the incentive provided by equity-based compensation, prior research has argued that other corporate governance mechanisms can be used to control managerial opportunistic behavior. However, the empirical results are mixed. Meulbroek, Mitchell, Mulherin, Netter, and Poulsen (1990) find that the implementation of anti-takeover provisions decreases the R&D investments; Gompers, Ishi, and Metrick (2003) find that anti-takeover provisions increases capital investments; and Richardson (2006) finds that anti-takeover increases over-investment. Further, Huson *et al.* (2004) argue that better monitoring can lead to the appointment of a superior CEO, which leads to larger changes in investments. On the other hand, better monitoring can result in more rapid and accurate assessment of an incumbent CEO, which leads to small changes in investments. Therefore, the prediction of corporate governance impact on the behavior of newly appointed CEO is ambiguous. The hypothesis, stated in null form, is as follows:

Hypothesis 8: Ceteris paribus, better corporate governance is not associated with the investments behavior of the newly appointed CEO.

SAMPLE, MODEL SPECIFICATION, AND VARIABLES

Sample

The initial sample is identified using Standard & Poor's *Execucomp* database for the period 1992-2004. We use "BECAMECE" and "LEFTOFC" provided by *Execucomp* to identify CEOs of firms. Besides "BECAMECE", Execucomp provides "CEOANN" flag to identify the individual who was CEO for the majority of the fiscal year. When the "BECAMECE" is missing and the compensation data is available, we use "CEOANN" and DEF 14A from EDGAR on SEC's website to determine the CEOs.[3] We then identify the new CEOs when there is a different CEO in year t than in year t-1. This process yields 2,326 new CEO observations for the period 1992-2004. We exclude interim CEOs and new CEOs resigned after one-year in office because future investment measures are not available during their tenures. This process eliminates 238 observations. Further, new CEOs due to spin-off are excluded. In addition, we eliminate the financial and utility industry firms because they have different investment policies.

[3] For example, firms sometimes do not have CEO title, which is taken to be the chairperson or president based on "CEOANN" and DEF 14A from EDGAR on SEC's website to determine the CEOs.

Using CEO names provided by Execucomp, we collect the incoming CEO's organization tenure, voluntary or forced turnover, CEO age from LexisNexis, company proxy statement, press release, and web pages. Outgoing CEOs are classified as FORCED if they are fired, ousted, terminated, or resigned due to loss of operations. If the CEO leaves to join another firm, if they die, or if they departed to pursue personal or other interests, the turnovers are classified as voluntary.

Following Huson *et al.* (2004), we define OUTSIDER CEO as new CEOs that have worked for the company for one year or less when they are appointed. Otherwise, they are considered INSIDER. In addition, some new CEOs initially join the firm as COO or president and are promoted as CEO after one year. Although these new CEOs are INSIDER, their behavior is different than new INSIDER CEOs that have been with the firm for longer years. Therefore, another variable, CEO organization tenure, is defined as subtracting the year that new CEOs join the firm from the year they become CEOs.

The above data is merged with the Compustat database. We exclude firms that have zero capital expenditure, R&D, and advertising, respectively, for each test. The final sample is 1,705, 1,167, and 483 firm-year observations for capital expenditure, R&D, and advertising, respectively.

Model Specification and Variable Measurements

The main question of the current paper is to examine whether equity-based compensation of newly appointed CEOs affect firms' future investment decisions and whether the relation is affected by the corporate governance provisions and other CEO characteristics. Empirically, we first use the univariate analysis to test hypotheses 1 to 3 and use multivariate regressions to test hypotheses 4 to 8. Following Huson *et al.* (2004), the regression model is as follows:

$$\text{Change in investments}_{(-1,\,+2)} = a_0 + \alpha_1 \text{ Forced} + \alpha_2 \text{ Outsider} + \alpha_3 \text{HISTK} + \alpha_4 \text{ HIOPT} + \alpha_5 \textit{ CEO DUALITY} + \alpha_6 \textbf{ CONTROLS} + \text{error}_t$$

where **CONTROLS** is a vector of variables that are expected to influence the investments. By including the control variables, the effects of the interested variables on change in investments are isolated.

Dependent Variable

The dependent variable is measured using observable managerial investment decisions; i.e., capital expenditure, R&D, and advertising costs. We examine the change in the above investments over the period from one year before to two years after the year of CEO turnover (-1, +2). Investment intensities are measured as R&D/sales, advertising/sales, and capital expenditure/sales. We measure industry investments as the median value of corresponding measures for the same two-digit Standard Industrial Classification (SIC) code for firms available from the Compustat database.

Independent Variables

The independent variables include OUTSIDER, FORCED, equity-based compensation, and corporate governance variables. OUTSIDER and FORCED variable are defined previously. The equity-based compensation measures are HISTK and HIOPT. HISTK equals one if CEO stock ownership is greater than the median of the samples and 0 otherwise. HIOPT equals one if options-based compensation is greater than the median of the samples (without change for subsamples) and 0 otherwise. The options-based compensation is calculated based on previous year CEO's value of unexercised exercisable options and unexercised unexercisable options and value of stock options grants as a percent of the total compensation. This is to say that for the event window (-1, 1), the CEO's options-based compensation is calculated for year zero; but for the event windows (-1, 2) and (-1, 3), the options-based compensation is calculated for year 1 and year 2, respectively. The corporate governance variable is measured as CEO dual leadership (CEO Duality). Prior research argues that when the CEO is the chair of the board of directors, the agency problem is greater since decision-making and the monitoring of decisions is performed by the same individual (Ryan and Wiggins, 2002). CEO dual leadership is obtained from the Execucomp database.

