

# Executive Compensation, Financial Constraints and Product Market Behavior

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We introduce a new explanatory variable for a firm's product market behavior. We report significant variation in industry adjusted sales change due to various components of CEO compensation. For example, one standard deviation increase in CEO cash compensation increases industry adjusted sales change by 4.11%, which is economically significant given that the mean value of industry adjusted sales change is 1.859%. This positive significant relationship between industry adjusted sales change and CEO compensation is more prominent when the managers are more entrenched. Finally, we report that financially constrained firms have higher industry adjusted sales change. CEO compensation appears to partially explain this increased industry adjusted sales change for the financially constrained firms.<sup>12</sup>

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<sup>2</sup> Primary work of this paper was done when I was a graduate student at Virginia Tech.

## **1. Introduction**

Product market behavior has received attention in the finance literature in the recent days. Product market behavior is important because papers have reported how product market competition affects stock returns. Product market decisions are made in conjunction with financing and investment decisions. Recent papers have documented different factors which explain product market behavior. In this paper, we introduce a new factor, CEO compensation, which explains product market behavior.

Managerial compensation is designed to create incentives for the managers to increase firm value. Firm value is dependent on product market behavior of the firms, apart from several other factors. For example, Lyandres and Watanabe (2011) report that more profitable firms earn higher stock returns. This suggests that managerial compensation may be an explanatory variable in understanding the dynamics of product market behavior. Managerial compensation structure may provide incentives to the managers to be more aggressive in the product market. In the next section, we develop a theoretical model to provide some insight as to why managerial compensation should affect product market behavior. We restrict the focus of the paper only on CEO compensation instead of compensation of all top executives because CEO is the ultimate decision maker of a firm.

The first issue which comes to mind is that of endogeneity. CEO compensation may be endogenous with respect to product market behavior. Papers by Cunat and Guadalupe (2005, 2009) have established how product market behavior can affect CEO compensation structure. In this paper, we suggest that the opposite relationship also holds good. CEO compensation also

affects product market behavior. CEO compensation causes the manager to be more aggressive in the product market. Both CEO compensation and product market behavior are jointly determined. Following papers like Opler and Titman (1994), Campello (2003,2005), Campello and Fluck (2008), Fresard (2010), our proxy for product market aggressive behavior is industry adjusted sales change. Using a simultaneous equation model and treating both CEO compensation and product market aggressive behavior as endogenous, we document that product market behavior is explained by CEO compensation. For example, one standard deviation increase in cash compensation (total compensation) of the CEO increases industry adjusted sales change by 4.11% (2.99%). Mean value of industry adjusted sales change of a firm is 1.859% which can serve as a benchmark for comparison of these percentage increases of industry adjusted sales change in response to increases in the various components of CEO compensation.

We further explore the positive relationship between aggressive product market behavior and CEO compensation. Aggressive product market behavior entails undertaking risky product market strategies. This suggests that firms managed by more entrenched managers will be more aggressive in the product markets. We use the entrenchment index (EI) proposed by Bebchuk et al (2009). This entrenchment index is designed to measure the degree of competitive protection enjoyed by managers of the firm. More entrenched managers are both less likely to be subject to significant oversight, and less likely to face external pressures in the form of a corporate takeover. We present empirical evidence that the positive relationship between CEO compensation and product market aggression is driven by firms where the CEO is more entrenched. We sort our firms into deciles based on the EI score every year. The bottom four decile firms are classified as low entrenchment firms. The top four deciles are classified as the

high entrenchment firms. The positive relationship between CEO compensation and product market compensation is stronger for firms with deeply entrenched CEOs and considerably weaker in firms with CEOs not entrenched.

Financially constrained firms face higher cost of borrowing compared to the rest. For compensating for their higher cost of borrowing, these firms may act more aggressively in the product market. Recent paper by Lyandres and Watanabe (2011) report how more profitable firms earn higher stock returns. Financially constrained firms try to be more aggressive in the product market in order to be more profitable which may result in higher stock return and may help these firms to decrease their cost of external financing. Using two measures of financial constraint, long run credit ratings and short run credit ratings, we report that financially constrained firms are more aggressive in the product market. Further, CEO compensation partially explains this positive relationship between financial constraint and aggressive product market.

This paper makes four main contributions to the literature. First, this paper complements the recent literature that explains product market behavior through various channels by adding another variable which can affect product market behavior. For example, Campello (2003, 2005) and Campello and Fluck (2008) documents how debt financing affects product market behavior. Fresard (2010) reports how cash holding explains product market behavior. This paper introduces CEO compensation as an additional explanatory variable for product market behavior. This is the first paper to our knowledge which reports that CEO compensation can explain product market behavior.

Secondly, we add to the literature on how executive compensation affects managerial risk taking. Several papers like Core and Guay (1999) and Coles, Daniel and Naveen (2006) document how higher managerial compensation results in riskier investment and financial policy. We complement these papers by reporting that higher managerial compensation result in more aggressive product market behavior.

Thirdly, there is a small literature on how product market behavior can affect managerial compensation (Cunat and Guadalupe (2005), (2009)). We complement this literature by showing that managerial compensation and product market behavior are jointly determined. Both of them affect each other and the relationship is both ways. This is the first paper to our knowledge where both managerial compensation and product market behavior are jointly determined using a simultaneous equation model.

Finally, we contribute to the literature on financial constraint by documenting that financially constrained firms are more aggressive in the product market. Further we document that this aggressive product market behavior in the product market is partially explained by CEO compensation.

This paper is organized as follows. In the second section, we develop a theoretical model which justifies why managerial compensation should affect product market behavior. In the third section, we describe our data. In the fourth section, we describe our methodology and report our results. In the fifth section, we conclude the paper.

## 2. Theoretical Model

In this section, we present a theoretical model linking the financial constraints with managerial compensation and product market behavior. Let us consider a Cournot duopoly setup. Without loss of generality, let us assume that firm 2 is more financially constrained than firm 1.

### 2.1 Definition of Financial Constraint

If a firm is financially unconstrained, the cost of internal capital and the cost of external capital should be the same. Any wedge between the cost of internal capital and the cost of external capital is a measure of the degree of financial constraint. The cost of capital of firm 1 is  $r$  and the cost of capital of firm 2 is  $r+d$ , where  $d$  is the extra cost of capital the more financially constrained firm 2 faces. The higher is the degree of financial constraint, the higher is the value of the parameter  $d$ .

### 2.2 The Two Stage Game

The manager of a firm  $i$  treats the wage contract as exogenously given. The wage contract is given by

$$w_i = \alpha_i + \beta_i V_i^{1/3}, i=1,2 \quad (1)$$

$\alpha_i$  and  $\beta_i$  are exogenous to the manager's decision making process.  $V_i$  is the equity value of the firm.<sup>3</sup>

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<sup>3</sup> We use  $V_i^{1/3}$  instead of  $V_i$  in equation 1 in order to facilitate easy algebraic calculations. As long as the wage depends on a functional form of  $V_i$ , the basic intuitions of this model holds good.

### 2.2.1 The Set-Up

The two firms engage in a Cournot duopoly game to maximize their values. The manager of each firm chooses her effort and firm output. In the first stage, the manager chooses her effort. In the second stage, the manager of a firm engages in a Cournot duopoly with the other firm. Effort is unobservable to the equity holders and debt holders. The equity holders of a firm design a compensation contract to ensure that the interest of the manager is aligned with that of the equity holders in order to tackle the agency problem between the manager and the equity holders. Managerial compensation is composed of two parts. The first component is  $\alpha_i$ , which is the fixed component of managerial compensation. The second component is  $\beta_i V_i^{1/3}$ , which is the variable component of the compensation structure.

In the first stage, the manager maximizes her utility by choosing her effort. Managerial utility is given by

$$\max_{e_i} U_i = w_i - \frac{e_i^2}{2}, i = 1, 2 \quad (2)$$

As a manager's wage depends on the equity value of the firm, the manager has an incentive to maximize the equity value of the firm by putting more effort. But putting more effort is a disutility for the manager which is represented by the second term in the utility function.

There is an inverse market demand of the affine-linear form

$$p_i = \theta + e_i + z - q_i - \lambda q_j \quad (3)$$

where  $\lambda$  is the degree of product differentiation,  $\theta - c$  is a positive constant and  $z$  is a random parameter, which represents the state of the nature. We further assume that  $z$  is uniformly distributed on a non-degenerate interval  $[\underline{z}, \bar{z}]$  with the density function given by

$$f(z) = \frac{1}{\bar{z} - \underline{z}} \quad (4)$$

If the manager puts more effort, the price increases leading to an increase in revenue. If the state of the nature  $z$  improves, the revenue of the firm increases. The outsiders, like the equity holders and the debt holders, cannot distinguish if the increase in revenue is due to increase in manager's effort or due to the improvement of the state of nature, which is random. The outside world cannot distinguish between  $e_i$  and  $z_i$ . This creates an opportunity for the manager to act in her self-interest causing a principle agent problem between the manager and the equity holders of the firm. The compensation structure of the manager is designed to mitigate this agency problem.

In the second stage, the manager of a firm chooses output to maximize the equity value of the firm. We assume that there is zero fixed cost or sunk cost and the marginal cost of production is  $c \geq 0$ . We further assume that a firm  $i$  issues debt to finance its production cost so that it will have debt  $D_i$  equal to

$$D_i = cq_i$$

where  $q_i$  is the level of production for firm  $i$ .

Switching state of nature  $\hat{z}$  is defined as that state of nature at which the revenue of a firm is exactly equal to its debt and interest on debt.

$$(1 + \tilde{r})D_i = R^i(q_i, q_{-i}, \hat{z})$$

where  $R^i$  is the revenue of firm  $i$  and  $\tilde{r}$  is the interest to be paid on debt  $D_i$ .

For firm 1,

$$(1 + r)D_1 = R^1(q_1, q_2, \hat{z}_1) \quad (4a)$$

For firm 2,



$$(1+r+d)D_2 = R^2(q_1, q_2, \hat{z}_2) \quad (4b)$$

### 2.2.2 The Second Stage

This game is solved by backward induction. In the second stage, the manager of a firm engages in a Cournot duopoly game with the other firm to maximize the value of her firm.

With limited liability, firm  $i$ 's manager maximizes

$$\max_{q_i} V_i = \max_{q_i} \int_{\bar{z}}^{\bar{z}} R^i(q_i, q_{-i}, z_i) f(z) dz \quad (5)$$

It can be shown that the maximized values of the firms are given by

$$V_i^* = \frac{(q_i^*)^3}{\bar{z}}, i = 1, 2 \quad (6)$$

where

$$q_1^* = \frac{\bar{z} + \theta + e_1 - (1+r)c - \frac{\lambda}{3}[\bar{z} + \theta + e_2 - (1+r+d)c]}{3 - \frac{\lambda^2}{3}} \quad (7a)$$

$$q_2^* = \frac{\bar{z} + \theta + e_2 - (1+r+d)c - \frac{\lambda}{3}[\bar{z} + \theta + e_1 - (1+r)c]}{3 - \frac{\lambda^2}{3}} \quad (7b)$$

### 2.2.3 The First Stage

In the first stage, the manager of a firm chooses her effort simultaneously with the manager of the other firm to maximize her own utility.

Solving this maximization problem, the optimal efforts are given by

$$e_i^* = \frac{\beta_i}{(\bar{z})^{\frac{1}{3}}(3 - \frac{\lambda^2}{3})} \quad (8)$$

We assume that

$$3 - \frac{\lambda^2}{3} > 0. \quad (\text{A1})$$

Given that the sensitivity of wage to the value of the firm  $\beta_i$  is always positive, this assumption A1 is needed to ensure that the optimal effort is positive.

Individual rationality constraint suggests that the utility of an individual manager must be greater than or equal to the reservation utility  $\bar{U}$  prevailing in the market.

$$U_i \geq \bar{U} \quad (9)$$

where  $\bar{U}$  is the prevailing reservation utility.

We assume that the labor market for managers is perfectly competitive which implies that a manager receives only the reservation utility.

Using equations (1) and (7), the equilibrium managerial compensation contract is given by

$$w_i = \bar{U} + \frac{\beta_i^2}{2(\bar{z})^{\frac{2}{3}}(3 - \frac{\lambda^2}{3})^2}, i = 1, 2 \quad (10)$$

The equilibrium outputs are given by

$$q_1^* = \frac{[\bar{z} + \theta + \frac{\beta_1}{(\bar{z})^{\frac{1}{3}}(3 - \frac{\lambda^2}{3})} - (1+r)c] - \frac{\lambda}{3}[\bar{z} + \theta + \frac{\beta_2}{(\bar{z})^{\frac{1}{3}}(3 - \frac{\lambda^2}{3})} - (1+r+d)c]}{3 - \frac{\lambda^2}{3}} \quad (11a)$$

$$q_2^* = \frac{[\bar{z} + \theta + \frac{\beta_2}{(\bar{z})^{\frac{1}{3}}(3 - \frac{\lambda^2}{3})} - (1+r+d)c] - \frac{\lambda}{3}[\bar{z} + \theta + \frac{\beta_1}{(\bar{z})^{\frac{1}{3}}(3 - \frac{\lambda^2}{3})} - (1+r)c]}{3 - \frac{\lambda^2}{3}} \quad (11b)$$

Equilibrium values of the outputs depend on the parameters  $\beta_i, i = 1, 2$ , of the managerial compensation contract.

### 2.3 Proposition 1

*More is the percentage of variable compensation in the total compensation of the manager of a firm; the more aggressive is the firm in the product market compared to its rival.*

It can be easily shown from equations (11a) and (11b) that  $\frac{dq_2^*}{d\beta_2} - \frac{dq_1^*}{d\beta_2} > 0$

**Intuition:** The compensation contract of the manager of firm 2 is given by equation (1).

Equity value of a firm depends on its output given by equation (6). An increase in the value of the parameter  $\beta_2$  provides greater incentive to the manager of firm 2 to increase the value of firm 2 by increasing firm 2's output. This illustrates why the compensation contract of the manager of a firm should play an active role in explaining the dynamics of the product market behavior of the firm. An increase in managerial compensation of a firm increases the equilibrium output of the firm.

