EXECUTIVE COMPENSATION DISPERSION AND FIRM PERFORMANCE

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Abstract

In this study, we examine the correlation between managerial pay dispersion and firm performance. We conduct a horse race between two different theories---tournament theory versus behavioral theory. We come to the conclusion that firm performance, measured by abnormal return, is positively associated with managerial compensation dispersion. The result is in consistent with the tournament theory.

Keyword: Compensation dispersion; Firm performance; Abnormal return

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Table of Contents

1. Introduction

Smart investors try to find companies that can outperform their rivals. Of course there are various factors affecting firm performance. In this paper, we focus on the relationship between executive compensation dispersion and firm performance.

After the economic crisis, executive compensation has become a concern of investors. Firms always offer considerable compensation to CEOs as incentive if they achieve certain operating goals. As a result, CEOs prefer higher risk projects in order to get higher return, which may be the reason for market crush. Many papers focus on the relationship between dispersion of executive compensation and firm performance and have several significant findings. Generally speaking, there are two opposite theories —— tournament theory and behavioral theory. According to tournament theory, a high dispersion in executive compensation, where the higher level executives are paid much more than executives that are just below them (i.e., having a high dispersion in executive compensation), provides incentives for executives to exert effort and work hard in order to be promoted within the company towards the top position (see Conyon, Peck and Sandler, 2001). The compensation of top executives is economically efficient because it is secured by considerable salary served as incentive to the lower position managers who are getting paid less than their own expected marginal product and willing to join the tournament, in which the big prize is the top executive's job (Lazer and Rosen, 1981). Behavioral theory suggests that when the pay is more or less equal, it promotes collaboration, which can strengthen firm performance .The behavioral theory is based on the idea that people tend to compare themselves to others —— when they see that co-executives are paid much more, they envy one another (See Akerlof and Yellen, 1988, 1990). That can potentially reduce their motivation and create conflicts within the organization.

In order to quantify firm performance, we use abnormal returns. We analyzed 81,720 firm-month observations, representing 454 listed firms from 1999-2013. We partition 15

years from 1999 to 2013 into three 5-year time period in to be able to get abnormal returns based on monthly data (i.e., 60 months firm level regressions for calculating abnormal return). We estimate company's abnormal return within each time period by using Fama-French three-factor model. We compute the HHI of managerial total compensation for each firm as the measure of compensation dispersion. Then we compute the 5-year average HHI for each firm at each time period. Finally, we regress the abnormal return on HHI and other control variables and find that there is a positive correlation between abnormal return and HHI, indicating that firm performance, measured by abnormal return, is positively associated with the managerial compensation dispersion.

2. Prior researches and our hypotheses

Henderson and Fredrickson (2001) suggest that there is a balance between tournament theory and behavioral theory as predictor of firm performance. When monitoring is reliable and cost is low, paying managers on a basis of their marginal products and choosing the employee with better performance for promotion are both appropriate for improving firm performance. When monitoring is unreliable or expensive, agents will have stronger motives to shirk, so paying on basis of marginal products is not feasible and choosing the appropriate employee for promotion becomes more difficult. In this case, due to tremendous cost or unreliable resulting from monitoring, firms prefer spending their money on incentives and let managers working for the prize. As a result, the interrank compensation gaps become larger, compensation gaps between ranks grow with hierarchical level and the gap between the biggest prize, which is the CEO's compensation, and the second-high compensation is the greatest of all gaps.

2.1 Tournament theory and the first hypothesis

According to tournament theory, tournament shows its advantages in three aspects.

First, compensation is based on rankings, so that monitoring costs are lower. Second, larger compensation gap gives managers incentives to be higher ranked. As a result, shrinking becomes less common. Third, managers who have been successfully promoted before also have incentives to work hard for a better position because the pay gaps are larger and larger.

There are some evidences supporting tournament theory. Lazer and Rosen (1981) found that the compensation gap is effective because lower-position managers are willing to join the tournament to get better paid. Conyon, Peck and Sandler (2001) argue that high dispersion of executive compensation can be incentives for manager to chase a better-paid job position. Kale, Reis and Venkateswaran(2009) conclude that short-term and long-term compensation gaps between CEO and other competitors positively affect firm performance. They also found that if the CEO is close to retirement, tournament becomes more motivating. If the CEO is new to firm, tournament is less useful. Lin, Yeh and Shih (2010) argue that the relationship between tournament and firm performance is industry-specific. For low R&D level firms, tournament theory works well while in high-tech firms; the pay gaps cannot always strengthen firm performance. O'Reilly, Main and Crystal (1988) and Main, O'Reilly and Wade (1993) are in favor of tournament theory. They suggest that the size of the prize should increase with the increasing number of contestants.