Control Variables

The control variables are derived from previous studies studying the determinants of firm's investments, such as Ryan and Wiggins (2002), Coles *et al*. (2006), and Ghosh *et al.* (2007).

Investment Opportunity Sets

In a perfect world, with frictionless capital markets, according to the Modigliani and Miller (1958) proposition, a firm's investment should depend only on the profitability of its investment opportunity sets.[4] Firms with higher investment opportunities undertake higher levels of risky investments to maintain their future growth. Ryan and Wiggins (2002) find that investment opportunity set is positively related to firm's R&D investment. Coles *et al.* (2006) find that investment opportunity set is positive related to both R&D and capital expenditures. Therefore, we expect a positive association between investment opportunity set and capital expenditure, R&D and advertising investments. The investment opportunity set is measured as Tobin's Q (TOBINQ), which is defined as the ratio of market value of the firm's securities to replacement cost of its tangible assets; i.e., the market value of the firm's equity plus the liquidating value of preferred stock, plus the book value of total debt divided by the book value of total assets.

Firm Size

Holmstrom (1989) argues that small firms are more innovative because of their simpler task structure and different attitude toward risk as compared with larger firms. Clinch (1991) documents that firm size and R&D are negatively related. Coles *et al.* (2006) find that firm size has a significant negative impact on R&D and capital expenditures. Based on the results in the previous research, we expect a negative relation between firm size and capital expenditure, R&D and advertising investments. The logarithm of a firm's market value at the fiscal year-end is used to control for the firm size (SIZE).

Surplus Cash

Surplus cash is related to the firm's financial constraints and liquidity. A large literature examines the influence of financial constraints on investment, such as Fazzari, Hubbard, and Petersen (1988), Hoshi, Kashyap, and Scharfstein (1991), and Petersen and Rajan (1994). They find that cash flows and liquidity measures are strongly related to investment. Coles *et al.* (2006) find that surplus cash is significantly positively related to R&D investment. Following prior findings, we expect that the firm's investments are positively related to surplus cash. Surplus cash is defined as cash flow from operations minus capital expenditures, scaled by the current assets.

Industry Investment Change

Bushee (1998) argues that industry R&D investment intensity captures the investment opportunity set within the firm's industry and the firm's investment spending needed to stay competitive within the industry. He finds that industry investment has a positive effect on the firm's R&D investment. We expect that individual firm investment and industry investment are positively related.

CEO Age

Prior research suggests that older CEOs are more conservative and reluctant to change (Bertrand and Schoar, 2003, and Barker and Mueller, 2002). Younger CEOs, on the other hand, are more risk-seeking and prefer to change. The empirical findings are mixed. Bertrand and Schoar (2003) find that CEO age is negatively related to capital investment and insignificantly related to R&D investment. Ryan and Wiggins (2002) find that CEO age is positively related to R&D investment. Based on the previous studies, we expect an ambiguous relation between CEO age (AGE) and the firms' investments.

[4] The Modigliani and Miller (1958) assumption is violated by the existence of taxes and transaction costs, as well as the informational asymmetries and agency problems. See Stein (2003) for more discussion and empirical evidence of the violation of the Modigliani–Miller theorem.

Incoming CEO Organization Tenure

Prior research argues that longer tenure with the firm before becoming CEO is negatively related to the extent of the strategic changes in the firms (Finkelstein and Hambrick, 1990). We expect that CEO organization tenure is negatively related to changes in capital expenditure, R&D, and advertising expense.

Year Dummies

To the extent that there may exist other correlated omitted variables, following Coles *et al*. (2006), we include year dummies as control variables to account for unobservable aspects of the firms' investments or contracting environments that may co-vary with years.

Table 1 provides the variable definitions, data generalization method and the expected sign on investments.