### 3. Data

Our universe of firms consists of all NYSE, AMEX, and Nasdaq firms present in the Execucomp database from 1993 to 2011. Further these firms have to be present in the Riskmetrics (formerly IRRC) dataset and Thompson Financial dataset. We exclude financial services firms and utility firms (SIC codes 6000 – 6999 and 4900 – 4999, respectively), as well as firms with assets less than \$10 million and sales less than \$5million. We utilize several accounting variables throughout our analysis. For all our accounting variables, we rely on COMPUSTAT through WRDS. We calculate percentage of institutional holding from Thompson Financial and use the value of GIM index (Gompers, Ishii and Metrick, 2003) from Riskmetrics. We exclude firms with incomplete COMPUSTAT asset or sales data. Further we exclude firms with incomplete

Thompson Financial institutional holding data and incomplete GIM index data from Riskmetrics. Our final sample has 13,118 firm year observations.

We use five measures of CEO compensation. Following Cooper, Gulen and Rau (2011), our first three CEO compensation variables are (i) cash compensation ( Total\_curr), which includes salary and bonus, (ii) total compensation (TDC1) which includes salary, bonus, total value of stock options granted (using Black and Scholes) , total value of restricted stock granted and long term incentive payouts and (iii) incentive compensation, which is the difference between total compensation and cash compensation. The last two CEO compensation variables we use in this paper are (iv) change in stock holding valuation and (v) change in option valuation. The change in stock holding valuation is defined as the percentage of stocks held by the CEO at the beginning of the fiscal year multiplied by shareholder dollar return. Total return to shareholders is reported in Execucomp database in percentages. The shareholder dollar return is defined as the percentage total return multiplied by the market value of the firm at the beginning of the fiscal year. The change in option valuation is more difficult to calculate. We calculate the value of the old options as the sum of opt\_unex\_exer\_est\_val and opt\_unex\_unexer\_est\_val. opt\_unex\_exer\_est\_val is the value of unexercised exercisable options. opt\_unex\_unexer\_est\_val is the value of unexercised unexercisable options. New options is option\_awards\_rpt\_value. Options\_awards\_rpt\_value is the dollar value of options awards as reported by the company. Total value of the options is the sum of old and new options. Change in option valuation is the value of the options in current year minus the value of the options in the previous year.

Industry adjusted sales change is our proxy for product market behavior. For a particular year, we subtract the industry median sales change in that year from the sales change of a firm to calculate industry adjusted sales change. We define industry by the three digits SIC code. Our results are similar if we define industry by naics code. We also refer industry adjusted sales change as a proxy for product market aggressive behavior. If a firm is aggressive in the product market, sales change of that firm will be greater than the industry median for that year. Several papers like Campello (2003, 2005), Campello and Fluck (2008), Fresard (2010) have used industry adjusted sales change as a measure of product market behavior.

We use several control variables. Tenure is calculated using the variable BECAME\_CEO from Execucomp, which reports the date when a person becomes the CEO of a firm. Tenure serves as a proxy for a CEO's ability. Profitability is defined as the sum of income before extraordinary items (Compustat variable ib) and depreciation (Compustat variable dp) scaled by total assets (Compustat variable at). Firm size is the total assets of the firm, in millions of dollars. Leverage is defined as the sum of long term debt (Compustat variable dltt) and debt in current liability (Compustat variable dlc) divided by total assets. Investment is defined as capital expenditure (Compustat variable capx) scaled by property, plant and equipment (Compustat variable ppent) at the beginning of the year. Cash capital is calculated as the sum of cash and short term investment (Compustat variable che) scaled by total assets. Book to market is calculated as the ratio of book equity to market equity. Book equity is the sum of total asset plus balance sheet deferred income tax credit (Compustat variable txditc) plus convertible debt (Compustat variable dcvt) minus total liabilities (lt) minus book value of preferred stock (in the following order Compustat variable pstkl, Compustat variable pstkrv). Market value is the market capitalization of the firm

in December of the year. Tobin's  $q$  is calculated as the ratio of market value of assets to book value of assets. All these accounting data definitions in this paragraph are standard and have been used in several other papers like Kaplan and Zingales 1997.

Sh\_dollar\_ret is the shareholder dollar return as defined above. Var\_ret is the variance of stock returns for the previous year using daily stock returns data. Var\_ret is a proxy for firm risk. ROA is defined as operating income before depreciation (Compustat variable OIBDP) scaled by total assets. CAR1 is the twelve month buy and hold return over January(t) to December(t) as  $[(1+r_1) \times (1+r_2) \dots \times (1+r_{12}) - 1]$  where  $r_i$  is the return in month  $i$ . CAR3 is the three year buy and hold return over January (t-2) to December (t) and is computed as  $[(1+r_1) \times (1+r_2) \dots \times (1+r_{36}) - 1]$  where  $r_i$  is the return in month  $i$ . Asset growth is calculated as one year percentage change in assets of a firm (Compustat variable at). Abnormal capital investment is computed as the following  $[CE_t / (CE_{t-1} + CE_{t-2} + CE_{t-3}) / 3 - 1]$  where  $CE_t$  is the capital expenditure (Compustat variable capx) scaled by net sales (Compustat variable sale). Firm market capitalization is the market value of the firm in December of year  $t$ . All these data definitions in this paragraph are from Cooper, Gulen and Rau (2011).

#### **4. Methodology and Results**

In this section, we describe the methodology used in this paper and also document our results.

Table 1

In table 1, we report the descriptive statistics of the different variables used in the subsequent statistical analysis. In panel A, the percentage sales change from last year to the present year and

industry adjusted sales change in percentage are reported. Industry adjusted sales change is our dependent variable for the regression analysis. In panel B, the various components of CEO compensation are reported in millions. We describe the various compensation variables in data section. The numbers are similar to Cooper, Gulen and Rau (2011). In panel C, the descriptive statistics of the various control variables are documented.

## Table 2

Table 2 reports the sales change and industry adjusted sales change for firms with different CEO compensation groups, classified by quartiles. If CEO compensation is positively associated with sales change and industry adjusted sales change, then as we move from a lower to a higher CEO compensation group, sales change and industry adjusted sales change should increase. In the panels A to E, the quartiles are formed based on the respective CEO compensation variable, with the first quartile being associated with the lowest compensation. In panel A of table 2, we divide the firms into quartiles based on CEO's cash compensation. There is an upward trend in sales change and industry adjusted sales change as we move from a lower quartile to a higher quartile. Further, the difference in sales change and industry adjusted sales change between the 4<sup>th</sup> quartile and the 1<sup>st</sup> quartile and the corresponding t statistics is reported in the last column of the panel. In panels A, B, C, D and E, we report that sales change and industry adjusted sales change increases as we move from a lower to a higher quartile. Overall, table 2 illustrates that there is a positive correlation between components of CEO's compensation and sales change/ industry adjusted sales change.

In order to establish a causal relation between industry adjusted sales change and CEO compensation, we need to use a regression framework. Prior literature, notably Cunaat and

Guadalupe(2005), (2009) have documented how product market behavior determines managerial compensation. Industry adjusted sales change is a good proxy for product market behavior as has been used by numerous prior studies like Campello (2005), Campello and Fluck (2008), Fresard (2010). Following these papers, we use the following as our baseline regression equation for industry adjusted sales change.

$$\begin{aligned}
\text{Industry adjusted sales change}_{i,t} = & c + \beta_1 \text{ Industry adjusted sales change}_{i,t-1} + \beta_2 \text{ Profitability}_{i,t} \\
& + \beta_3 \text{ Profitability}_{i,t-1} + \beta_4 \text{ Investment}_{i,t} + \beta_5 \text{ Investment}_{i,t-1} + \beta_6 \text{ Leverage}_{i,t} + \beta_7 \text{ Leverage}_{i,t-1} \\
& + \beta_8 \text{ Cash Capital}_{i,t} + \beta_9 \text{ Cash Capital}_{i,t-1} + \beta_{10} \text{ Tobin's } Q_{i,t} + \beta_{11} \text{ Tobin's } Q_{i,t-1} + \beta_{12} \text{ Var\_ret}_{i,t} \\
& + \beta_{13} \text{ Size}_{i,t} + \varepsilon_{i,t}
\end{aligned} \tag{R1}$$

In order to test a causal relationship between industry adjusted sales change and CEO compensation, we include an additional variable in the baseline regression. We estimate the following regression equation.

$$\begin{aligned}
\text{Industry adjusted sales change}_{i,t} = & c + \beta_1 \text{ Industry adjusted sales change}_{i,t-1} + \beta_2 \text{ Profitability}_{i,t} \\
& + \beta_3 \text{ Profitability}_{i,t-1} + \beta_4 \text{ Investment}_{i,t} + \beta_5 \text{ Investment}_{i,t-1} + \beta_6 \text{ Leverage}_{i,t} + \beta_7 \text{ Leverage}_{i,t-1} \\
& + \beta_8 \text{ Cash holding}_{i,t} + \beta_9 \text{ Cash holding}_{i,t-1} + \beta_{10} \text{ Tobin's } Q_{i,t} + \beta_{11} \text{ Tobin's } Q_{i,t-1} + \beta_{12} \text{ Var\_ret}_{i,t} \\
& + \beta_{13} \text{ Size}_{i,t} + \beta_{14} \text{ CEO compensation}_{i,t} + \varepsilon_{i,t}
\end{aligned} \tag{R2}$$

If the coefficient of CEO compensation  $\beta_{14}$  is positive and significant, it will be in support of a causal relationship between industry adjusted sales change and CEO compensation. The biggest econometric problem of this setup is that CEO compensation is endogenous to industry adjusted sales change. There is a small literature (Cunat and Guadalupe(2005),(2009)) which finds empirical evidence of how product market competition affects managerial compensation. Given



the presence of this literature, we are of the opinion that both industry adjusted sales change and CEO compensation should be determined jointly. We will employ the standard simultaneous equation methodology with three stage least squares, as has been done in the literature by Coles, Daniel and Naveen (2006). Following Aggarwal and Samwick (1999) and Cooper, Gulen and Rau (2011), CEO compensation regression equation is given by the following.

$$\begin{aligned}
\text{CEO Compensation}_{i,t} = & c + \beta_1 \text{Sh\_dollar\_ret}_{i,t} + \beta_2 \text{Tenure}_{i,t} + \beta_3 \text{Var\_ret}_{i,t} + \beta_4 \text{Size}_{i,t} \\
& + \beta_5 \text{Sh\_dollar\_ret}_{i,t} * \text{Var\_ret}_{i,t} + \beta_6 \text{Sh\_dollar\_ret}_{i,t} * \text{Tenure}_{i,t} + \beta_7 \text{Ret}_{i,t} * \text{Size}_{i,t} + \beta_8 \text{ROA}_{i,t} \\
& + \beta_9 \text{CAR1} + \beta_{10} \text{CAR3} + \beta_{11} \text{Asset growth}_{i,t} + \beta_{12} \text{Book-to-market}_{i,t} \\
& + \beta_{13} \text{Firm market capitalization}_{i,t} + \beta_{14} \text{Gindex}_{i,t} + \beta_{15} \text{Staggered board dummy} \\
& + \beta_{16} \text{Institutional holding}_{i,t} + \beta_{17} \text{Abnormal capital expenditure}_{i,t} \\
& + \beta_{18} \text{Industry adjusted sales change} + v_{i,t} \tag{R3}
\end{aligned}$$

We estimate equations (R2) and (R3) using the standard simultaneous equation system and three stage least square methodology. We include firm fixed effect and time fixed effect and report the results in table 3.

Table 3

In panel A of table 3, we report that the results for the three CEO compensation variables which are measured in levels. In the first column, we document the estimates for the baseline regression given by equation R1. In columns 2 and 3, we report the simultaneous equation regression estimates using equations R2 and R3. Column 2 reports the estimates from equation R2 and column 3 reports the estimates from equation R3. We document that cash compensation coefficient is positive (2.518) and statistically significant at 1 percent level. Cash compensation

is in millions and has a standard deviation of 1.634. When there is one standard deviation increase in cash compensation, industry adjusted sales change increases by 4.11%. Given that the mean value of industry adjusted sales change is 1.859%, an increase or decrease of 4.11% is economically significant. The estimates for the control variables are similar to the results reported in the previous literature. Estimates of equation R3, as reported in column 3, like market capitalization, variance of return, size, tenure, shareholder dollar return, ROA, CAR3, asset growth are positive and significant, in line with Cooper, Gulen and Rau (2011) and Agarwal and Samwick (1999). Book to market is negative but insignificant. Book to market is negative and significant for the other two measures of compensation in this panel. We include a dummy for staggered board (Bebchuk and Cohen, 2005), percentage of institutional holding from Thompson Financials and also use GIM index (Gompers, Ishii and Metrick, 2003) as additional control variables. The staggered board dummy is positive and significant whereas institutional holding estimate is negative and significant. Both these results are in contrast to Cooper, Gulen and Rau (2011). The coefficients on these two variables are not consistent in sign and not always significant in Cooper, Gulen and Rau (2011). In columns 4 and 5 of panel A, we document the results for total compensation with column 4 documenting the estimates for equation R2 and column 5 reporting the estimates for equation R3. In columns 6 and 7, we document the results for incentive compensation. Column 6 reports the estimates for equation R2 while column 7 reports the estimates for equation R3. Both total compensation and incentive are positive and statistically significant at 1 percent level. When there is one standard deviation increase in total compensation (incentive compensation), industry adjusted sales change increases by 2.99% (3.16%). Further, both total compensation and incentive compensation are dependent on industry

adjusted sales change which is in support of Cunat and Guadalupe (2005, 2009) and justifies using simultaneous equation methodology.

In panel B of table 3, change in stock holding valuation and change in option valuation are the two CEO compensation variables are used to explain industry adjusted sales change. Both of these variables are positive and significant at 1 percent level of significance. When there is one standard deviation increase in change in stock holding valuation (change in option valuation), industry adjusted sales change increases by 5.17% (3.15%).

Several papers like Bizjak, Lemmon and Naveen (2008) and Faulkender and Yang (2010) have reported that a firm benchmark pay based on peer group which depend on industry and size. We follow Cooper, Gulen and Rau (2011)'s methodology to calculate industry and size adjusted CEO compensation. We subtract the industry median compensation from the compensation for every year to get industry adjusted compensation where industry is defined by Fama French 49 industry classification. Then we rank the firms into two groups based on market capitalization of the firms in December of the year and calculate the median compensation for the two groups. We subtract this group median to calculate the industry and size adjusted CEO compensation. We estimate all our regressions based on raw compensation and also based on industry and size adjusted compensation. The results are similar. As a robustness test, we estimate the simultaneous equations R2 and R3, but using industry and size adjusted compensation variables. The results are documented in table 4.