Tournament theory assumes that compensation gaps are incentives for executives to compete for higher positions. As a result, firm performance is improved. Therefore, we developed our first hypothesis based on tournament theory.

H1: Top-five executive compensation dispersion is positively related to firm performance.

2.2 Behavioral theory and the second hypothesis

The behavior theory suggests that pay dispersion is critical for firms in both

psychological and sociopolitical way. The theory believes the small difference between top managers and lower-lever managers can help people cooperatively contribute to organization's goals. There are two theories concerning behavioral theory.

First one is relative deprivation theory. Martin (1981) states that, according to relative deprivation theory, when people compare the rewards the get to other people's rewards and find they receive less than they deserve, they get the feeling to injustice and experience deprivation. Cowherd and Levine (1992) argue that experience of deprivation can lead to a hopeful or a frustrated attitude to the possibility of change. Levine (1992) found that decreasing compensation difference increase people's cohesiveness, which could lead to group's higher productivity. Few empirical studies tested relative deprivation theory. Hambrick and Siegel (1993) found that for firms in industries where executive cooperation was important, the smaller pay gaps between ranks are, the higher stock returns is.

The second theory is allocation preference theory. Allocation preference theory describes how compensation is set. Freeman and Montanari (1980) imply that pay is set by a criterion that can avoid dissatisfactions among employees. Leventhal, Karuza and Fry (1980) suggest that such dissatisfaction could lead to negative consequences for allocators. Specifically, it may pose threat to allocator's authority and status. Henderson and Fredrickson (2001) allocation is significant when (1) maintaining social harmony is important, (2) assessing individuals' marginal contributions is hard to achieve, (3) competition is likely to result in sabotage of interdependent work efforts, and (4) collaboration is vital (See Leventhal Karuza and Fry, 1980).

Behavioral theory suggests that smaller pay gaps will promote collaboration and reduce the probability of sabotage. Based on behavioral theory, we developed our second hypothesis.

H2: Top-five executive compensation dispersion is negatively related to firm performance.

3. Data and methodology

3.1 Data Source

Our sample is drawn from firms listed in the Execucomp of WRDS from 1999-2013. We use “cusip” as identification number of the firms and “tdc1” (the total compensation, which is the sum of salary, bonus, other annual, restricted stock grants and long term incentives) to measure compensation.

We obtain monthly return data and monthly factor data from CRSP database and Fama-French Portfolios and Factors database of WRDS, respectively. Monthly data is applied to measure the alpha of firm in each period. Moreover, we obtain annual financial statement data from the Compustat database.

We use “cusip” as firm identification number to combine compensation data, monthly return data and annually financial data for each company. Companies that have fewer than five top executives and those that do not have complete 60 monthly return data are excluded from our sample. After filtering companies that have incomplete information, we construct our final data sample consisting of 81,720 firm-month observations, representing 454 listed firms from 1999-2013.

3.2 Model and methodology

We measure firm performance by Alpha, which is calculated from Fama and French three-factor model using monthly data. Alpha is the dependent variable of our regression. According to Barron and Waddell (2003), the five highest paid executives are considered as the top management team. Compensation dispersion is measured by the Herfinahl index (also known as Herfindahl-Hirschman Index or HHI) according to the following formula,

$$HHI_i = \sum \{ \frac{each\ executive's\ total\ compensation}{Total\ compensation\ of\ all\ executives} \}^2$$

We partition the whole 1999 to 2013 period into three 5-year periods, 1999 to 2003, 2004 to 2008 and 2008 to 2013. Then we calculate the yearly HHI and five-year average HHI for each company.

A lot of researches use Tobin's Q to measure firm performance. In this paper, we choose abnormal return as measurement of firm performance. To calculate abnormal return, we use Fama and French three-factor model as follows,

$$R_i - r_f = \alpha_i + \beta_1 \times (R_M - r_f) + \beta_2 \times SMB + \beta_3 \times HML + \varepsilon_i$$

Where R_i is the return of the firm, r_f is the risk-free return, R_M is the return of the market, *SMB* stands for "Small Minus Big" which means the return of firms with small market capitalization minus the return of firms with big market capitalization. *HML* stands for "High Minus Low" which means the return of firms with high book-to-market ratio minus the return of firms with low book-to-market ratio.