Table 1: Data Description, Source, and Expected Sign on Investment

Variable	Data Generalization Methods	Expected Sign
R&D intensity (RDINT), Advertising intensity (ADINT), and Capital expenditure intensity (CAPINT)	RDINT = R&D investment/Sales*100 ADINT = Advertising /Sales*100 CAPINT = Capital expenditure/sales*100	
Change in R&D (DRD), advertising (DAD), and capital expenditure (DK)	DRD = (R&D investment $_{t+2}$ - R&D investment $_{t-1}$)/ R&D investment $_{t-1}$*100, DAD = (Advertising$_{t+2}$-Advertising$_{t-1}$) /Advertising$_{t-1}$ *100, and DK = (Capital invest$_{t+2}$-capital invest$_{t-1}$) / capital invest$_{t-1}$*100	
Industry R&D intensity (INDRD), Advertisement intensity (INDAD) and Capital expenditure intensity (INDK)	INDRD = median (RDINT) for all sample firms in the same two-digit SIC code for the same sample year INDAD = median (ADINT) for all sample firms in the same two-digit SIC code for the same sample year INDK = median (CAPINT) for all sample firms in the same two-digit SIC code for the same sample year	(+)
SIZE: Market value (LOGMKTVAL)	LOGMKTVAL=log (The close price for the fiscal year*the company's common shares outstanding)	-
Tobin's average Q (TOBINQ)	TOBINQ=(market value of equity + liquidating value of preferred stock + total long term debt + debt in current liabilities)/total assets	(+)
Free cash flow (FCF)	FCF=(net operating cash flow – capital expenditure)/total assets	R&D & AD: (+/-) Capital: (+)
Cash compensation as a percentage of total compensation	(salary + bonus)/total compensation. Obtained from ExecuComp.	R&D/AD: (-) Capital: (+)
Options-based compensation as a percentage of total compensation	(Value of unexercised exercisable options + value of unexercised unexercisable options) / total compensation. Obtained from ExecuComp	R&D/AD: (+) Capital: (+/-)
CEO stock ownership (SHROWNPC)	CEO's percentage of stock ownership. Obtained from ExecuComp.	R&D/AD: (-) Capital: (+)
Interlock relationship (INTLOC)	INTLOC is a dummy variable that equals to 0 if false and 1 if true. Obtained from ExecuComp.	R&D/AD: (+/-) Capital: (+/-)
CEO's age (AGE)	Obtained from ExecuComp and supplemented with proxy statement.	R&D/AD: (+/-) Capital: (+/-)
CEO's organization tenure	Current fiscal year minus the year that CEO joins the company.	R&D/AD: (-) Capital: (-)

EMPIRICAL RESULTS

Descriptive Statistics

Table 2 presents the descriptive statistics for the variables. The median (mean) capital expenditure, R&D, and advertising, as a percentage of sales, are 4% (9%), 3% (12%), 2% (4%). Total cash compensation (cash plus bonus) for CEOs is about 31% (39%) of the total compensation and the median (mean) options-based compensation (Black-Scholes value of current stock options granted) is about 47% (46%) of their total compensation during the sample period (1992-2004). The median (mean) value of CEOs' total holdings of the unexercised stock options is about 30 (128) times of total compensation. The median (mean) stock ownerships of CEOs are about 0.10% (1.08%). The CEO's age and organization tenure range from 28 to 79, and 0 to 49, respectively. The median of age and organization tenure are about 52 and 5 years. CEO age is younger than CEO median age of 56, as reported in Execucomp, because the sample includes new CEOs only.

Table 2: Descriptive Statistics for Sample Data from 1992-2004

	Mean	Median	Standard Deviation	25th Percentile	75th Percentile
Capital investment as a percentage of sales	9%	4%	18%	2%	8%
R&D as a percentage of sales	12%	3%	45%	1%	10%
Advertisement as a percentage of sales	4%	2%	7%	1%	5%
Tobin's Q	1.76	1.26	1.73	0.88	1.98
Firm size: log of market value	6.93	6.84	1.79	5.76	8.06
Free cash flow	0.02	0.04	0.19	(0.02)	0.09
Salary	437	390	294	250	573
Bonus	445	229	758	26	537
Restricted stock granted	688	-	2,647	-	200
Stock options granted (black-scholes values)	3,256	1,004	9,738	193	2,902
Total compensation (TDC+ other annual +restricted stock grants + LTIP + all other + value realized from options exercised + value of stock options granted)	5,093	2,272	10,967	1,020	4,878
Value of stock options held (Value of unexercised exercisable options + Value of unexercised unexercisable options)	5,170	653	28,726	3	3,271
Total cash compensation as a percentage of total compensation	39	31	30	15	58
Black-Scholes value of current stock options granted as a percentage of total compensation	46	47	31	19	73
Value of stock options held as a percentage of total compensation	128	30	404	1	110
CEO's stock ownership	1.075	0.099	5.191	0.022	0.333
CEO's age	51	52	7	46	56
CEO's organization tenure	9	5	11	-	16
Force turnover	0.38	-	0.49	-	1.00
Interlock relationship	0.04	-	0.21	-	-
CEO dual leadership	0.31	-	0.46	-	1.00

Note: Compensation data are obtained from Compustat ExecuComp and financial data are from Compustat Industrial Annual. CEO age, organization tenure and forced turnover are obtained from firms' proxy statement and financial press. The descriptions and sources of data are presented in Table 1.

Figure 1 provides the median unadjusted and industry-adjusted capital expenditures, R&D, and advertising as a percentage of sales around the CEO's turnover events. It shows that the median of industry-adjusted capital expenditure and advertisement are the lowest for the turnover year compared to those before and after turnover. Since there are increases in capital expenditure and advertising investments during year (0, +1), it is inconsistent with the scapegoat hypothesis. The figure shows that median industry-adjusted advertising is increasing over the time from (0, +3) and median industry-adjusted R&D is not different from zero at all times. This suggests that managers are not taking big bath behavior. The decrease in median industry-adjusted capital expenditure in year (+2, +3) is consistent with the big bath hypothesis for capital expenditure. However, the results do not support that the CEO will increase the firm's R&D and advertising investments more than capital expenditure in the first year of office.