#### Table 4

The results in table 4 are similar to table 3. In panel A, industry and size adjusted cash compensation, total compensation and incentive compensation are all positive and statistically

significant at 1 percent level of significance. In panel B, change in stock holding and change in stock options are both positive and significant at 1 percent level of significance. The results of table 3 and 4 suggest that industry adjusted sales change can be explained by CEO compensation even after we control for the entire set of known variables which affect industry adjusted sales change and after we control for endogeneity of CEO compensation.

We explore the reasons for the positive relationship between industry adjusted sales change and CEO compensation. Aggressiveness in the product market is a risky product market strategy and may only be implemented by entrenched managers. Bebchuk et al (2009) propose an entrenchment index (EI) derived from six provisions of the governance index of Gompers et al (2003). More entrenched managers are both less likely to be subject to significant oversight, and less likely to face external pressures in the form of a corporate takeover. The entrenchment index is therefore a natural measure to use in examining the relationship between product market aggression and managerial compensation.

We sort our firms into deciles based on the EI score every year. The bottom four decile firms are classified as low entrenchment firms. The top four deciles are classified as the high entrenchment firms. For each of these two groups, we estimate the simultaneous equation regressions R2 and R3 and report the results in table 5.<sup>4</sup>

#### Table 5

In panel A of table 5, we report the results with cash compensation as the explanatory variable. Column 1 and 2 reports the results for low entrenchment firms and columns 3 and 4 report the

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<sup>4</sup> In table 5, we report the results for CEO compensation. In unreported results, we replicate the results with industry and size adjusted CEO compensation. The results were similar to what we report here and are available upon request.

results for high entrenchment firms. The coefficient for cash compensation is 0.719 and not statistically significant for low entrenchment firms whereas the same coefficient is larger in magnitude (3.758) and significant at 1% level for high entrenchment firms. Further, we include an indicator dummy variable which takes the value of 1 if the firm is entrenched. We also include an interaction variable of the entrenchment dummy with cash compensation. The results of this new model are presented in columns 5 and 6 of panel A of table 5. The coefficient on the interaction term is 3.282 and significant providing evidence that the coefficient of cash compensation for the high entrenched firms is statistically greater than that of the low entrenched firms. The strong positive relation between cash compensation and industry adjusted sales change as documented in columns 2 and 3 of panel A of table 3 and 4 are mostly driven by the high entrenchment firms.

In panel B, we document the results with total compensation as the explanatory variable. Total compensation's coefficient is small in magnitude (0.210) and is barely significant at 10 percent level for low entrenched firms. But the same coefficient is larger in magnitude (0.418) and statistically significant at 1 percent level for high entrenched firms. The difference in the magnitude of the total compensation coefficient is positive and statistically significant because the coefficient on the interaction term of entrenchment dummy and total compensation is positive (0.664) and statistically significant at 1 percent level as reported in column 5.

In panel C, the estimates for the regression with incentive compensation are presented. The results are similar to panels A and B. The coefficient of incentive compensation for low entrenchment firms is lower in magnitude (0.267) than that of the high entrenchment firms (0.355). Further, incentive compensation for the low entrenchment firms is barely significant at 10% level while that of high entrenchment firm is more significant at 5% level of significance.

Further, the interaction term of entrenchment dummy with incentive compensation is positive (0.678) and significant as reported in column 5 of the panel.

In panels D and E, we report the parameter estimates with the change in stock holding valuation and the change in option valuation respectively. The results presented in panels D and E are similar to that of the previous panels. In both panels, the coefficient for CEO compensation for the low entrenched firms is lower in magnitude compared to that of high entrenched firms. The coefficient of change in stock holding valuation (change in option valuation) for the low entrenched firms is 3.934(0.056). In contrast, the coefficient of change in stock valuation (change in option valuation) is 8.309 (0.215) for the high entrenched firms. The difference in the coefficients is statistically significant at 1percent level because the interaction term of entrenchment dummy with the respective CEO compensation is positive and significant. Overall, the results in table 5 suggest that the positive relationship between CEO compensation and industry adjusted sales change is more prominent for the firms where the managers are more entrenched. Intuitively, product market aggressive behavior is a risky strategy which only entrenched managers are willing to undertake.

Financially constrained firms are inherently more risky than the rest. These firms face higher cost of external financing compared to financially unconstrained firms. In order to cover for their higher cost of external financing, these firms may act more aggressively in the product market. Recent paper by Lyandres and Watanabe (2011) report how more profitable firms earn higher stock returns. Financially constrained firms try to be more aggressive in the product market in order to be more profitable which may result in higher stock return and help them decrease their cost of external financing.

We test if the financially constrained firms are more aggressive in the product market by classifying the firms into two groups, financially constrained and financially unconstrained. We use two measures of financial constraint. First, we classify the firms based on long run credit ratings. Second, we use short run credit ratings as another measure of financial constraint. We report the descriptive statistics in table 6.

Table 6

In panel A of table 6, we divide the firms based on long run credit ratings. If a firm has a long run credit rating (Compustat variable SPLTCRM) of BBB- or better, it is classified as financially unconstrained. A firm with a rating below BBB- is considered financially constrained. Several papers including Gilchrist and Himmelberg(1995) and Malmendier and Tate (2005) have used these ratings to classify the firms into constrained and unconstrained. The numbers reported in panel A are the mean value of industry adjusted sales change of the two groups of firms. The financially constrained group of firms has a mean value of 2.928 for industry adjusted sales change and the financially unconstrained group of firms has a mean value of -0.080. Further, the difference in the mean value of industry adjusted sales change between constrained and unconstrained group of firms is 3.008 and is statistically significant at 1 percent level of significance.

In panel B, we classify the firms based on short run credit ratings. If the short run credit ratings (Compustat variable SPSTICRM) is B and above, then the firm is classified as financially unconstrained. If a firm has a short run credit rating of B1 and below, the firm is classified as financially constrained. We document that the mean value of industry adjusted sales change for the financially unconstrained group of firms is -0.695 while that of financially constrained group

of firms is 2.638. In column 3 of the panel, we report the difference between financially constrained and financially unconstrained firms' industry adjusted sales change. The difference is 3.333 and statistically significant. Results from table 6 suggest that on average the financially constrained firms have higher industry adjusted sales change compared to the financially unconstrained firms.

In order to explore further, we employ a multivariate regression analysis with a simultaneous equation model and three stage least squares. We include a dummy for the financial constraint based on long run credit rating. If a firm has a long run credit ratings of BBB- or better, it is classified as financially unconstrained. A firm with a rating below BBB- is considered financially constrained. The dummy for financial constraint has a value of 1 if a firm is financially constrained based on long run credit ratings. The dummy variable has a value of 0 if the firm is unconstrained.<sup>5</sup>

#### Table 7

In column 1 of panel A of table 7, we report the baseline regression results including the dummy for financial constraint. The coefficient for long run ratings dummy is 2.100 and significant indicating that financially constrained firms have higher industry adjusted sales change. If we include CEO compensation in the regression analysis, the coefficient on long run ratings dummy is still positive and significant even though the magnitude of the coefficient is reduced. This suggests a portion of the effect of financial constraint on industry adjusted sales change can be explained by CEO compensation. We include CEO cash compensation in the regression analysis and report the results in columns 2 and 3. The coefficient on long run credit ratings dummy

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<sup>5</sup> We report the results in table 7 and 8 with CEO compensation. In unreported tables, we replicate the results of tables 7 and 8 using industry and size adjusted CEO compensation. The results are similar and available upon request.



decreases to 1.902. Further, we include CEO total compensation in the regression and present the results in columns 4 and 5. The coefficient on long run credit ratings dummy is reduced from 2.1000 to 1.351. If we include CEO incentive compensation in the regression, the coefficient of long run credit ratings dummy decreases from 2.100 to 1.397. The coefficient for the three CEO compensation variables is still positive and significant, which is similar to panel A of table 3. In panel B, we include the other two CEO compensation variables in the regression analysis. When we include change in stock holding valuation (change in option valuation) in the regression, the coefficient on long run credit ratings dummy decreases from 2.100 to 2.025 (2.069).

As an additional robustness test, we classify the firms based on another measure of financial constraint, namely, short run credit ratings. If a firm has short run credit ratings of B and above, then the firm is classified as financially unconstrained. If the short run credit rating is B1 and below, the firm is classified as financially constrained. We include a dummy for financial constraint based on short run credit ratings. The dummy variable is 0 for the financially unconstrained firms. The dummy variable has a value of 1 if the firm is financially constrained based on short run credit ratings. A simultaneous regression methodology with three stage least squares is used and the regression estimates are presented in table 8.

#### Table 8

The results in table 8 are similar to table 7. The baseline regression results are reported in column 1 of panel A. The coefficient on the short run ratings dummy is 2.865 and significant. Upon the inclusion of CEO cash compensation in the regression analysis, the coefficient on short run ratings dummy decreases to 2.718. If we include total compensation (incentive compensation) in the regression, the coefficient on the short run credit ratings dummy decreases from 2.865 to

2.218(2.183). Similarly, in panel B, we include change in stock holding and change in stock option as explanatory variables, the coefficient on financial constraint decreases.

Overall, the results from table 7 and 8 indicate that financially constrained firms are more aggressive in the product market (higher industry adjusted sales change). Some of this aggressive behavior can be explained by CEO compensation because the coefficient of financial constraint dummy decreases in magnitude after we include the CEO compensation variables in the regression analysis.

## **5. Conclusion**

In this paper, we introduce a new factor, managerial compensation, which can explain product market behavior of a firm. We report that various CEO compensation variables positively affect industry adjusted sales change, which is a proxy for product market aggressiveness and has been widely used in the literature. For example, we document that when cash compensation increases by one standard deviation, industry adjusted sales change increases by 4.11% which is economically significant, given that the mean value of industry adjusted sales change is 1.859%. We also document that this positive relationship between industry adjusted sales change and CEO compensation is more prominent when the CEO is more entrenched. Further, we report that the financially constrained firms have higher industry adjusted sales change. CEO compensation explains a portion of this increased industry adjusted sales change for the financially constrained firms.

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## Table 1

### Descriptive statistics

Our universe of firms consists of all NYSE, AMEX, and Nasdaq firms present in the Execucomp database from 1993 to 2011. Further these firms have to be present in the Riskmetrics (formerly IRRIC) and Thompson Financial dataset. We exclude financial services firms and utility firms (SIC codes 6000 – 6999 and 4900 – 4999, respectively), as well as firms with assets less than \$10 million and sales less than \$5million. We utilize several accounting variables throughout our analysis. For all our accounting variables, we rely on COMPUSTAT through WRDS. We calculate percentage of institutional holding from Thompson Financial and use the value of GIM index (Gompers, Ishii and Metrick, 2003) from Riskmetrics. We exclude firms with incomplete COMPUSTAT asset or sales data. Further we exclude firms with incomplete Thompson Financial institutional holding data and incomplete GIM index data from Riskmetrics. Our final sample has 13,118 firm year observations.

Cash compensation is total\_curr from Execucomp. Total compensation is TDC1 from Execucomp. Incentive compensation is the difference between total compensation and cash compensation. Change in stock holding valuation is calculated as the percentage of stocks held by the CEO at the beginning of the fiscal year multiplied by shareholder dollar return. The shareholder dollar return is calculated as the percentage total return multiplied by the market value of the firm at the beginning of the fiscal year. Change in option valuation is the value of the options in the current year minus the value of the options in the previous year.

All accounting variables are from Compustat. Sales change is the year-over-year percentage change in sales of the firm. Industry adjusted sales change is calculated by subtracting the industry median sales change in a year, where industry is defined by three digit industry code. Size is the total assets as reported in Compustat. Profitability is the sum of income before extraordinary income and depreciation scaled by total assets. Tenure is the number of years CEO is in office. Leverage is defined as the sum of long term debt and short term debt divided by total assets. Investment is defined as the ratio of capital expenditure to property, plant and equipment at the beginning of the year. Cash capital is calculated as the sum of cash and short term investments scaled by total assets. Tobin's q is the ratio of market value of assets to book value of assets. Book to market is the ratio of book equity to market equity. Firm market capitalization is the market value of the firm in December of the current year. sh\_dollar\_ret is the shareholder dollar return as defined above. var\_ret is the variance of stock returns for the previous year using daily stock returns data. ROA is defined as operating income before depreciation scaled by total assets. CAR1 is the twelve month buy and hold return over January(t) to December(t) as  $[(1+r_1) \times (1+r_2) \dots \times (1+r_{12}) - 1]$  where  $r_i$  is the return in month  $i$ . CAR3 is the three year buy and hold return over January (t-2) to December (t) and is computed as  $[(1+r_1) \times (1+r_2) \dots \times (1+r_{36}) - 1]$  where  $r_i$  is the return in month  $i$ . Asset growth is calculated as one year percentage change in asset of a firm. Abnormal capital investment is computed as  $[CE_t / (CE_{t-1} + CE_{t-2} + CE_{t-3}) - 1]$  where  $CE_t$  is the capital expenditure scaled by net sales. Firm market capitalization is the market value of of the firm in December of year t.