By applying the monthly data to the Fama and French three-factor Model, we obtained the estimated alpha for each period. Four control variables are introduced in our model.

The first control variable is market size. The second one is R&D expense divided by sales. Cui and Mak (2001) found that the relationship between firm performance and managerial ownership is a W-shaped, which showcase the significance of industry effects between firm performance and managerial ownership. For high R&D firms, firm performance is negatively related to managerial ownership but positively and significantly related to the squared managerial ownership. The third one is ROA. Jensen, Michael and Murphy (1990b) suggest ROA is an accounting return that is extremely important in determining executive compensation. Paul (1992) argues that ROA can provide information about the extra value to the firm added by the CEO. Therefore, top

managers have motives to make decisions and report income in a way that ROA is higher, which can affect their compensation. The last one is leverage ratio. Myers and Majluf (1984) suggest that more profitable companies will reduce their demand for debt, because internal will be available to finance investment. They would have more retention or investment so they prefer building their equity rather than their debt. Debt ratio is an accounting ratio that can reflect a company's debt policy.

Then we develop our regression model,

$$Alpha_i = \beta_0 + \beta_1 \times HHI_i + \beta_2 \times SIZE_i + \beta_3 \times RDSALES_i + \beta_4 \times ROA_i + \beta_5 \times LEV_i + \sum \beta_l \, Firm\ indicators_i + \sum \beta_m \, Idusty\ indicators_i + \sum \beta_n \, Time\ indicators_i + \varepsilon_i$$

where Alpha_i is the abnormal return we get from the Fama and French three-factor Model. HHI_i is the 5 year average Herfinahl index we computed previously for each firm. SIZE_i is the natural logarithm of the firms' 5-year average market value. RDSALES_i is calculated by dividing firms' 5-year average research and development expense by sales. ROA_i is the 5-year average return on asset. LEV_i is a 5-year average leverage ratio, calculated by dividing the long-term debt by equity. β_l, β_m and β_n are coefficients associated with variables describing firm, industry and time period. ε_i is a zero mean error term that is uncorrelated with independent variables.

4. Empirical results and Discussion

4.1 HHI value

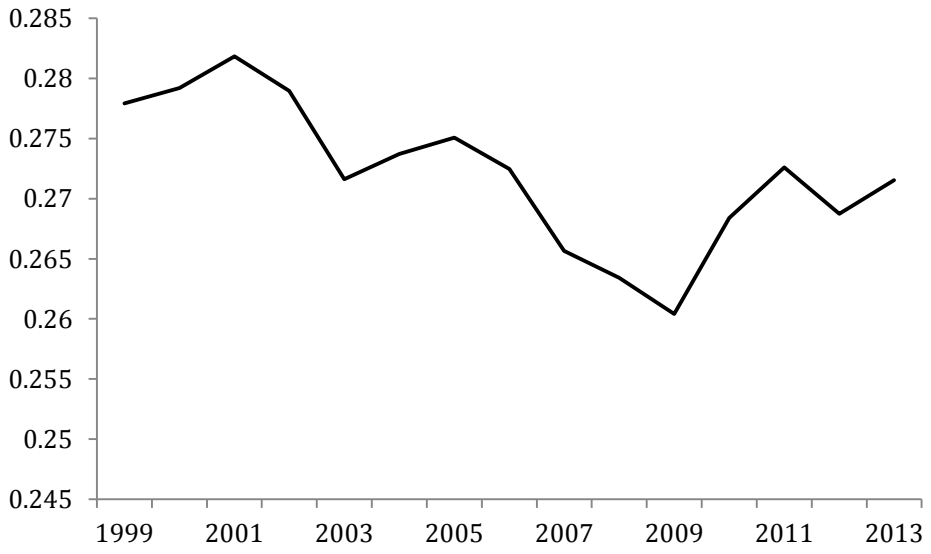
We use HHI index to measure the dispersion of the top five executives' compensation. The results are shown in the table below：

Table 1: HHI Value in Three Periods

Variable	Obs	Mean	Std. Dev.	Min	Max
HHI(1999-2003)	454	0.2726673	0.084097	0.1376829	0.8886119
HHI(2004-2008)	454	0.2670737	0.064231	0.1492836	0.6472647
HHI(2009-2013)	454	0.2685237	0.056015	0.1481874	0.5934191

In addition, we compute the average annual HHI for all observations to see the trend in HHI. The trend is displayed in the following graph:

Graph 1: Average HHI Trend from 1999 to 2013



We can observe that there is a decreasing trend of HHI during the period from 1999 to 2009, and it rebounded after 2009.