Figure 1: Median Unadjusted and Industry-Adjusted Capital Expenditure, R&D, And Advertising Around CEO Turnover Events

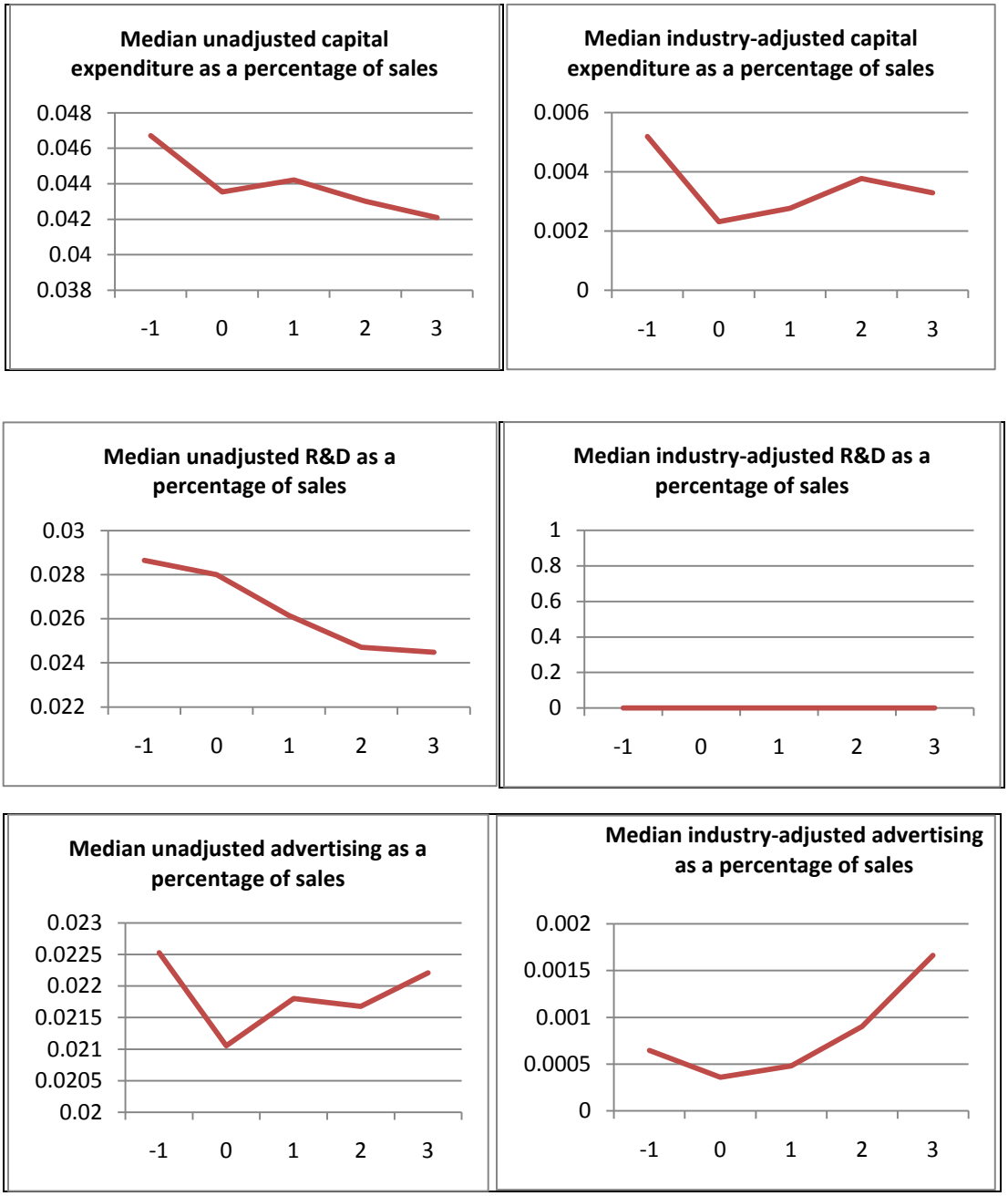

Table 3 Panel A, Panel B, and Panel C provide the results for the median and mean tests for OUTSIDER, FORCED, HIOPT and HISTK. The results show that OUTSIDER CEOs invest less in R&D and advertising investment, which is inconsistent with Hypothesis 4. In addition, CEOs following FORCED turnover invest more in R&D and advertising investments, but less in capital expenditures compared to CEOs following voluntary turnover. These results are consistent with Hypothesis 5 in terms of R&D and advertising investments. Table 3 also shows that new CEOs with high options-based compensation invest more in R&D and advertising investments than low