Variable	Mean	Median	Std Dev	Lower Quartile	Upper Quartile	Skewness	N
<b>Panel A: Dependent Variables ( In percentage)</b>							
Sales Changes	10.310	7.476	25.262	-0.380	17.409	3.524	13117
Sales Changes Industry Adjusted	1.859	0.000	21.512	-5.516	5.923	4.830	13117
<b>Panel B : Executive Compensation ( In millions)</b>							
Cash Compensation	1.224	0.903	1.634	0.598	1.408	21.365	13118
Total Compensation	4.432	2.398	8.597	1.180	5.054	30.095	13049
Incentive Compensation	3.206	1.294	8.069	0.375	3.589	35.707	13049
Change in stock holding valuation	0.045	0.002	1.088	-0.005	0.022	19.926	11980
Change in option valuation	2.402	0.308	28.940	-0.803	3.648	0.660	12054
<b>Panel C: Control Variables</b>							
Size (Total Asset)	5797.984	1285.046	17683.681	501.563	3912.565	9.126	13118
Profitability	0.092	0.100	0.101	0.062	0.140	-4.632	13118
Leverage	0.226	0.217	0.175	0.089	0.331	1.190	13102
Investment	0.249	0.196	0.195	0.129	0.301	2.578	13118
Firm Age	27.962	26.000	15.867	13.000	42.000	0.272	13118
Cash Capital	0.123	0.061	0.149	0.019	0.174	1.908	13115
Return Variance	0.018	0.010	0.032	0.005	0.019	10.659	13107
Tobin's Q	1.604	1.269	1.081	0.901	1.926	2.018	13118
Tenure	7.193	5.000	7.928	2.000	10.000	1.729	12699
Roa	4.402	5.449	10.456	2.033	8.971	-5.671	13118
CAR1	0.748	0.166	9.614	-0.207	0.681	63.160	13113
CAR3	3.187	0.411	81.536	-0.242	1.556	98.509	13113
Asset growth	0.118	0.063	0.318	-0.011	0.168	6.323	13118
Book to market	0.001	0.000	0.001	0.000	0.001	10.825	12899
Firm market capitalization	6.898	1.349	21.327	0.498	4.278	8.644	13118
Shareholder's dollar return	56.252	7.680	594.827	-12.393	54.811	2.570	11980
Abnormal capital expenditure	0.590	0.334	2.643	0.242	0.487	34.846	13107

**Table 2**

**Simple relationships between product market behavior and CEO compensation**

Our universe of firms consists of all NYSE, AMEX, and Nasdaq firms present in the Execucomp database from 1993 to 2011. Further these firms have to be present in the Riskmetrics (formerly IRRC) and Thompson Financial dataset. We exclude financial services firms and utility firms (SIC codes 6000 – 6999 and 4900 – 4999, respectively), as well as firms with assets less than \$10 million and sales less than \$5million. We utilize several accounting variables throughout our analysis. For all our accounting variables, we rely on COMPUSTAT through WRDS. We calculate percentage of institutional holding from Thompson Financial and use the value of GIM index (Gompers, Ishii and Metrick, 2003) from Riskmetrics. We exclude firms with incomplete COMPUSTAT asset or sales data. Further we exclude firms with incomplete Thompson Financial institutional holding data and incomplete GIM index data from Riskmetrics. Our final sample has 13,118 firm year observations.

In panel A, the firms are divided into quartiles based on CEO's cash compensation. Cash compensation is Total\_curr from Execucomp. The numbers reported in all the columns except the last column is the industry adjusted sales change. The difference between the 4<sup>th</sup> quarter and the 1st quarter is reported in the last column with the corresponding t statistics of the difference.

In panel B, the firms are divided into quartiles based on CEO's total compensation. Total compensation is TDC1 from Execucomp. The numbers reported in all the columns except the last column is the industry adjusted sales change. The difference between the 4<sup>th</sup> quarter and the 1st quarter is reported in the last column with the corresponding t statistics of the difference.

In panel C, the firms are divided into quartiles based on CEO's incentive compensation. Incentive compensation is the difference between total compensation and cash compensation. The numbers reported in all the columns except the last column is the industry adjusted sales change. The difference between the 4<sup>th</sup> quarter and the 1st quarter is reported in the last column with the corresponding t statistics of the difference.

In panel D, the firms are divided into quartiles based on CEO's change in stock holding valuation. Change in stock holding valuation is calculated as the percentage of stocks held by the CEO at the beginning of the fiscal year multiplied by shareholder dollar return. The numbers reported in all the columns except the last column is the industry adjusted sales change. The difference between the 4<sup>th</sup> quarter and the 1st quarter is reported in the last column with the corresponding t statistics of the difference.

In panel E, the firms are divided into quartiles based on CEO's change in option valuation. Change in option valuation is the value of the options in the current year minus the value of the options in the previous year. The numbers reported in all the columns except the last column is the industry adjusted sales change. The difference between the 4<sup>th</sup> quarter and the 1st quarter is reported in the last column with the corresponding t statistics of the difference.

	<i>Full sample</i>	<i>Quartile 1</i>	<i>Quartile 2</i>	<i>Quartile 3</i>	<i>Quartile 4</i>	<i>Quar 5 - Quar1 (t stat)</i>
<i>Panel A</i> <span style="float: right;"><i>Cash Compensation</i></span>						
Sales Change	10.310	10.427	9.225	9.643	11.947	1.521 (2.32)
Industry Adjusted Sales Change	1.859	1.870	1.502	2.019	2.046	0.176 (0.31)
<i>Panel B</i> <span style="float: right;"><i>Total Compensation</i></span>						
Sales Change	10.310	9.540	10.262	10.571	10.770	1.231 (1.98)
Industry Adjusted Sales Change	1.859	1.203	1.836	2.229	2.138	0.934 (1.74)
<i>Panel C</i> <span style="float: right;"><i>Incentive Compensation</i></span>						
Sales Change	10.310	9.976	10.509	10.056	10.602	1.815 (1.03)
Industry Adjusted Sales Change	1.859	1.372	1.952	1.870	2.212	0.840 (1.62)
<i>Panel D</i> <span style="float: right;"><i>Change in stock holding valuation</i></span>						
Sales Change	10.310	6.134	7.503	10.475	14.388	8.254 (14.27)
Industry Adjusted Sales Change	1.859	-0.677	0.087	1.682	4.477	5.154 (10.95)
<i>Panel E</i> <span style="float: right;"><i>Change in option valuation</i></span>						
Sales Change	10.310	6.700	5.909	10.135	15.583	8.883 (14.53)
Industry Adjusted Sales Change	1.859	-0.496	-0.853	2.025	4.769	5.265 (10.27)



**Table 3**

**Simultaneous equation regression**

Our universe of firms consists of all NYSE, AMEX, and Nasdaq firms present in the Execucomp database from 1993 to 2011. Further these firms have to be present in the Riskmetrics (formerly IRRC) and Thompson Financial dataset. We exclude financial services firms and utility firms (SIC codes 6000 – 6999 and 4900 – 4999, respectively), as well as firms with assets less than \$10 million and sales less than \$5million. We utilize several accounting variables throughout our analysis. For all our accounting variables, we rely on COMPUSTAT through WRDS. We calculate percentage of institutional holding from Thompson Financial and use the value of GIM index (Gompers, Ishii and Metrick, 2003) from Riskmetrics. We exclude firms with incomplete COMPUSTAT asset or sales data. Further we exclude firms with incomplete Thompson Financial institutional holding data and incomplete GIM index data from Riskmetrics. Our final sample has 13,118 firm year observations.

Cash compensation is total\_curr from Execucomp. Total compensation is TDC1 from Execucomp. Incentive compensation is the difference between total compensation and cash compensation. Change in stock holding valuation is calculated as the percentage of stocks held by the CEO at the beginning of the fiscal year multiplied by shareholder dollar return. The shareholder dollar return is calculated as the percentage total return multiplied by the market value of the firm at the beginning of the fiscal year. Change in option valuation is the value of the options in the current year minus the value of the options in the previous year.

All accounting variables are from Compustat. Sales change is the year-over-year percentage change in sales of the firm. Industry adjusted sales change is calculated by subtracting the industry median sales change in a year, where industry is defined by three digit industry code. Size is the total assets as reported in Compustat. Profitability is the sum of income before extraordinary income and depreciation scaled by total assets. Tenure is the number of years CEO is in office. Leverage is defined as the sum of long term debt and short term debt divided by total assets. Investment is defined as the ratio of capital expenditure to property, plant and equipment at the beginning of the year. Cash capital is calculated as the sum of cash and short term investments scaled by total assets. Tobin's q is the ratio of market value of assets to book value of assets. Book to market is the ratio of book equity to market equity. Firm market capitalization is the market value of the firm in December of the current year. sh\_dollar\_ret is the shareholder dollar return as defined above. var\_ret is the variance of stock returns for the previous year using daily stock returns data. ROA is defined as operating income before depreciation scaled by total assets. CAR1 is the twelve month buy and hold return over January(t) to December(t) as  $[(1+r_1) \times (1+r_2) \dots \times (1+r_{12}) - 1]$  where  $r_i$  is the return in month  $i$ . CAR3 is the three year buy and hold return over January (t-2) to December (t) and is computed as  $[(1+r_1) \times (1+r_2) \dots \times (1+r_{36}) - 1]$  where  $r_i$  is the return in month  $i$ . Asset growth is calculated as one year percentage change in asset of a firm. Abnormal capital investment is computed as  $[CE_t / (CE_{t-1} + CE_{t-2} + CE_{t-3}) - 1]$  where  $CE_t$  is the capital expenditure scaled by net sales. Firm market capitalization is the market value of of the firm in December of year t.

Industry adjusted sales change and CEO compensation are the two endogenous variables in the simultaneous regression equation system.

Panel A	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Independent Variable							
Intercept	-7.411 (-5.42)	-7.733 (-5.28)	-1.751 (-17.99)	-5.773 (-3.84)	-10.756 (-21.32)	-5.235 (-3.44)	-9.047 (-18.69)
lagSALECHG_indus	0.101 (11.11)	0.102 (11.23)		0.098 (10.99)		0.098 (11.01)	
lagprofitability	-21.319 (-10.98)	-22.237 (-11.23)		-21.445 (-11.04)		-21.350 (-11.01)	
profitability	18.900 (8.44)	14.096 (6.15)		13.965 (6.25)		14.038 (6.28)	
laginvestment	-2.113 (-3.21)	-1.840 (-2.79)		-1.750 (-2.74)		-1.755 (-2.75)	
investment	20.338 (18.31)	17.723 (14.75)		17.323 (14.90)		16.989 (14.65)	
lagleverage	-9.661 (-4.12)	-8.537 (-3.49)		-7.174 (-3.04)		-7.184 (-3.05)	
leverage	15.653 (6.64)	13.476 (5.54)		11.690 (4.95)		11.660 (4.95)	
cash_capital	-16.462 (-6.09)	-19.801 (-6.98)		-17.665 (-6.37)		-17.748 (-6.41)	
lagcash_capital	19.727 (7.24)	24.924 (8.66)		23.707 (8.49)		23.851 (8.55)	
var_ret	4.442 (0.70)	-9.250 (-1.39)	1.096 (2.17)	-14.739 (-2.23)	14.211 (5.41)	-15.448 (-2.33)	13.238 (5.25)
size	0.084 (0.64)	-0.259 (-1.54)	0.368 (30.03)	-0.124 (-0.73)	1.915 (29.89)	-0.105 (-0.61)	1.551 (25.21)
tobinq	2.287 (8.68)	2.073 (7.40)		2.178 (7.90)		2.196 (7.95)	
lagtobinq	-0.965 (-4.69)	-0.758 (-3.53)				-0.766 (-3.69)	
cash compensation		2.518 (5.36)					
total compensation				0.348 (4.13)			
incentive compensation						0.392 (3.88)	
SALECHG_indus			0.002 (0.70)		0.068 (3.73)		0.064 (3.70)
sh_dollar_ret			0.001 (3.13)		0.002 (1.74)		0.002 (1.27)

sh_dollar_ret*tenure		0.000	0.000	0.000
		(-1.17)	(2.98)	(3.37)
sh_dollar_ret*var_ret		-0.002	-0.029	-0.027
		(-0.86)	(-2.86)	(-2.76)
sh_dollar_ret*size		0.000	0.000	0.000
		(-2.89)	(-2.01)	(-1.60)
tenure		0.017	0.020	0.003
		(8.91)	(2.09)	(0.33)
ROA		0.005	0.004	0.000
		(3.32)	(0.57)	(-0.03)
CAR1		-0.002	-0.016	-0.013
		(-1.26)	(-1.78)	(-1.56)
CAR3		0.003	0.012	0.009
		(2.38)	(2.11)	(1.71)
Asset_growth		0.336	1.594	1.587
		(2.38)	(3.34)	(3.47)
Book-to-market		-0.793	-152.482	-154.865
		(-0.05)	(-1.97)	(-2.10)
Firm Market Capitalization		0.006	0.048	0.041
		(6.91)	(10.40)	(9.25)
Gindex		0.006	-0.007	-0.016
		(0.95)	(-0.22)	(-0.52)
Staggered board dummy		0.071	0.398	0.336
		(2.02)	(2.24)	(1.98)
Institutional holding		-0.096	0.137	0.226
		(-1.83)	(0.51)	(0.88)
Abnormal capital expenditure		-0.002	-0.006	-0.003
		(-0.34)	(-0.18)	(-0.09)
Firm fixed effect	yes	yes	yes	yes
Time fixed effect	yes	yes	yes	yes
R <sup>2</sup>	0.084	0.125	0.140	0.128
N	13118	11438	11396	11396

Panel B	[1]	[2]	[3]	[4]	[5]
Independent Variable					
Intercept	-7.411 (-5.42)	-6.866 (-4.72)	0.064 (1.28)	-6.900 (-4.75)	-3.488 (-2.36)
lagSALECHG_indus	0.101 (11.11)	0.104 (11.35)		0.104 (11.39)	
lagprofitability	-21.319 (-10.98)	-21.783 (-11.00)		-21.970 (-11.08)	
profitability	18.900 (8.44)	15.053 (6.61)		15.253 (6.71)	
laginvestment	-2.113 (-3.21)	-1.988 (-3.00)		-1.979 (-2.97)	
investment	20.338 (18.31)	17.130 (14.29)		17.405 (14.49)	
lagleverage	-9.661 (-4.12)	-8.849 (-3.64)		-9.316 (-3.81)	
leverage	15.653 (6.64)	14.657 (6.00)		15.076 (6.14)	
cash_capital	-16.462 (-6.09)	-21.015 (-7.39)		-20.959 (-7.35)	
lagcash_capital	19.727 (7.24)	24.774 (8.65)		24.766 (8.63)	
var_ret	4.442 (0.70)	-10.470 (-1.58)	-0.282 (-1.09)	-10.415 (-1.58)	1.544 (0.20)
size	0.084 (0.64)	0.144 (1.03)	-0.004 (-0.64)	0.111 (0.80)	0.621 (3.35)
tobinq	2.287 (8.68)	2.217 (7.90)		2.250 (7.98)	
lagtobinq	-0.965 (-4.69)	-0.743 (-3.46)		-0.715 (-3.31)	
change in stock holding valuation		4.757 (6.37)			
change in option valuation				0.109 (7.64)	
SALECHG_indus			0.000 (0.27)		-0.033 (-0.62)
sh_dollar_ret			0.002 (14.90)		0.113 (27.41)
sh_dollar_ret*tenure			0.000 (19.69)		0.001 (17.10)

sh_dollar_ret*var_ret			0.001 (0.82)	0.214 (7.00)
sh_dollar_ret*size			0.000 (-15.82)	-0.010 (-26.43)
tenure			0.002 (2.38)	0.041 (1.43)
ROA			0.001 (0.96)	-0.007 (-0.32)
CAR1			0.001 (1.51)	0.033 (1.20)
CAR3			0.002 (3.38)	0.109 (6.36)
Asset_growth			0.160 (3.36)	5.074 (3.60)
Book-to-market			-0.552 (-0.07)	-145.807 (-0.62)
Firm Market Capitalization			-0.001 (-1.23)	-0.064 (-4.74)
Gindex			-0.004 (-1.13)	0.004 (0.05)
Staggered board dummy			-0.005 (-0.29)	-0.125 (-0.23)
Institutional holding			-0.038 (-1.40)	-1.187 (-1.48)
Abnormal capital expenditure			-0.001 (-0.18)	-0.049 (-0.45)
Firm fixed effect	yes	yes		yes
Time fixed effect	yes	yes		yes
R <sup>2</sup>	0.084	0.095		0.249
N	13118	11438		11434