4.2 Alpha value

In this section, we compute the abnormal return (measured by alpha) and run the Student-T test on alpha for each period. The results are summarized in Table2 as follows:

Table 2: Alpha Values in Three Periods

Variable	Obs	Mean	Std. Dev.	Min	Max	P Value	95% Conf. Interval	
Alpha(1999-2003)	454	0.0131	0.0188	-0.0396	0.1087	0.0000	0.0113	0.0148
Alpha(2004-2008)	454	0.0048	0.0130	-0.0394	0.0538	0.0000	0.0036	0.0060
Alpha(2009-2013)	454	0.0032	0.0122	-0.0515	0.0568	0.0000	0.0020	0.0043

We observe that during each of the three time periods alpha value is significantly different from zero.

4.3 Association between compensation dispersion and abnormal return

All estimated values of coefficients for independent variables are shown in Table 3 below. The regression model is used to investigate the correlation between managerial pay dispersion and firm performance.

In column (1), the result demonstrates that there exists a strong positive correlation between alpha and HHI at 95% confidence level, which confirms the positive relationship between managerial pay dispersion and firm performance.

The significance test results from applying industry-time and firm-time fixed effect models are shown in column (2) and (3) respectively. After omitting the effects of industry, firm and time, we find strong positive correlation between alpha and HHI at 95% confidence level in both models.

In addition, we add SIZE, RDSALE, ROA and LEV as control variables in the regression model and the result is displayed in column (4). Same results can be achieved from this scenario; that is to say, there is a positive relationship between abnormal return and HHI at 95% confidence level. Interestingly, one of the control variables, RDSALE, has a significant positive impact on abnormal return. It is probably because the return on investment of research and development surpasses the required return. The other two control variables, ROA and LEV, have a positive relationship with abnormal return at 90% confidence level.

Compared to column (2) and (3), column (5) and (6) also apply industry-time and firm-time fixed effect models respectively but add four control variables. Both HHI and RDSALE show positive correlations with abnormal return. However, the other three control variables show no significant impact on firm performance.

Table 3 Regression Results

Independent variables	Y=Alpha (abnormal return)					
	(1)	(2)	(3)	(4)	(5)	(6)
HHI	0.0161**(0.00670)	0.0178**(0.00580)	0.0209**(0.00940)	0.0163**(0.00661)	0.0185**(0.00767)	0.0213**(0.00909)
SIZE				0.000972(0.001279)	0.000901(0.002234)	0.000833(0.001793)
RDSALE				0.000978***(0.000267)	0.000759**(0.00157)	0.00654**(0.00335)
ROA				0.00192*(0.001565)	0.00074(0.00856)	0.000110(0.00722)
LEV				0.0105*(0.00916)	0.00501(0.00922)	0.00432(0.00679)
Constant	0.002768**(0.00168)	0.00653*(0.00156)	0.00798***(0.00268)	-0.00331*(0.00284)	-0.04672***(0.01214)	-0.0577***(0.00992)
Firm control?	NO	NO	YES	NO	NO	YES
Industry control?	NO	YES	NO	NO	YES	NO
Time control?	YES	YES	YES	YES	YES	YES
Observations	1362	1362	1362	1362	1362	1362
Adj. R-squared	0.0955	0.1345	0.142	0.1223	0.1421	0.1580

Notes: The dependent variable is the abnormal return. Alpha stands for the abnormal return we get from Fama and French three factor model. HHI is the 5-year average Herfinahl index we compute for each firm. SIZE is the natural logarithm of the 5-year average market size. RDSALES is average proportion, which is the sum of research and development costs divided by sales. ROA is the 5-year average return on assets. LEV is the 5-year average leverage ratio which is total debt divided by total assets. βl to βn are coefficients associated with variables describing the characteristics of firm, industry and time period. ε is the zero mean error term that is uncorrelated with the independent variables.

Firm control in column is according to cusip. Industry control is according to 2-digit SIC code. Time control is according to three time periods.

Standard errors in parentheses.

*Estimated coefficient or T-statistic is significantly different from zero at 10% level.

**Estimated coefficient or T-statistic is significantly different from zero at 5% level.

***Estimated coefficient or T-statistic is significantly different from zero at 1% level.

5. Limitation

The data we collected is from 1999-2013 and all companies in the sample are U.S. listed companies. In addition, we exclude companies with less than 5 top executives and we also delete companies with incomplete return or financial data during the whole period. Therefore, we only get 454 sample companies. If we use different time period or companies from different area, the result may change.