Table 3: Managerial Incentives Effects on New CEO Investment Behavior

Panel A: Managerial Incentives Effects on New CEO R&D Investment Behavior

		OUTSIDER vs. INSIDER						FORCED vs. Voluntary					
Event Window	**Percentage Change**	**Mean Difference**			**Median Difference**			**Mean Difference**			**Median Difference**		
		Insider	**Outsider**	**t-stat p-value for Difference**	**Insider**	**Outsider**	**Wilcoxon p-value for Difference**	**Forced**	**Voluntary**	**t-stat p-value for Difference**	**Forced**	**Voluntary**	**Wilcoxon p-value for Difference**
(-1, 1)	Simple percentage change	12.718	12.037	0.461	1.051	-2.911	**0.035****	16.239	11.120	0.464	0.107	-0.510	0.788
	Market-adjusted change	11.567	11.057	0.901	-0.397	-4.099	**0.046****	15.243	10.978	0.539	-1.805	-0.843	0.982
	Industry-adjusted change	6.060	4.577	0.925	-2.680	-9.180	**0.023****	7.394	6.539	0.901	-7.993	-2.877	0.231
(-1, 2)	Simple percentage change	19.089	18.960	0.788	0.957	-2.297	0.299	20.235	11.076	0.338	-1.683	-2.424	0.758
	Market-adjusted change	17.246	17.353	0.986	-0.571	-2.096	0.354	19.422	9.771	0.310	-3.845	-1.806	0.693
	Industry-adjusted change	10.098	8.280	0.988	-3.390	-9.039	0.200	11.081	3.085	0.407	-10.879	-4.513	0.345
(-1, 3)	Simple percentage change	14.703	20.673	0.808	-0.646	-3.768	0.419	31.124	10.380	**0.087***	1.351	-1.729	0.272
	Market-adjusted change	12.333	19.394	0.476	-2.306	-3.191	0.624	30.552	8.331	**0.065***	2.407	-4.244	0.122
	Industry-adjusted change	3.208	9.534	0.398	-4.809	-9.879	0.488	22.138	0.555	**0.077***	-4.804	-5.982	0.235

Panel A: Managerial Incentives Effects on New CEO R&D Investment Behavior (Cont.)

		Options-based Compensation						CEO Stock Ownership					
Event Window	**Percentage Change**	**Mean Difference**			**Median Difference**			**Mean Difference**			**Median Difference**		
		HIOPT	**LOWOPT**	**t-stat p-value for Difference**	**HIOPT**	**LOWOPT**	**Wilcoxon p-value for Difference**	**HISTK**	**LOWSTK**	**t-stat p-value for Difference**	**HISTK**	**LOWSTK**	**Wilcoxon p-value for Difference**
(-1, 1)	Simple percentage change	15.714	8.041	0.118	0.855	-1.683	0.303	15.499	10.000	0.299	0.188	-0.523	0.813
	Market-adjusted change	14.503	7.091	0.129	-0.844	-2.657	0.367	14.388	9.193	0.324	-1.338	-1.465	0.902
	Industry-adjusted change	9.382	0.584	**0.072***	-3.137	-5.824	0.374	8.660	3.135	0.302	-4.781	-3.671	0.934
(-1, 2)	Simple percentage change	26.686	9.303	**0.007****	2.575	-2.767	0.106	19.899	20.096	0.979	-0.858	1.904	0.720
	Market-adjusted change	25.290	7.081	**0.004****	0.887	-4.801	**0.053***	17.951	18.831	0.904	-1.741	-0.277	0.635
	Industry-adjusted change	18.343	-1.516	**0.003****	-2.057	-10.826	**0.026****	8.970	12.409	0.647	-4.625	-4.957	0.485
(-1, 3)	Simple percentage change	20.371	12.726	0.261	-0.556	-1.582	0.965	20.128	13.815	0.376	-1.164	-0.556	0.626
	Market-adjusted change	18.917	9.970	0.188	-1.244	-2.816	0.587	17.937	12.249	0.424	-1.945	-2.338	0.685
	Industry-adjusted change	9.958	0.402	0.177	-4.042	-9.155	0.458	7.758	4.690	0.679	-6.558	-5.456	0.999

Panel B: Managerial Incentives Effects on New CEO Capital Expenditure Investment Behavior

		OUTSIDER vs. INSIDER						FORCED vs. Voluntary					
Event Window	**Percentage Change**	**Mean Difference**			**Median Difference**			**Mean Difference**			**Median Difference**		
		Insider	**Outsider**	**t-stat p-value for Difference**	**Insider**	**Outsider**	**Wilcoxon p-value for Difference**	**Forced**	**Voluntary**	**t-stat p-value for Difference**	**Forced**	**Voluntary**	**Wilcoxon p-value for Difference**
(-1, 1)	Simple percentage change	19.358	14.558	0.556	-3.235	-15.801	0.240	5.562	6.650	0.852	-15.812	-4.590	**0.001****
	Market-adjusted change	20.456	15.872	0.562	-1.967	-14.816	0.106	7.318	7.420	0.986	-15.728	-4.623	**0.002****
	Industry-adjusted change	18.371	15.078	0.677	0.050	-14.225	0.115	9.472	7.105	0.686	-7.928	-3.783	**0.022****
(-1, 2)	Simple percentage change	15.441	17.848	0.789	-7.466	-15.675	0.820	10.992	6.026	0.619	-21.467	-7.074	**0.005****
	Market-adjusted change	18.622	21.225	0.771	-5.578	-12.857	0.651	15.177	8.624	0.510	-15.588	-8.241	**0.011****
	Industry-adjusted change	17.778	22.507	0.600	-3.876	-10.417	0.208	21.286	10.353	0.273	-10.710	-2.094	0.176
(-1, 3)	Simple percentage change	12.326	20.582	0.528	-13.898	-22.462	0.447	-0.848	2.345	0.710	-26.779	-14.941	**0.001****
	Market-adjusted change	16.729	25.668	0.464	-8.324	-16.641	0.752	6.368	6.874	0.952	-23.823	-8.586	**0.002****
	Industry-adjusted change	17.093	28.417	0.355	-5.134	-10.818	0.113	13.968	7.991	0.480	-9.137	-5.369	0.401