**Table 4**

**Simultaneous equation regression: compensation is industry and size adjusted**

Our universe of firms consists of all NYSE, AMEX, and Nasdaq firms present in the Execucomp database from 1993 to 2011. Further these firms have to be present in the Riskmetrics (formerly IRRC) and Thompson Financial dataset. We exclude financial services firms and utility firms (SIC codes 6000 – 6999 and 4900 – 4999, respectively), as well as firms with assets less than \$10 million and sales less than \$5million. We utilize several accounting variables throughout our analysis. For all our accounting variables, we rely on COMPUSTAT through WRDS. We calculate percentage of institutional holding from Thompson Financial and use the value of GIM index (Gompers, Ishii and Metrick, 2003) from Riskmetrics. We exclude firms with incomplete COMPUSTAT asset or sales data. Further we exclude firms with incomplete Thompson Financial institutional holding data and incomplete GIM index data from Riskmetrics. Our final sample has 13,118 firm year observations.

Cash compensation is total\_curr from Execucomp. Total compensation is TDC1 from Execucomp. Incentive compensation is the difference between total compensation and cash compensation. Change in stock holding valuation is calculated as the percentage of stocks held by the CEO at the beginning of the fiscal year multiplied by shareholder dollar return. The shareholder dollar return is calculated as the percentage total return multiplied by the market value of the firm at the beginning of the fiscal year. Change in option valuation is the value of the options in the current year minus the value of the options in the previous year.

Industry and size adjusted compensation is calculated as follows. We subtract the industry median compensation from the compensation for every year to get industry adjusted compensation where industry is defined by Fama French 49 industry classification. Then we rank the firms into two groups based on market capitalization of the firms and calculate the median compensation for the two groups. We subtract this group median to calculate the industry and size adjusted CEO compensation.

All accounting variables are from Compustat. Sales change is the year-over-year percentage change in sales of the firm. Industry adjusted sales change is calculated by subtracting the industry median sales change in a year, where industry is defined by three digit industry code. Size is the total assets as reported in Compustat. Profitability is the sum of income before extraordinary income and depreciation scaled by total assets. Tenure is the number of years CEO is in office. Leverage is defined as the sum of long term debt and short term debt divided by total assets. Investment is defined as the ratio of capital expenditure to property, plant and equipment at the beginning of the year. Cash capital is calculated as the sum of cash and short term investments scaled by total assets. Tobin's q is the ratio of market value of assets to book value of assets. Book to market is the ratio of book equity to market equity. Firm market capitalization is the market value of the firm in December of the current year. sh\_dollar\_ret is the shareholder dollar return as defined above. var\_ret is the variance of stock returns for the previous year using daily stock returns data. ROA is defined as operating income before depreciation scaled by total assets. CAR1 is the twelve month buy and hold return over January(t) to December(t) as  $[(1+r_1) \times (1+r_2) \dots \times (1+r_{12}) - 1]$  where  $r_i$  is the return in month  $i$ . CAR3 is the three year buy and hold return over January (t-2) to December (t) and is computed as  $[(1+r_1) \times (1+r_2) \dots \times (1+r_{36}) - 1]$  where  $r_i$  is the return in month  $i$ . Asset growth is calculated as one year percentage change in asset of a firm. Abnormal capital investment is computed as  $[CE_t / (CE_{t-1} + CE_{t-2} + CE_{t-3}) - 1]$  where  $CE_t$  is the capital expenditure scaled by net sales. Firm market capitalization is the market value of the firm in December of year t.

Industry adjusted sales change and industry and size adjusted CEO compensation are the two endogenous variables in the simultaneous regression equation system.

Panel A	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Independent Variable							
Intercept	-7.411 (-5.42)	-5.964 (-3.84)	-1.561 (-16.15)	-6.066 (-3.82)	-7.209 (-14.37)	-6.025 (-3.80)	-5.788 (-12.07)
lagSALECHG_indus	0.101 (11.11)	0.104 (11.41)		0.100 (11.15)		0.099 (11.12)	
lagprofitability	-21.319 (-10.98)	-21.928 (-11.08)		-21.530 (-11.01)		-21.428 (-10.98)	
profitability	18.900 (8.44)	15.733 (6.92)		15.116 (6.72)		14.874 (6.61)	
laginvestment	-2.113 (-3.21)	-1.975 (-2.98)		-1.800 (-2.79)		-1.779 (-2.77)	
investment	20.338 (18.31)	17.557 (14.31)		17.167 (14.55)		16.807 (14.33)	
lagleverage	-9.661 (-4.12)	-8.421 (-3.45)		-7.546 (-3.17)		-7.456 (-3.15)	
leverage	15.653 (6.64)	14.019 (5.75)		12.519 (5.25)		12.262 (5.16)	
cash_capital	-16.462 (-6.09)	-19.676 (-6.92)		-18.038 (-6.45)		-18.144 (-6.50)	
lagcash_capital	19.727 (7.24)	24.317 (8.48)		24.057 (8.55)		24.257 (8.63)	
var_ret	4.442 (0.70)	-10.345 (-1.57)	1.557 (3.11)	-12.989 (-1.96)	10.979 (4.21)	-13.268 (-1.99)	9.754 (3.91)
size	0.084 (0.64)	-0.064 (-0.39)	0.197 (16.24)	-0.041 (-0.24)	1.041 (16.40)	-0.028 (-0.16)	0.880 (14.50)
tobinq	2.287 (8.68)	2.141 (7.60)		2.045 (7.41)		(2.06) (7.46)	
lagtobinq	-0.965 (-4.69)	-0.760 (-3.53)		-0.774 (-3.68)		-0.764 (-3.65)	
cash compensation		1.913 (3.28)					
total compensation				0.406 (3.64)			
incentive compensation						0.481 (3.62)	
SALECHG_indus			0.002 (0.68)		0.053 (2.94)		0.051 (2.94)
sh_dollar_ret			0.000 (1.64)		0.001 (1.09)		0.001 (0.96)
sh_dollar_ret*tenure			0.000		0.000		0.000

			(-1.38)	(3.36)	(3.79)
sh_dollar_ret*var_ret			-0.001	-0.023	-0.022
			(-0.47)	(-2.31)	(-2.35)
sh_dollar_ret*size			0.000	0.000	0.000
			(-1.44)	(-1.31)	(-1.22)
tenure			0.017	0.014	-0.002
			(8.86)	(1.51)	(-0.17)
ROA			0.001	-0.004	-0.004
			(0.80)	(-0.53)	(-0.49)
CAR1			-0.002	-0.017	-0.014
			(-1.04)	(-1.85)	(-1.66)
CAR3			0.002	0.008	0.007
			(1.35)	(1.47)	(1.31)
Asset_growth			0.219	1.501	1.604
			(2.38)	(3.17)	(3.55)
Book-to-market			25.785	-24.863	-61.075
			(1.69)	(-0.32)	(-0.83)
Firm Market Capitalization			0.008	0.046	0.037
			(9.26)	(10.13)	(8.42)
Gindex			0.001	0.011	0.008
			(0.11)	(0.35)	(0.27)
Staggered board dummy			0.094	0.407	0.313
			(2.68)	(2.29)	(1.85)
Institutional holding			-0.007	-0.673	-0.708
			(-0.13)	(-2.52)	(-2.79)
Abnormal capital expenditure			-0.002	0.000	0.001
			(-0.33)	(-0.01)	(0.03)
Firm fixed effect	yes	yes			
Time fixed effect	yes	yes			
R <sup>2</sup>	0.084	0.080	0.090	0.083	
N	13118	11438	11396	11396	



Panel B	[1]	[2]	[3]	[4]	[5]
Independent Variable					
Intercept	-7.411 (-5.42)	-6.875 (-4.72)	0.067 (1.34)	-6.914 (-4.76)	-2.967 (-2.00)
lagSALECHG_indus	0.101 (11.11)	0.104 (11.34)		0.105 (11.39)	
lagprofitability	-21.319 (-10.98)	-21.812 (-11.02)		-22.055 (-11.11)	
profitability	18.900 (8.44)	15.094 (6.63)		15.437 (6.78)	
laginvestment	-2.113 (-3.21)	-1.988 (-3.00)		-2.001 (-3.00)	
investment	20.338 (18.31)	17.103 (14.27)		17.427 (14.49)	
lagleverage	-9.661 (-4.12)	-8.798 (-3.62)		-9.254 (-3.780)	
leverage	15.653 (6.64)	14.618 (5.99)		15.078 (6.14)	
cash_capital	-16.462 (-6.09)	-21.003 (-7.39)		-20.880 (-7.32)	
lagcash_capital	19.727 (7.24)	24.762 (8.64)		24.673 (8.59)	
var_ret	4.442 (0.70)	-10.686 (-1.61)	-0.262 (-1.01)	-10.692 (-1.62)	3.666 (0.48)
size	0.084 (0.64)	0.145 (1.05)	-0.005 (-0.86)	0.118 (0.85)	0.377 (2.03)
tobinq	2.287 (8.68)	2.211 (7.89)		2.259 (8.00)	
lagtobinq	-0.965 (-4.69)	-0.740 (-3.44)		-0.713 (-3.29)	
change in stock holding valuation		4.976 (6.39)			
change in option valuation				0.115 (7.38)	
SALECHG_indus			0.000 (0.26)		-0.041 (-0.77)
sh_dollar_ret			0.002 (14.20)		0.103 (24.98)
sh_dollar_ret*tenure			0.000		0.001

			(18.93)	(16.30)
sh_dollar_ret*var_ret			0.001	0.224
			(1.15)	(7.32)
sh_dollar_ret*size			0.000	-0.009
			(-15.13)	(-24.27)
tenure			0.002	0.038
			(2.26)	(1.32)
ROA			0.001	-0.010
			(0.86)	(-0.42)
CAR1			0.001	0.027
			(1.45)	(0.98)
CAR3			0.002	0.107
			(3.43)	(6.23)
Asset_growth			0.164	4.589
			(3.45)	(3.26)
Book-to-market			0.542	28.751
			(0.07)	(0.12)
Firm Market Capitalization			-0.001	-0.053
			(-1.11)	(-3.95)
Gindex			-0.004	-0.027
			(-1.09)	(-0.28)
Staggered board dummy			-0.007	-0.024
			(-0.37)	(-0.04)
Institutional holding			-0.033	-0.622
			(-1.24)	(-0.77)
Abnormal capital expenditure			-0.001	-0.074
			(-0.21)	(-0.68)
Firm fixed effect	yes	yes		yes
Time fixed effect	yes	yes		yes
R <sup>2</sup>	0.084	0.093		0.161
N	13118	11438		11434

**Table 5**

**Managerial entrenchment and simultaneous equation regression.**

Our universe of firms consists of all NYSE, AMEX, and Nasdaq firms present in the Execucomp database from 1993 to 2011. Further these firms have to be present in the Riskmetrics (formerly IRRC) and Thompson Financial dataset. We exclude financial services firms and utility firms (SIC codes 6000 – 6999 and 4900 – 4999, respectively), as well as firms with assets less than \$10 million and sales less than \$5million. We utilize several accounting variables throughout our analysis. For all our accounting variables, we rely on COMPUSTAT through WRDS. We calculate percentage of institutional holding from Thompson Financial and use the value of GIM index (Gompers, Ishii and Metrick, 2003) from Riskmetrics. We exclude firms with incomplete COMPUSTAT asset or sales data. Further we exclude firms with incomplete Thompson Financial institutional holding data and incomplete GIM index data from Riskmetrics. Our final sample has 13,118 firm year observations.

Cash compensation is total\_curr from Execucomp. Total compensation is TDC1 from Execucomp. Incentive compensation is the difference between total compensation and cash compensation. Change in stock holding valuation is calculated as the percentage of stocks held by the CEO at the beginning of the fiscal year multiplied by shareholder dollar return. The shareholder dollar return is calculated as the percentage total return multiplied by the market value of the firm at the beginning of the fiscal year. Change in option valuation is the value of the options in the current year minus the value of the options in the previous year.

All accounting variables are from Compustat. Sales change is the year-over-year percentage change in sales of the firm. Industry adjusted sales change is calculated by subtracting the industry median sales change in a year, where industry is defined by three digit industry code. Size is the total assets as reported in Compustat. Profitability is the sum of income before extraordinary income and depreciation scaled by total assets. Tenure is the number of years CEO is in office. Leverage is defined as the sum of long term debt and short term debt divided by total assets. Investment is defined as the ratio of capital expenditure to property, plant and equipment at the beginning of the year. Cash capital is calculated as the sum of cash and short term investments scaled by total assets. Tobin's q is the ratio of market value of assets to book value of assets. Book to market is the ratio of book equity to market equity. Firm market capitalization is the market value of the firm in December of the current year. sh\_dollar\_ret is the shareholder dollar return as defined above. var\_ret is the variance of stock returns for the previous year using daily stock returns data. ROA is defined as operating income before depreciation scaled by total assets. CAR1 is the twelve month buy and hold return over January(t) to December(t) as  $[(1+r_1) \times (1+r_2) \dots (1+r_{12}) - 1]$  where  $r_i$  is the return in month  $i$ . CAR3 is the three year buy and hold return over January (t-2) to December (t) and is computed as  $[(1+r_1) \times (1+r_2) \dots (1+r_{36}) - 1]$  where  $r_i$  is the return in month  $i$ . Asset growth is calculated as one year percentage change in asset of a firm. Abnormal capital investment is computed as  $[CE_t / (CE_{t-1} + CE_{t-2} + CE_{t-3}) - 1]$  where  $CE_t$  is the capital expenditure scaled by net sales. Firm market capitalization is the market value of of the firm in December of year t.