Additionally, besides the control variables we discussed above, there maybe some other potential factors that contributes to the abnormal return. The influence of omitted variables results in error term, interacting with independent variables, and this interaction can cause endogeneity problem.

6. Conclusion

This paper examines the association between top executives' compensation dispersion and firm performance. According to our regression results, we find a significantly positive correlation between compensation dispersion and firm performance. The result supports the first hypothesis and tournament theory is proved.

We also find that research and development intensity has a significantly positive correlation with firm performance. This may indicate that companies spending more proportion of investment on research and development are likely to create higher abnormal return.

Bibliography

Akerlof G, Yellen J (1988) Fainess and unemployment. Am Econ Rev 78:44-49

Akerlof G, Yellen J (1990) The fair wage-effort hypothesis and unemployment. Quart J Econ 105:255-284

Chen C, Steiner T (2000) Tobin's Q, managerial ownership and analyst coverage: a nonlinear simultaneous equations model. J Econ Bus 52(4): 365-382

Conyon M, Peck S, Sandler G (2001) Corporate tournaments and executive compensation: evidence from the UK. Start Manage J 22: 805-815

Cowherd D (1992) Product quality and pay equity between lower-level employees and top management: An investigation of distributive justice theory. Admin Sci Quart 37: 302-320

Cui H, Mak Y (2002) The relationship between managerial ownership and firm performance in high R&D firms. J Corp Finan 8: 313-336

Defeo, Victor J, Lanvert R, Larcker D (1989) The executive compensations effects of equity-for debt swaps. Acc Rev 64: 201-227

Fama E, French K (1992) The cross-section of expected stock returns. J Finan 47:427-465

Fama E, French K (1995) Size and Book-to-Market factors in earnings and returns. J Finan 50(1): 131-155

Freeman S, Montanari J (1980) An integrative model of managerial rewards allocation. Acad Manag Rev 5:381-390

Hambrick D, Siegel P (1998) Pay dispersion within top management groups: Evidence of its harmful effects of performance of high-technology firms. Working paper, Columbia University, NY

Hartzell J, Starks L (2003) Institutional investors and executive compensation. J Finan 58(6): 2351-2374

Henderson A, Fredrickson J (2001) Top management team coordination needs and the CEO pay gap: a competitive test of economic and behavioral views. The Academy of Management J 44(2): 96-117

Jensen, Michael C, Murphy K (1990b) Performance pay and top-management incentives. J Polit Econ 98: 225-264

Kale J, Reis E, Venkateswaran A (2014) Pay inequalities and managerial turnover. J Empiric Finan 27:21-39

Lazear E, Rosen S (1981) Rank order tournaments as optimum labor contracts. J Polit Econ 11:606-628

Lee K, Lev B, Yeo G (2008) Executive pay dispersion, corporate governance and firm perform. Rev Quant Fianan Acc 30: 315-338

Leventhal G, Karuza J, Fry W (1980) Beyond fairness: A theory of allocation preferences. In G mikula (Ed.) Justive and social interation: 167-218

Levine D (1991) Cohesiveness, productivity and wage dispersion. J Econ Behav Org 15:237-255

Levine J, Moreland R (1990) Progress in small group research. Annual review of psychology 41:585-634

Lin, Yeh, Shih (2013) Tournament theory's perspective of executive pay gaps. J Bus Research 66: 585-592

Main B, O'Reilly C, Wade J (1993) Top executive Pay: Tournament or teamwork? J Labor Econ 11(4): 606-628

Martin J (1981) Relative deprivation: A theory of distributive injustice for an era of shrinking resources. Res Org Behav 3:53-107

Myers S, Majluf N (1984) The capital structure puzzle. J Finan 39: 575-592

O'Reilly C, Main B, Crystal G (1988) CEO compensation as tournament and social comparison: A tale of two theories. Admin Sci Quart. 33: 257-274

Paul, Jonathan M (1992) On the efficiency of stock-based compensation. Rev Finan Stu

(5): 471-502

Ryan H, Wiggins R (2004) Who is in whose pocket? Director compensation, board independence and barriers to effective monitoring. J Finan Econ 73: 491-524

Mehran H (1995) Executive compensation structure, ownership and firm performance. J Finan Econ 38:163-184

Barron, J. and G. Waddell, 2003, "Executive rank, pay and project selection," Journal of Financial Economics 67 (February), 305–349.