Panel B: Managerial Incentives Effects on New CEO Capital Expenditure Investment Behavior (Cont.)

		Options-based Compensation						CEO Stock Ownership					
Event Window	**Percentage Change**	**Mean Difference**			**Median Difference**			**Mean Difference**			**Median Difference**		
		HIOPT	**LOWOPT**	**t-stat p-value for Difference**	**HIOPT**	**LOWOPT**	**Wilcoxon p-value for Difference**	**HISTK**	**LOWSTK**	**t-stat p-value for Difference**	**HISTK**	**LOWSTK**	**Wilcoxon p-value for Difference**
(-1, 1)	Simple percentage change	20.549	15.081	0.459	-8.711	-6.064	0.905	21.059	13.948	0.361	-3.264	-11.012	**0.007****
	Market-adjusted change	22.203	15.758	0.357	-5.169	-6.128	0.468	22.483	14.925	0.303	-1.873	-9.091	**0.009****
	Industry-adjusted change	21.831	12.935	0.202	-2.499	-7.254	**0.079***	20.509	13.384	0.330	0.791	-10.696	**0.002****
(-1, 2)	Simple percentage change	17.590	13.818	0.617	-14.711	-6.493	**0.013****	18.838	9.717	0.253	-8.822	-14.219	**0.081***
	Market-adjusted change	22.290	15.498	0.364	-10.133	-5.047	0.198	21.676	13.810	0.322	-3.415	-10.996	0.124
	Industry-adjusted change	23.806	13.543	0.171	-7.543	-5.895	0.948	21.760	13.628	0.306	-1.311	-9.952	**0.010****
(-1, 3)	Simple percentage change	8.234	21.990	0.171	-20.957	-10.756	**0.004****	14.647	12.021	0.804	-13.808	-17.860	0.155
	Market-adjusted change	14.437	24.860	0.277	-13.537	-7.023	0.104	19.620	16.946	0.790	-7.032	-13.934	0.101
	Industry-adjusted change	17.692	23.658	0.532	-6.891	-6.807	0.925	22.028	17.681	0.664	-1.821	-10.847	**0.019****

Panel C: Managerial Incentives Effects on New CEO Advertising Investment Behavior

		OUTSIDER vs. INSIDER						FORCED vs. Voluntary					
Event Window	**Percentage Change**	**Mean Difference**			**Median Difference**			**Mean Difference**			**Median Difference**		
		Insider	**Outsider**	**t-stat p-value for Difference**	**Insider**	**Outsider**	**Wilcoxon p-value for Difference**	**Forced**	**Voluntary**	**t-stat p-value for Difference**	**Forced**	**Voluntary**	**Wilcoxon p-value for Difference**
(-1, 1)	Simple percentage change	29.559	151.798	0.422	-1.650	-11.087	**0.001****	263.180	-1.784	0.274	-10.078	-0.920	0.325
	Market-adjusted change	13.956	7.951	0.669	-3.189	-12.538	**0.001****	32.973	-4.319	0.100	-13.235	-4.529	0.260
	Industry-adjusted change	20.543	16.537	0.777	4.856	-3.655	**0.002****	46.011	4.429	0.063*	6.268	0.328	0.363
(-1, 2)	Simple percentage change	30.133	8.383	0.300	-1.093	-9.786	**0.027****	27.324	-2.623	0.166	-7.032	0.600	0.641
	Market-adjusted change	18.739	4.492	0.328	-3.826	-14.079	**0.057***	21.668	-7.377	0.186	-12.040	-5.492	0.684
	Industry-adjusted change	29.120	22.900	0.668	5.773	3.971	0.679	41.864	7.373	0.110	12.259	5.743	0.216
(-1, 3)	Simple percentage change	16.682	18.218	0.928	-3.314	-11.328	0.135	38.029	-3.217	0.175	-2.123	-8.341	0.236
	Market-adjusted change	12.811	11.015	0.916	-5.489	-15.084	0.119	28.915	-9.926	0.209	-12.074	-14.495	0.466
	Industry-adjusted change	28.429	35.648	0.673	8.257	2.525	0.709	58.456	8.656	0.101	18.217	1.460	**0.011****

Panel C: Managerial Incentives Effects on New CEO Advertising Investment Behavior (Cont.)