We sort our firms into deciles based on the EI score every year. The bottom four decile firms are classified as low entrenchment firms. The top four deciles are classified as the high entrenchment firms.

Industry adjusted sales change and CEO compensation are the two endogenous variables in the simultaneous regression equation system.

Panel A : Cash compensation						
	[1]	[2]	[3]	[4]	[5]	[6]
Independent Variable	Low EI Index firms		High EI index firms		All firms	
Intercept	-7.521	-1.748	-5.717	-1.748	-1.030	-1.831
	(-3.23)	(-9.68)	(-2.56)	(-9.39)	(-0.62)	(-14.76)
lagSALECHG_indus	0.113		0.031		0.064	
	(6.43)		(2.36)		(5.96)	
lagprofitability	-25.960		-13.175		-19.139	
	(-7.73)		(-4.53)		(-8.66)	
profitability	20.060		0.701		9.456	
	(5.66)		(0.20)		(3.81)	
laginvestment	-0.426		-4.492		-1.500	
	(-0.51)		(-3.50)		(-2.20)	
investment	13.639		19.410		14.649	
	(7.47)		(9.67)		(11.10)	
lagleverage	-11.786		-2.904		-7.781	
	(-3.05)		(-0.79)		(-2.94)	
leverage	14.213		7.149		11.010	
	(3.76)		(1.94)		(4.21)	
cash_capital	-13.325		-22.018		-18.387	
	(-2.98)		(-5.09)		(-5.92)	
lagcash_capital	17.989		27.409		23.689	
	(4.03)		(6.14)		(7.52)	
var_ret	-13.532	0.812	-34.494	1.170	-25.687	0.882
	(-1.17)	(0.78)	(-3.23)	(1.28)	(-3.26)	(1.29)
size	0.100	0.348	-0.518	0.371	-0.869	0.374
	(0.39)	(16.03)	(-1.95)	(16.44)	(-4.66)	(24.45)
tobinq	2.254		0.700		1.723	
	(5.65)		(1.51)		(5.79)	
lagtobinq	-1.006		0.525		-0.487	
	(-3.46)		(1.39)		(-2.17)	
cash compensation	0.719		3.758		2.427	
	(1.06)		(6.93)		(5.07)	
dum_ei					-4.165	
					(-9.19)	
dum_ei*cash_compensation					3.282	
					(21.28)	
SALECHG_indus		0.000		0.008		0.004
		(0.04)		(1.05)		(0.69)
sh_dollar_ret		0.000		0.004		0.001
		(-0.46)		(5.38)		(2.74)
sh_dollar_ret*tenure		0.000		0.000		0.000

	(1.18)	(-5.86)	(-1.04)
sh_dollar_ret*var_ret	0.004	-0.021	-0.003
	(1.31)	(-4.21)	(-1.27)
sh_dollar_ret*size	0.000	0.000	0.000
	(0.33)	(-4.47)	(-2.54)
tenure	0.017	0.025	0.018
	(4.89)	(7.42)	(7.72)
ROA	0.004	0.005	0.005
	(1.66)	(2.08)	(2.50)
CAR1	-0.002	0.002	-0.001
	(-0.40)	(1.01)	(-0.62)
CAR3	0.000	0.010	0.002
	(0.02)	(4.17)	(1.67)
Asset_growth	0.122	0.632	0.477
	(0.73)	(3.24)	(3.51)
Book-to-market	-5.832	-11.384	-11.914
	(-0.22)	(-0.39)	(-0.61)
Firm Market Capitalization	0.006	0.011	0.006
	(4.81)	(4.69)	(5.66)
Gindex	0.035	-0.009	0.006
	(2.71)	(-0.84)	(0.81)
Staggered board dummy	0.061	0.047	0.082
	(0.99)	(0.67)	(1.94)
Institutional holding	-0.120	-0.034	-0.072
	(-1.23)	(-0.38)	(-1.09)
Abnormal capital expenditure	-0.002	-0.060	-0.008
	(-0.32)	(-2.92)	(-1.15)
Firm fixed effect	yes	yes	yes
Time fixed effect	yes	yes	yes
R <sup>2</sup>	0.119	0.133	0.134
N	4251	4977	9229

Panel B : Total compensation		[1]	[2]	[3]	[4]	[5]	[6]
Independent Variable							
	Low EI Index firms		High EI index firms		All firms		
Intercept	-6.646	-11.363	-3.420	-9.560	-0.029	-11.041	
	(-2.73)	(-10.31)	(-1.53)	(-13.16)	(-0.02)	(-17.21)	
lagSALECHG_indus	0.109		0.033		0.057		
	(6.26)		(2.61)		(5.57)		
lagprofitability	-25.439		-12.974		-17.446		
	(-7.61)		(-4.69)		(-8.15)		
profitability	19.228		1.169		10.269		
	(5.48)		(0.35)		(4.30)		
laginvestment	-0.415		-3.779		-1.424		
	(-0.50)		(-3.14)		(-2.20)		
investment	13.460		19.818		14.845		
	(7.48)		(10.73)		(11.89)		
lagleverage	-11.175		-1.302		-6.544		
	(-2.95)		(-0.38)		(-2.60)		
leverage	13.297		4.308		9.578		
	(3.58)		(1.25)		(3.83)		
cash_capital	-12.315		-18.592		-14.909		
	(-2.77)		(-4.57)		(-4.99)		
lagcash_capital	18.255		23.436		21.051		
	(4.15)		(5.61)		(7.00)		
var_ret	-17.445	21.956	-42.155	11.865	-32.264	15.964	
	(-1.50)	(3.45)	(-4.05)	(3.29)	(-4.17)	(4.51)	
size	0.025	1.827	-0.100	1.793	-0.725	1.900	
	(0.09)	(13.67)	(-0.37)	(20.08)	(-3.79)	(23.84)	
tobinq	2.211		1.340		1.606		
	(5.58)		(3.03)		(5.56)		
lagtobinq	-1.000		0.119		-0.511		
	(-3.49)		(0.34)		(-2.38)		
total compensation	0.210		0.418		0.325		
	(1.79)		(3.47)		(3.69)		
dum_ei					-2.903		
					(-6.69)		
dum_ei*total_compensation					0.664		
					(17.50)		
SALECHG_indus		0.050		0.113		0.108	
		(1.16)		(3.78)		(3.74)	
sh_dollar_ret		-0.001		0.016		0.003	
		(-0.27)		(6.53)		(1.62)	
sh_dollar_ret*tenure		0.000		0.000		0.000	

	(2.59)	(1.25)	(3.12)
sh_dollar_ret*var_ret	-0.021	-0.070	-0.036
	(-1.03)	(-3.68)	(-2.70)
sh_dollar_ret*size	0.000	-0.002	0.000
	(0.15)	(-6.94)	(-1.82)
tenure	0.019	0.032	0.022
	(0.92)	(2.60)	(1.89)
ROA	0.011	0.006	0.009
	(0.69)	(0.56)	(0.91)
CAR1	-0.051	0.005	-0.013
	(-1.66)	(0.52)	(-1.23)
CAR3	0.024	0.035	0.011
	(1.43)	(3.73)	(1.57)
Asset_growth	1.556	1.137	1.435
	(1.53)	(1.51)	(2.06)
Book-to-market	-105.400	-82.186	-88.536
	(-0.65)	(-0.75)	(-0.90)
Firm Market Capitalization	0.041	0.086	0.045
	(5.76)	(9.39)	(8.69)
Gindex	0.127	-0.051	0.012
	(1.63)	(-1.31)	(0.30)
Staggered board dummy	0.249	0.191	0.289
	(0.67)	(0.71)	(1.36)
Institutional holding	0.493	0.130	0.352
	(0.84)	(0.38)	(1.06)
Abnormal capital expenditure	-0.015	-0.234	-0.038
	(-0.33)	(-3.02)	(-1.15)
Firm fixed effect	yes	yes	yes
Time fixed effect	yes	yes	yes
R <sup>2</sup>	0.112	0.185	0.140
N	4237	4965	9203

Panel C : Incentive compensation		[1]	[2]	[3]	[4]	[5]	[6]
Independent Variable							
	Low EI Index firms		High EI index firms		All firms		
Intercept	-6.224	-9.636	-3.345	-7.780	-0.857	-9.217	
	(-2.52)	(-9.04)	(-1.48)	(-11.40)	(-0.51)	(-14.97)	
lagSALECHG_indus	0.108		0.035		0.058		
	(6.25)		(2.75)		(5.64)		
lagprofitability	-25.391		-13.028		-17.322		
	(-7.60)		(-4.69)		(-8.09)		
profitability	19.157		1.261		10.583		
	(5.46)		(0.38)		(4.43)		
laginvestment	-0.402		-4.052		-1.430		
	(-0.49)		(-3.36)		(-2.20)		
investment	13.257		19.175		14.872		
	(7.39)		(10.40)		(11.93)		
lagleverage	-11.102		-1.507		-6.500		
	(-2.94)		(-0.44)		(-2.59)		
leverage	13.123		4.606		9.568		
	(3.54)		(1.33)		(3.83)		
cash_capital	-12.388		-19.049		-14.841		
	(-2.78)		(-4.67)		(-4.96)		
lagcash_capital	18.439		24.350		21.024		
	(4.20)		(5.82)		(6.99)		
var_ret	-18.207	21.057	-42.609	10.918	-32.637	15.174	
	(-1.56)	(3.41)	(-4.09)	(3.23)	(-4.22)	(4.47)	
size	0.010	1.485	0.052	1.416	-0.555	1.526	
	(0.04)	(11.47)	(0.19)	(16.92)	(-2.92)	(19.95)	
tobinq	2.201		1.541		1.637		
	(5.56)		(3.43)		(5.64)		
lagtobinq	-0.995		0.135		-0.510		
	(-3.49)		(0.38)		(-2.38)		
incentive compensation	0.267		0.355		0.340		
	(1.92)		(2.38)		(3.21)		
dum_ei					-2.045		
					(-4.87)		
dum_ei*incentive compensation					0.678		
					(16.35)		
SALECHG_indus		0.048		0.105		0.103	
		(1.15)		(3.73)		(3.71)	
sh_dollar_ret		0.000		0.013		0.002	
		(-0.17)		(5.58)		(1.24)	
sh_dollar_ret*tenure		0.000		0.000		0.000	



	(2.49)	(3.20)	(3.49)
sh_dollar_ret*var_ret	-0.024	-0.048	-0.033
	(-1.27)	(-2.72)	(-2.58)
sh_dollar_ret*size	0.000	-0.001	0.000
	(0.07)	(-6.29)	(-1.49)
tenure	0.002	0.007	0.004
	(0.08)	(0.57)	(0.37)
ROA	0.006	0.000	0.004
	(0.40)	(0.04)	(0.41)
CAR1	-0.048	0.003	-0.011
	(-1.62)	(0.38)	(-1.08)
CAR3	0.024	0.025	0.008
	(1.45)	(2.79)	(1.26)
Asset_growth	1.761	0.851	1.303
	(1.79)	(1.20)	(1.95)
Book-to-market	-110.301	-70.992	-83.033
	(-0.71)	(-0.69)	(-0.88)
Firm Market Capitalization	0.035	0.075	0.039
	(5.03)	(8.74)	(7.85)
Gindex	0.087	-0.045	0.002
	(1.16)	(-1.23)	(0.06)
Staggered board dummy	0.198	0.129	0.215
	(0.55)	(0.51)	(1.05)
Institutional holding	0.600	0.198	0.437
	(1.06)	(0.62)	(1.37)
Abnormal capital expenditure	-0.013	-0.183	-0.033
	(-0.30)	(-2.50)	(-1.02)
Firm fixed effect	yes	yes	yes
Time fixed effect	yes	yes	yes
R <sup>2</sup>	0.097	0.156	0.119
N	4237	4965	9203

Panel D : Change in stock holding valuation	[1]	[2]	[3]	[4]	[5]	[6]
Independent Variable						
	Low EI Index firms		High EI index firms		All firms	
Intercept	-6.307	0.140	-6.891	-0.033	-6.182	0.062
	(-2.74)	(1.93)	(-3.18)	(-0.91)	(-3.85)	(1.56)
lagSALECHG_indus	0.111		0.037		0.069	
	(6.38)		(2.73)		(6.36)	
lagprofitability	-25.981		-13.127		-18.877	
	(-7.80)		(-4.41)		(-8.52)	
profitability	19.785		2.484		10.948	
	(5.64)		(0.71)		(4.45)	
laginvestment	-0.394		-5.296		-1.528	
	(-0.48)		(-4.02)		(-2.22)	
investment	13.110		20.214		16.056	
	(7.24)		(10.23)		(12.22)	
lagleverage	-11.804		-3.248		-8.004	
	(-3.11)		(-0.87)		(-3.01)	
leverage	14.656		8.751		12.249	
	(3.93)		(2.33)		(4.63)	
cash_capital	-14.115		-24.255		-18.778	
	(-3.17)		(-5.49)		(-5.99)	
lagcash_capital	17.688		28.745		22.531	
	(4.00)		(6.41)		(7.17)	
var_ret	-15.844	-0.077	-34.937	-0.077	-27.173	-0.086
	(-1.37)	(-0.18)	(-3.34)	(-0.43)	(-3.49)	(-0.40)
size	0.135	-0.027	0.336	0.009	0.173	-0.013
	(0.65)	(-3.14)	(1.54)	(2.00)	(1.15)	(-2.59)
tobinq	2.238		1.256		1.935	
	(5.66)		(2.63)		(6.44)	
lagtobinq	-0.974		0.496		-0.516	
	(-3.38)		(1.28)		(-2.26)	
ch in stock holding	3.934		8.309		4.781	
	(3.57)		(4.80)		(4.83)	
dum_ei					0.165	
					(0.40)	
dum_ei*ch in stock holding					6.031	
					(7.74)	
SALECHG_indus		0.002		-0.001		0.000
		(0.73)		(-0.47)		(-0.01)
sh_dollar_ret		0.002		0.001		0.002
		(13.37)		(7.66)		(16.37)
sh_dollar_ret*tenure		0.000		0.000		0.000