		Options-based Compensation						CEO Stock Ownership					
Event Window	**Percentage Change**	**Mean Difference**			**Median Difference**			**Mean Difference**			**Median Difference**		
		HIOPT	**LOWOPT**	**t-stat p-value for Difference**	**HIOPT**	**LOWOPT**	**Wilcoxon p-value for Difference**	**HISTK**	**LOWSTK**	**t-stat p-value for Difference**	**HISTK**	**LOWSTK**	**Wilcoxon p-value for Difference**
(-1, 1)	Simple percentage change	115.610	25.613	0.400	-5.239	-4.321	0.745	29.964	121.057	0.419	-5.474	-1.966	0.369
	Market-adjusted change	15.307	6.545	0.494	-8.374	-4.447	0.230	7.893	17.126	0.494	-9.644	-3.221	0.237
	Industry-adjusted change	26.226	10.227	0.211	2.979	-0.690	0.195	16.126	24.234	0.549	-0.545	2.012	0.756
(-1, 2)	Simple percentage change	18.887	26.489	0.780	-5.221	-2.182	0.465	38.464	11.807	0.331	-0.414	-4.488	0.235
	Market-adjusted change	13.782	13.096	0.966	-11.610	0.074	**0.068***	21.275	8.588	0.456	-3.444	-8.826	0.341
	Industry-adjusted change	33.160	18.957	0.373	7.573	2.327	0.124	35.367	23.453	0.478	7.243	5.503	0.673
(-1, 3)	Simple percentage change	25.558	6.079	0.181	-7.700	-2.666	0.213	13.739	24.607	0.515	-0.490	-6.070	0.537
	Market-adjusted change	17.755	4.557	0.371	-16.738	6.495	0.023	7.576	19.378	0.485	-5.673	-11.188	0.678
	Industry-adjusted change	45.282	11.924	**0.021****	12.775	0.093	**0.072***	29.403	37.797	0.612	8.152	8.257	0.976

Note: For data definition, please refers to Table 1. High and low are based on the median of variables option-based compensation and CEO stock ownership.
* and ** denote the significance at the 10% and 5% levels, respectively.

options-based compensation, which supports Hypothesis 8. On the other hand, CEOs with high stock ownership investment more in capital expenditures, which supports Hypothesis 7.

Regressions

We conducted a hierarchical multiple regression analysis following prior research (Bigley and Wiersema, 2002; and Huson *et al.*, 2004) and reported the results in Table 4. Model 1 regresses the firm's investments on the control variables only. Model 2 includes the interested variables besides the control variables. The results suggest that the explanatory power of the models increases after including the interested variables. HIOPT has a significant positive impact on changes in R&D investment from (-1, 2). The impact of HIOPT on change in advertising and capital expenditures is positive, although insignificant. This result is consistent with the descriptive statistics, which supports Hypothesis 8. HISTK, on the other hand, is insignificant for all investment types, which does not support Hypothesis 7. FORCED turnover has a positive impact on the firm's investments, which supports Hypothesis 5, although only the effect on changing in advertising from (-1, 2) is statistically significant. OUTSIDER is insignificant in all the regressions, which seems inconsistent with Hypothesis 4. However, CEO organization tenure has a significant lower effect on the firm's R&D investment, which suggests that CEO with shorter organization tenure before becoming CEO significantly changes the firm's strategy. Since OUTSIDER is measured as a new

Table 4: Managerial Incentive Effects on New CEO Change in R&D/Sales, Advertisement/Sales, and Capital Expenditure/Sales

	ΔR&D/Sales $_{(-1, +2)}$		**Δ Advertising/Sales $_{(-1, +2)}$**		**Δ Capital Expenditure/ Sales $_{(-1, +2)}$**	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Industry ΔR&D/sales $_{(-1, +2)}$	0.2173 (1.54)	**0.3123*** **(1.85)**				
Industry Δadvertising /sales $_{(-1, +2)}$			**0.4519***** **(3.07)**	**0.3592*** **(1.68)**		
Industry Δcapital expenditure /sales $_{(-1, +2)}$					**0.6104**** **(2.33)**	**0.4792***** **(2.77)**
Log asset	**-4.0944**** **(-2.03)**	**-5.2966**** **(-2.25)**	-0.6037 (-0.23)	0.3025 (0.09)	**-7.0311***** **(-3.71)**	-5.4295 (-1.40)
Tobin's Q	4.0062 (0.83)	1.5011 (0.34)	**6.5728*** **(1.70)**	6.1478 (1.09)	3.9783 (1.37)	-0.5356 (-0.17)
Free cash flow	29.5254 (0.56)	40.1028 (0.55)	-56.0945 (-0.88)	-148.1404 (-1.18)	33.0031 (0.59)	135.2805 (1.25)
HIOPT		**16.2887**** **(2.29)**		21.9637 (0.93)		3.7202 (0.51)
HISTK		-6.2840 (-0.78)		-10.8451 (-0.63)		-6.5356 (-0.64)
FORCED		2.8275 (0.29)		**46.9889*** **(1.72)**		0.5903 (0.07)
OUTSIDER		-22.5789 (-1.64)		-46.7755 (-1.59)		-5.7831 (-0.38)
CEO DUALITY		3.6242 (0.45)		-5.7369 (-0.36)		7.4595 (0.96)
Young CEO		-3.6197 (-0.44)		23.3268 (1.22)		**18.5295**** **(2.22)**
CEO organization tenure		**-0.9333**** **(-2.54)**		-0.3159 (-0.37)		-0.3591 (-0.97)
CEO cash-based compensation		-2.9167 (-0.31)		25.2908 (0.63)		-8.7736 (-1.07)
Year control	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.038	0.0824	0.0613	0.1745	0.0619	0.0846
Numbers of observations	744	433	345	198	1,403	793

Note: Model 1 includes the control variables and model 2 includes the addition of the managerial incentive and dismissal effect. The models are estimated using clustered standard errors. The descriptions and sources of data are presented in Table 1. t-statistics are in parentheses, * and ** denote the significance at the 10% and 5% levels, respectively.

CEO that has worked for the company for one year or less when appointed, CEO organization tenure may reflect a better measure for the OUTSIDER construct. CEO dual leadership is insignificant in the model specifications. The control variables, including industry change in R&D, advertising, and capital expenditures, firm size (log assets), and investment opportunity set (Tobin's Q) are significant. Consistent with previous research, firm size is negatively related to the firm's investments, and investment opportunity set is positively related to the firm's investments.

In sum, the results suggest that new CEOs with options-based compensation, CEOs following forced turnover, and incoming CEOs with shorter organization tenure invest more in investments than the industry average, while new CEOs with stock-based compensation, CEOs following voluntary turnover, and incoming CEOs with longer origination tenure are more likely to mimic the industrial average. These results are consistent with the managerial incentive effect and the dismissal effect.

Robustness Tests

We examine the robustness of the main results using generalized least squares (GLS) regression that allows heteroskedastic and cross-sectional correlation of the errors. The estimation results are mostly significantly stronger than those reported in Table 4, as shown in Table 5.

Table 5: Robustness Test with GLS Regression

	ΔR&D/Sales $_{(-1, +2)}$	**Δ Advertising/Sales $_{(-1, +2)}$**	**Δ Capital Expenditure/ Sales $_{(-1, +2)}$**
Industry ΔR&D/sales $_{(-1, +2)}$	**0.5204**** **(19.73)**		
Industry Δadvertising /sales $_{(-1, +2)}$		**0.4802**** **(12.72)**	
Industry Δcapital expenditure /sales $_{(-1, +2)}$			**0.6853**** **(56.54)**
Log asset	**-4.6021**** **(-14.45)**	**-3.0221**** **(-4.86)**	**-5.9850**** **(-36.80)**
Tobin's Q	**1.9992**** **(4.74)**	**3.1221**** **(7.08)**	**-2.6593**** **(-11.67)**
Free cash flow	**39.0586**** **(10.75)**	**-95.9655**** **(-11.45)**	**125.6038**** **(32.88)**
HIOPT	**16.6329**** **(18.43)**	**14.3501**** **(9.41)**	0.1114 (0.16)
HISTK	-0.2529 (-0.26)	**-18.5065**** **(-9.41)**	**-4.6641**** **(-8.77)**
FORCED	**1.783*** **(1.71)**	**39.7830**** **(14.05)**	**1.2301**** **(2.04)**
OUTSIDER	**-17.5680**** **(-13.70)**	**-39.1778**** **(-12.92)**	**-1.7865**** **(-2.95)**
CEO DUALITY	**2.4071**** **(2.53)**	**4.8285**** **(3.03)**	**7.6984**** **(13.41)**
Young CEO	**-3.1345**** **(-3.78)**	**14.7310**** **(8.68)**	**17.8863**** **(28.19)**
CEO organization tenure	**-0.9269**** **(-21.98)**	-0.1377 (-1.21)	**-0.1761**** **(-7.83)**
CEO cash-based compensation	**-4.2084**** **(-4.89)**	**14.4889**** **(6.35)**	**-7.0035**** **(-11.74)**
Wald chi2	5452.75	910.59	81616.2
Numbers of observations	433	198	793

Note: The above provides estimation results using generalized least squares (GLS) regression. The descriptions and sources of data are presented in Table 1. z-statistics are in parentheses, * and ** denote the significance at the 10% and 5% levels, respectively.

CONCLUSION

This paper examines equity-based compensation of newly appointed CEOs on firms' future investment decisions and whether the relation is affected by the corporate governance provisions and other CEO characteristics. The estimation results, in general, support the hypotheses. The CEO's weight of options-based compensation is found to be an important factor that affects the new CEOs' investment decisions. Higher percentage of options-based compensation of new CEOs leads to higher investment in R&D and advertisement. In addition, CEOs following forced turnover and having less organization tenure have a higher investment in R&D and advertisement investment. The effects of the control variables are generally consistent with the prediction. For example, the firm size is significantly negative in determining R&D and capital expenditure investment, which is consistent with prior research. In addition, the investment opportunity set, Tobin's Q, is positively related to firms' investments.

In sum, the current empirical research concludes that equity-based compensation has a significant impact on new CEOs' investment decisions. Since the model specifications are too simple, future researches can be extended in examining additional model specifications and simultaneous models to obtain improved results.

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