	(8.88)	(28.36)	(17.10)
sh_dollar_ret*var_ret	-0.001	0.001	0.000
	(-0.60)	(1.18)	(0.37)
sh_dollar_ret*size	0.000	0.000	0.000
	(-13.39)	(-10.02)	(-16.77)
tenure	0.002	0.002	0.002
	(1.22)	(2.34)	(2.86)
ROA	0.000	0.001	0.001
	(0.27)	(2.05)	(0.88)
CAR1	0.001	0.000	0.001
	(0.43)	(0.78)	(1.41)
CAR3	0.003	0.002	0.003
	(2.94)	(3.08)	(6.61)
Asset_growth	0.152	0.046	0.118
	(2.25)	(1.20)	(2.73)
Book-to-market	-2.860	-0.474	-1.322
	(-0.27)	(-0.08)	(-0.21)
Firm Market Capitalization	0.001	-0.001	0.000
	(2.12)	(-3.03)	(1.12)
Gindex	0.000	-0.002	-0.001
	(0.03)	(-1.02)	(-0.47)
Staggered board dummy	0.024	-0.004	0.009
	(0.98)	(-0.27)	0.62)
Institutional holding	0.025	-0.020	0.010
	(0.64)	(-1.09)	(0.48)
Abnormal capital expenditure	-0.001	-0.006	-0.001
	(-0.26)	(-1.33)	(-0.53)
Firm fixed effect	yes	yes	yes
Time fixed effect	yes	yes	yes
R <sup>2</sup>	0.125	0.138	0.112
N	4251	4977	9203

Panel E : Change in options valuation	[1]	[2]	[3]	[4]	[5]	[6]
Independent Variable						
	Low EI Index firms		High EI index firms		All firms	
Intercept	-7.318	-2.350	-5.629	-3.309	-6.319	-3.395
	(-3.18)	(-0.99)	(-2.58)	(-1.43)	(-3.95)	(-2.13)
lagSALECHG_indus	0.112		0.037		0.068	
	(6.41)		(2.73)		(6.28)	
lagprofitability	-26.116		-12.188		-18.754	
	(-7.80)		(-4.15)		(-8.46)	
profitability	20.316		0.998		11.225	
	(5.78)		(0.28)		(4.57)	
laginvestment	-0.462		-4.880		-1.491	
	(-0.55)		(-3.75)		(-2.16)	
investment	13.497		19.252		16.000	
	(7.40)		(9.82)		(12.19)	
lagleverage	-12.504		-2.925		-8.420	
	(-3.24)		(-0.79)		(-3.16)	
leverage	15.191		8.056		12.496	
	(4.02)		(2.16)		(4.71)	
cash_capital	-13.574		-24.039		-18.567	
	(-3.04)		(-5.50)		(-5.95)	
lagcash_capital	17.612		28.331		22.694	
	(3.97)		(6.36)		(7.24)	
var_ret	-12.976	18.141	-34.109	3.402	-26.259	0.780
	(-1.13)	(1.33)	(-3.22)	(0.30)	(-3.40)	(0.09)
size	0.191	0.395	0.205	0.651	0.151	0.511
	(0.93)	(1.38)	(0.92)	(2.34)	(1.01)	(2.62)
tobinq	2.306		1.133		1.932	
	(5.79)		(2.41)		(6.42)	
lagtobinq	-0.922		0.395		-0.517	
	(-3.16)		(1.03)		(-2.26)	
ch in stock option	0.056		0.215		0.085	
	(2.99)		(8.20)		(5.47)	
dum_ei					0.121	
					(0.30)	
dum_ei*ch in stock option					0.092	
					(7.60)	
SALECHG_indus		-0.036		0.031		-0.018
		(-0.39)		(0.32)		(-0.25)
sh_dollar_ret		0.108		0.083		0.110
		(20.75)		(9.88)		(26.67)
sh_dollar_ret*tenure		0.001		0.001		0.001
		(13.06)		(8.16)		(15.80)

sh_dollar_ret*var_ret	0.279 (6.37)	0.175 (2.75)	0.255 (7.34)
sh_dollar_ret*size	-0.009 (-20.64)	-0.007 (-8.21)	-0.009 (-25.97)
tenure	0.021 (0.48)	0.086 (2.05)	0.055 (1.78)
ROA	0.039 (1.13)	-0.006 (-0.17)	-0.004 (-0.16)
CAR1	-0.205 (-3.05)	0.032 (1.09)	0.010 (0.37)
CAR3	0.256 (6.88)	0.030 (1.09)	0.126 (6.98)
Asset_growth	-0.679 (-0.31)	10.432 (4.29)	5.146 (2.95)
Book-to-market	-52.436 (-0.15)	-342.173 (-0.94)	-108.684 (-0.42)
Firm Market Capitalization	-0.033 (-2.14)	-0.093 (-3.29)	-0.047 (-3.71)
Gindex	0.028 (0.17)	-0.007 (-0.06)	0.064 (0.64)
Staggered board dummy	-1.184 (-1.45)	-0.439 (-0.49)	-0.602 (-1.09)
Institutional holding	-0.142 (-0.11)	-1.732 (-1.54)	-0.758 (-0.89)
Abnormal capital expenditure	0.012 (0.12)	-0.157 (-0.61)	-0.014 (-0.16)
Firm fixed effect	yes	yes	yes
Time fixed effect	yes	yes	yes
R <sup>2</sup>	0.238	0.172	0.198
N	4248	4977	9226

**Table 6****Descriptive statistics with firms classified based on financial constraint**

Our universe of firms consists of all NYSE, AMEX, and Nasdaq firms present in the Execucomp database from 1993 to 2011. Further these firms have to be present in the Riskmetrics (formerly IRRC) and Thompson Financial dataset. We exclude financial services firms and utility firms (SIC codes 6000 – 6999 and 4900 – 4999, respectively), as well as firms with assets less than \$10 million and sales less than \$5million. We exclude firms with incomplete COMPUSTAT asset or sales data. Further we exclude firms with incomplete Thompson Financial institutional holding data and incomplete GIM index data from Riskmetrics. Our final sample has 13,118 firm year observations.

In Panel A, we divide the firms based on long run credit ratings. If a firm has a rating (Compustat variable SPLTCRM) of BBB- or better, it is classified as financially unconstrained. A firm with a rating below BBB- is considered financially constrained.

In panel B, we classify the firms based on short run credit ratings. If the short run credit ratings (Compustat variable SPSTICRM) is B and above, then the firm is classified as financially unconstrained. If a firm has a short run credit rating of B1 and below, the firm is classified as financially constrained.

The numbers reported in columns 1 and 2 are industry adjusted sales change. The third column reports the difference in industry adjusted sales change between constrained and unconstrained firms. \*\*\* implies that the difference is significant at one percent level of significance.

	Unconstrained	Constrained	Constrained - Unconstrained
Panel A			
LR Credit Rating	-0.080	2.928	3.008***
N	4662	8455	
Panel B			
SR Credit Rating	-0.695	2.638	3.333***
N	3239	12029	

**Table 7**

**Simultaneous equation regression with financial constraint based on long run credit ratings**

Our universe of firms consists of all NYSE, AMEX, and Nasdaq firms present in the Execucomp database from 1993 to 2011. Further these firms have to be present in the Riskmetrics (formerly IRRC) and Thompson Financial dataset. We exclude financial services firms and utility firms (SIC codes 6000 – 6999 and 4900 – 4999, respectively), as well as firms with assets less than \$10 million and sales less than \$5million. We utilize several accounting variables throughout our analysis. For all our accounting variables, we rely on COMPUSTAT through WRDS. We calculate percentage of institutional holding from Thompson Financial and use the value of GIM index (Gompers, Ishii and Metrick, 2003) from Riskmetrics. We exclude firms with incomplete COMPUSTAT asset or sales data. Further we exclude firms with incomplete Thompson Financial institutional holding data and incomplete GIM index data from Riskmetrics. Our final sample has 13,118 firm year observations.

Cash compensation is total\_curr from Execucomp. Total compensation is TDC1 from Execucomp. Incentive compensation is the difference between total compensation and cash compensation. Change in stock holding valuation is calculated as the percentage of stocks held by the CEO at the beginning of the fiscal year multiplied by shareholder dollar return. The shareholder dollar return is calculated as the percentage total return multiplied by the market value of the firm at the beginning of the fiscal year. Change in option valuation is the value of the options in the current year minus the value of the options in the previous year.

All accounting variables are from Compustat. Sales change is the year-over-year percentage change in sales of the firm. Industry adjusted sales change is calculated by subtracting the industry median sales change in a year, where industry is defined by three digit industry code. Size is the total assets as reported in Compustat. Profitability is the sum of income before extraordinary income and depreciation scaled by total assets. Tenure is the number of years CEO is in office. Leverage is defined as the sum of long term debt and short term debt divided by total assets. Investment is defined as the ratio of capital expenditure to property, plant and equipment at the beginning of the year. Cash capital is calculated as the sum of cash and short term investments scaled by total assets. Tobin's q is the ratio of market value of assets to book value of assets. Book to market is the ratio of book equity to market equity. Firm market capitalization is the market value of the firm in December of the current year. sh\_dollar\_ret is the shareholder dollar return as defined above. var\_ret is the variance of stock returns for the previous year using daily stock returns data. ROA is defined as operating income before depreciation scaled by total assets. CAR1 is the twelve month buy and hold return over January(t) to December(t) as  $[(1+r_1)(1+r_2)\dots(1+r_{12}) - 1]$  where  $r_i$  is the return in month  $i$ . CAR3 is the three year buy and hold return over January (t-2) to December (t) and is computed as  $[(1+r_1)(1+r_2)\dots(1+r_{36}) - 1]$  where  $r_i$  is the return in month  $i$ . Asset growth is calculated as one year percentage change in asset of a firm. Abnormal capital investment is computed as  $[CE_t / (CE_{t-1} + CE_{t-2} + CE_{t-3}) - 1]$  where  $CE_t$  is the capital expenditure scaled by net sales. Firm market capitalization is the market value of of the firm in December of year t.

We divide the firms based on long run credit ratings. If a firm has a rating (Compustat variable SPLTCRM) of BBB- or better are considered financially unconstrained. Firms with a rating below BBB- are considered financially constrained. If a firm is financially constrained, LR\_ratings dummy variable has a value of 1. Otherwise, the variable has a value of 0.

Industry adjusted sales change and CEO compensation are the two endogenous variables in the simultaneous regression equation system.

Panel A	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Intercept	-11.803 (-6.77)	-2.728 (-1.05)	-1.765 (-18.39)	3.122 (0.79)	-11.090 (-22.41)	1.887 (0.46)	-9.335 (-19.58)
lagSALECHG_indus	0.100 (10.93)	0.100 (10.88)		0.091 (10.49)		0.092 (10.55)	
lagprofitability	-21.306 (-10.98)	-21.907 (-10.99)		-20.342 (-10.56)		-20.325 (-10.54)	
profitability	18.793 (8.39)	13.194 (5.67)		12.938 (5.69)		13.261 (5.77)	
laginvestment	-2.185 (-3.32)	-1.894 (-2.88)		-1.715 (-2.77)		-1.735 (-2.80)	
investment	20.000 (17.97)	15.783 (12.25)		14.929 (12.59)		14.791 (12.65)	
lagleverage	-9.815 (-4.19)	-8.271 (-3.32)		-5.736 (-2.49)		-5.790 (-2.52)	
leverage	15.618 (6.63)	13.847 (5.58)		10.653 (4.53)		10.621 (4.53)	
cash_capital	-16.758 (-6.20)	-21.630 (-7.51)		-18.835 (-6.65)		-18.743 (-6.59)	
lagcash_capital	19.496 (7.15)	25.034 (8.60)		23.063 (8.35)		23.198 (8.36)	
var_ret	2.829 (0.44)	-11.183 (-1.61)	1.195 (2.38)	-20.898 (-3.02)	14.838 (5.69)	-21.489 (-3.11)	13.788 (5.50)
size	0.501 (2.99)	-1.601 (-3.75)	0.368 (8.06)	-1.627 (-2.75)	1.949 (30.65)	-1.257 (-2.13)	1.576 (25.78)
tobinq	2.355 (8.92)	1.921 (6.82)		1.930 (6.60)		2.000 (6.68)	
lagtobinq	-0.960 (-4.67)	-0.674 (-3.14)		-0.702 (-3.48)		-0.699 (-3.46)	
LR credit rating dummy	2.100 (4.05)	1.902 (3.53)		1.351 (2.60)		1.397 (2.64)	
cash compensation		5.303 (5.60)					
total compensation				0.897 (4.12)			
incentive compensation						0.898 (3.49)	
SALECHG_indus			0.001 (0.39)		0.066 (3.68)		0.064 (3.69)
sh_dollar_ret			0.001		0.003		0.002



			(3.57)	(2.38)	(1.88)
sh_dollar_ret*tenure			0.000	0.000	0.000
			(-0.97)	(2.91)	(3.27)
sh_dollar_ret*var_ret			-0.001	-0.025	-0.023
			(-0.74)	(-2.65)	(-2.59)
sh_dollar_ret*size			0.000	0.000	0.000
			(-3.36)	(-2.64)	(-2.19)
tenure			0.015	0.016	0.002
			(8.06)	(1.90)	(0.21)
ROA			0.005	0.008	0.003
			(3.61)	(1.09)	(0.42)
CAR1			-0.002	-0.014	-0.012
			(-1.04)	(-1.66)	(-1.48)
CAR3			0.002	0.010	0.008
			(2.08)	(1.93)	(1.60)
Asset_growth			0.551	2.746	2.565
			(6.06)	(5.94)	(5.77)
Book-to-market			-5.009	-166.518	-165.332
			(-0.35)	(-2.35)	(-2.42)
Firm Market Capitalization			0.006	0.043	0.037
			(6.79)	(9.68)	(8.77)
Gindex			0.006	-0.001	-0.008
			(0.94)	(-0.03)	(-0.29)
Staggered board dummy			0.066	0.349	0.299
			(1.97)	(2.13)	(1.89)
Institutional holding			-0.069	0.088	0.165
			(-1.37)	(0.35)	(0.69)
Abnormal capital expenditure			-0.001	0.001	0.002
			(-0.18)	(0.02)	(0.07)
Firm fixed effect	yes	yes		yes	yes
Time fixed effect	yes	yes		yes	yes
R <sup>2</sup>	0.085	0.132	0.151	0.129	
N	13086	11438	11396	11396	

Panel B	[1]	[2]	[3]	[4]	[5]
Intercept	-11.803 (-6.77)	-11.265 (-6.06)	0.061 (1.21)	-11.039 (-5.94)	-3.459 (-2.33)
lagSALECHG_indus	0.100 (10.93)	0.102 (11.17)		0.103 (11.21)	
lagprofitability	-21.306 (-10.98)	-21.790 (-11.02)		-21.959 (-11.08)	
profitability	18.793 (8.39)	14.928 (6.57)		15.229 (6.70)	
laginvestment	-2.185 (-3.32)	-2.051 (-3.10)		-2.054 (-3.09)	
investment	20.000 (17.97)	16.786 (13.99)		17.019 (14.13)	
lagleverage	-9.815 (-4.19)	-8.993 (-3.70)		-9.481 (-3.88)	
leverage	15.618 (6.63)	14.604 (5.99)		15.131 (6.17)	
cash_capital	-16.758 (-6.20)	-21.196 (-7.47)		-21.249 (-7.45)	
lagcash_capital	19.496 (7.15)	24.486 (8.55)		24.453 (8.52)	
var_ret	2.829 (0.44)	-12.161 (-1.83)	-0.284 (-1.10)	-12.049 (-1.83)	1.600 (0.21)
size	0.501 (2.99)	0.553 (3.15)	-0.004 (-0.60)	0.482 (2.75)	0.610 (3.27)
tobinq	2.355 (8.92)	2.278 (8.12)		2.315 (8.20)	
lagtobinq	-0.960 (-4.67)	-0.735 (-3.42)		-0.704 (-3.26)	
LR credit rating dummy	2.100 (4.05)	2.025 (3.76)		2.069 (3.82)	
change in stock holding valuation		4.670 (6.26)		0.109 (7.55)	
change in stock option					
incentive compensation					
SALECHG_indus			0.001 (0.38)		-0.034 (-0.65)

sh_dollar_ret			0.002 (14.90)	0.113 (27.41)
sh_dollar_ret*tenure			0.000 (19.69)	0.001 (17.09)
sh_dollar_ret*var_ret			0.001 (0.83)	0.214 (6.99)
sh_dollar_ret*size			0.000 (-15.82)	-0.010 (-26.43)
tenure			0.002 (2.38)	0.041 (1.43)
ROA			0.001 (0.95)	-0.007 (-0.31)
CAR1			0.001 (1.53)	0.033 (1.20)
CAR3			0.002 (3.36)	0.109 (6.35)
Asset_growth			0.155 (3.26)	5.046 (3.57)
Book-to-market			-0.562 (-0.07)	-148.852 (-0.64)
Firm Market Capitalization			-0.001 (-1.28)	-0.063 (-4.70)
Gindex			-0.003 (-1.03)	0.010 (0.11)
Staggered board dummy			-0.006 (-0.31)	-0.133 (-0.25)
Institutional holding			-0.038 (-1.40)	-1.176 (-1.46)
Abnormal capital expenditure			-0.001 (-0.19)	-0.049 (-0.45)
Firm fixed effect	yes	yes		yes
Time fixed effect	yes	yes		yes
R <sup>2</sup>	0.085	0.097		0.180
N	13086	11438		11434

**Table 8**

**Simultaneous equation regression with financial constraint based on short run credit ratings**

Our universe of firms consists of all NYSE, AMEX, and Nasdaq firms present in the Execucomp database from 1993 to 2011. Further these firms have to be present in the Riskmetrics (formerly IRRC) and Thompson Financial dataset. We exclude financial services firms and utility firms (SIC codes 6000 – 6999 and 4900 – 4999, respectively), as well as firms with assets less than \$10 million and sales less than \$5million. We utilize several accounting variables throughout our analysis. For all our accounting variables, we rely on COMPUSTAT through WRDS. We calculate percentage of institutional holding from Thompson Financial and use the value of GIM index (Gompers, Ishii and Metrick, 2003) from Riskmetrics. We exclude firms with incomplete COMPUSTAT asset or sales data. Further we exclude firms with incomplete Thompson Financial institutional holding data and incomplete GIM index data from Riskmetrics. Our final sample has 13,118 firm year observations.

Cash compensation is total\_curr from Execucomp. Total compensation is TDC1 from Execucomp. Incentive compensation is the difference between total compensation and cash compensation. Change in stock holding valuation is calculated as the percentage of stocks held by the CEO at the beginning of the fiscal year multiplied by shareholder dollar return. The shareholder dollar return is calculated as the percentage total return multiplied by the market value of the firm at the beginning of the fiscal year. Change in option valuation is the value of the options in the current year minus the value of the options in the previous year.

All accounting variables are from Compustat. Sales change is the year-over-year percentage change in sales of the firm. Industry adjusted sales change is calculated by subtracting the industry median sales change in a year, where industry is defined by three digit industry code. Size is the total assets as reported in Compustat. Profitability is the sum of income before extraordinary income and depreciation scaled by total assets. Tenure is the number of years CEO is in office. Leverage is defined as the sum of long term debt and short term debt divided by total assets. Investment is defined as the ratio of capital expenditure to property, plant and equipment at the beginning of the year. Cash capital is calculated as the sum of cash and short term investments scaled by total assets. Tobin's q is the ratio of market value of assets to book value of assets. Book to market is the ratio of book equity to market equity. Firm market capitalization is the market value of the firm in December of the current year. sh\_dollar\_ret is the shareholder dollar return as defined above. var\_ret is the variance of stock returns for the previous year using daily stock returns data. ROA is defined as operating income before depreciation scaled by total assets. CAR1 is the twelve month buy and hold return over January(t) to December(t) as  $[(1+r_1) \times (1+r_2) \dots \times (1+r_{12}) - 1]$  where  $r_i$  is the return in month  $i$ . CAR3 is the three year buy and hold return over January (t-2) to December (t) and is computed as  $[(1+r_1) \times (1+r_2) \dots \times (1+r_{36}) - 1]$  where  $r_i$  is the return in month  $i$ . Asset growth is calculated as one year percentage change in asset of a firm. Abnormal capital investment is computed as  $[CE_t / (CE_{t-1} + CE_{t-2} + CE_{t-3}) - 1]$  where  $CE_t$  is the capital expenditure scaled by net sales. Firm market capitalization is the market value of of the firm in December of year t.

We classify the firms based on short run credit ratings. If the short run credit ratings (Compustat variable SPSTICRM) is B and above, then the firm is classified as financially unconstrained. If a firm has a short run credit rating of B1 and below, the firm is classified as financially constrained. If a firm is financially constrained, SR\_ratings dummy variable has a value of 1. Otherwise, the variable has a value of 0.

Industry adjusted sales change and CEO compensation are the two endogenous variables in the simultaneous regression equation system.

Panel A	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Independent Variable							
Intercept	-12.151 (-7.00)	-4.562 (-1.70)	-1.762 (-18.35)	1.043 (0.27)	-11.052 (-22.29)	0.078 (0.02)	-9.296 (-19.47)
lagSALECHG_indus	0.099 (10.87)	0.098 (10.68)		0.090 (10.34)		0.091 (10.41)	
lagprofitability	-21.531 (-11.09)	-21.958 (-11.05)		-20.426 (-10.63)		-20.419 (-10.60)	
profitability	18.623 (8.32)	13.204 (5.70)		12.993 (5.73)		13.314 (5.81)	
laginvestment	-2.086 (-3.17)	-1.904 (-2.91)		-1.735 (-2.81)		-1.753 (-2.83)	
investment	20.254 (18.24)	15.771 (12.33)		14.925 (12.63)		14.794 (12.68)	
lagleverage	-9.723 (-4.15)	-8.195 (-3.31)		-5.845 (-2.54)		-5.898 (-2.57)	
leverage	15.547 (6.60)	13.629 (5.52)		10.631 (4.53)		10.611 (4.53)	
cash_capital	-16.650 (-6.16)	-21.513 (-7.50)		-18.838 (-6.67)		-18.782 (-6.62)	
lagcash_capital	19.622 (7.20)	24.896 (8.58)		23.026 (8.35)		23.197 (8.38)	
var_ret	4.454 (0.70)	-11.040 (-1.60)	1.183 (2.35)	-20.367 (-2.96)	14.818 (5.67)	-20.865 (-3.03)	13.781 (5.49)
size	0.496 (3.12)	-1.458 (-3.34)	0.367 (30.15)	-1.459 (-2.54)	1.941 (30.46)	-1.122 (-1.98)	1.568 (25.62)
tobinq	2.463 (9.32)	1.991 (7.07)		2.007 (6.86)		2.072 (6.93)	
lagtobinq	-0.980 (-4.77)	-0.666 (-3.12)		-0.696 (-3.45)		-0.693 (-3.44)	
SR credit rating dummy	2.865 (5.23)	2.718 (4.84)		2.218 (4.06)		2.183 (3.95)	
cash compensation		5.115 (5.41)					
total compensation				0.865 (4.08)			
incentive compensation						0.869 (3.48)	
SALECHG_indus			0.002 (0.58)		0.067 (3.73)		0.064 (3.70)
sh_dollar_ret			0.001 (3.60)		0.003 (2.42)		0.002 (1.92)
sh_dollar_ret*tenure			0.000		0.000		0.000

			(-0.98)	(2.93)	(3.29)
sh_dollar_ret*var_ret			-0.001	-0.025	-0.023
			(-0.75)	(-2.67)	(-2.61)
sh_dollar_ret*size			0.000	0.000	0.000
			(-3.39)	(-2.68)	(-2.23)
tenure			0.015	0.016	0.002
			(8.08)	(1.87)	(0.18)
ROA			0.005	0.008	0.003
			(3.57)	(1.05)	(0.38)
CAR1			-0.002	-0.014	-0.012
			(-1.03)	(-1.65)	(-1.48)
CAR3			0.002	0.010	0.008
			(2.06)	(1.92)	(1.59)
Asset_growth			0.536	2.688	2.525
			(5.89)	(5.81)	(5.68)
Book-to-market			-4.746	-167.737	-166.956
			(-0.33)	(-2.36)	(-2.44)
Firm Market Capitalization			0.006	0.044	0.038
			(6.97)	(9.89)	(8.97)
Gindex			0.006	0.002	-0.005
			(1.03)	(0.08)	(-0.19)
Staggered board dummy			0.066	0.350	0.299
			(1.97)	(2.13)	(1.89)
Institutional holding			-0.070	0.084	0.162
			(-1.38)	(0.34)	(0.67)
Abnormal capital expenditure			-0.001	0.000	0.002
			(-0.21)	(0.01)	(0.07)
Firm fixed effect	yes	yes		yes	yes
Time fixed effect	yes	yes		yes	yes
R <sup>2</sup>	0.084	0.133		0.151	0.129
N	13086	11438		11396	11396

Panel B	[1]	[2]	[3]	[4]	[5]
Intercept	-12.151 (-7.00)	-12.471 (-6.74)	0.062 (1.24)	-12.231 (-6.60)	-3.458 (-2.33)
lagSALECHG_indus	0.099 (10.87)	0.100 (10.98)		0.101 (11.03)	
lagprofitability	-21.531 (-11.09)	-21.896 (-11.08)		-22.049 (-11.13)	
profitability	18.623 (8.32)	14.914 (6.56)		15.204 (6.69)	
laginvestment	-2.086 (-3.17)	-2.061 (-3.12)		-2.062 (-3.10)	
investment	20.254 (18.24)	16.723 (13.95)		16.950 (14.09)	
lagleverage	-9.723 (-4.15)	-9.017 (-3.72)		-9.479 (-3.88)	
leverage	15.547 (6.60)	14.500 (5.95)		14.986 (6.11)	
cash_capital	-16.650 (-6.16)	-21.306 (-7.51)		-21.320 (-7.48)	
lagcash_capital	19.622 (7.20)	24.526 (8.57)		24.481 (8.54)	
var_ret	4.454 (0.70)	-11.532 (-1.74)	-0.283 (-1.09)	-11.477 (-1.74)	1.536 (0.20)
size	0.496 (3.12)	0.596 (3.58)	-0.004 (-0.66)	0.523 (3.14)	0.607 (3.25)
tobinq	2.463 (9.32)	2.346 (8.34)		2.381 (8.41)	
lagtobinq	-0.980 (-4.77)	-0.725 (-3.38)		-0.694 (-3.21)	
SR credit rating dummy	2.865 (5.23)	2.749 (4.85)		2.787 (4.89)	
change in stock holding valuation		4.728 (6.34)		0.109 (7.59)	
change in option valuation					
incentive compensation					
SALECHG_indus			0.001 (0.36)		-0.030 (-0.56)

sh_dollar_ret			0.002 (14.93)	0.113 (27.42)
sh_dollar_ret*tenure			0.000 (19.68)	0.001 (17.09)
sh_dollar_ret*var_ret			0.001 (0.83)	0.214 (7.00)
sh_dollar_ret*size			0.000 (-15.85)	-0.010 (-26.44)
tenure			0.002 (2.37)	0.041 (1.42)
ROA			0.001 (0.95)	-0.007 (-0.32)
CAR1			0.001 (1.53)	0.033 (1.21)
CAR3			0.002 (3.35)	0.109 (6.34)
Asset_growth			0.157 (3.29)	5.033 (3.57)
Book-to-market			-0.686 (-0.09)	-147.264 (-0.63)
Firm Market Capitalization			-0.001 (-1.20)	-0.063 (-4.67)
Gindex			-0.003 (-1.00)	0.013 (0.13)
Staggered board dummy			-0.006 (-0.31)	-0.133 (-0.25)
Institutional holding			-0.038 (-1.42)	-1.184 (-1.47)
Abnormal capital expenditure			-0.001 (-0.19)	-0.050 (-0.46)
Firm fixed effect	yes	yes		yes
Time fixed effect	yes	yes		yes
R <sup>2</sup>	0.084	0.097		0.181
N	13086	11438		11434