

TOURNAMENT VERSUS TEAM IN EXECUTIVE COMPENSATION

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Abstract

The executive ranking pay gap within the company is a continuous debated topic. Prior research has developed two different theories---tournament and teamwork. Tournament theory advanced by economists Edward Lazear and Sherwin Rosen describes wage differences driven by the desire to have incentives to work hard in order to promote within the company towards the top position. Teamwork theory however suggests that the large gap between higher-level executives and their lower-level executives can reduce motivation and create conflicts within the organization. In this paper, we use the Herfindahl–Hirschman Index (HHI) to measure the distribution of the top five executives' compensation and abnormal return to measure firm performance. We find no evidence supporting tournament theory over teamwork theory. A portfolio of firms with high concentration of executive pay outperforms that of firms with low concentration pay. However, these results do not stand at the firm level, once we control for other firm characteristics.

Keywords: Compensation dispersion, HHI, Firm performance, abnormal return, Tournament theory

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1. Introduction

The compensation dispersion of top executives has attracted the focus of compensation experts (e.g. Crystal, 1984), managers (e.g. Loomis, 1982), organizational theorists (e.g. Finkelstein and Hambrick, 1988), and economists (e.g. Lazear and Rosen, 1981; Nalebuff and Stiglitz, 1983). Some paper have already examined the role played by the executive compensation dispersion. In our paper, we focus on the relationship between dispersion of pay among the top management team and firm performance. Recent developments in economic theory have developed two obviously contradictory explanations of the distribution of pay among top executives: tournament theory and teamwork theory.

According to tournament theory, a large gap between executive compensation should exists. When higher-level executives are paid more than lower-level executive is, it offers incentives for executives to work hard in order to promote within the company towards the top position.

According to teamwork theory, the large gap between higher-level executives and their lower-level executives can potentially reduce their motivation and create conflicts within the organization. Lazear and Rosen (1981) noted, "On the day that a given individual is promoted from vice-president to president, his salary may triple. It is difficult to argue that his skills have tripled in that one-day period." When the lower position managers who are paid less than their own marginal product see their co-executives are paid much more, they envy one another. They suggested that when the pay is more or less equal, it promotes collaboration, which can strengthen firm performance.

As for firm performance, we quantify it as abnormal return (A term used to describe the returns generated by a given security or portfolio over a period of time that is different

from the expected rate of return. The expected rate of return is the estimated return based on an asset-pricing model, using a long run historical average or multiple valuation). We find that there is a positive but not significant correlation between abnormal return and HHI, indicating that firm performance, measured by abnormal return, cannot be explained by the top executives' compensation dispersion.

2. Review of literature

Henderson and Fredrickson (2001) suggested that tournament theory and teamwork theory are complements-ports, and they introduced two important sub patterns about these two theory: (1) tournament theory dominated the teamwork theory as predictors of the size of executives' compensation gaps; (2) there should be a balance between these two theories in predicting firm performance.

2.1 Tournament theory

Lazear and Rosen (1979) argued that they preferred to base the executives' compensation on their position within their firm rather than their absolute level of productivity, and they suggested that this compensation scheme is a natural outcome of a competitive social economy. Moreover, to observe the executives' position within the firm may be less costly than to measure the level of each executive's productivity directly. Tournament theory have showed its advantages in the following three aspects. First, monitoring costs might be lower because executives' compensation are based on their relative position. Second, larger executives' compensation gap gives them incentives to work hard to get a higher position. Third, executives who have been promoted before also have incentives to

get a higher position since the compensation gap are larger.

Meanwhile, Conyon, Peck and Sadler (2001) provided some significant evidence that promoted from the position below the CEO to a group CEO job position in their data base was associated with more than sixty percent increase in the compensation. They also suggested that high gap between executive compensation can be incentives for executives to work hard for a higher job position. Moreover, Kale, Reis and Venkateswaran (2009) found that the compensation gap between the executives, which they called tournament incentives, is positively related to firm performance. The positive relation is more significant when the executive is getting closely to his retirement and less significant when the executive is new to the firm. Lin, Yeh and Shih (2010) concluded that the significant of tournament theory as a predictor of firm performance is specific in different industry. For lower research and development firms, tournament theory works better; the compensation gaps can strengthen firm performance

2.2 Teamwork theory

Henderson and Fredrickson (2001) also stated that large executives' compensation gaps might be ineffective because the following reasons. First, high accountability have already promoted strong effort. Second, tournament theory might damage the relationships among executives that are already politicized and strained. Just like Martin (1981) and Crosby (1984), they have already highlighted the importance of "relative deprivation theory", which they explained that executives might experience deprivation if they compare the compensation they received to the compensation received by their college and notice that their compensation is less than they should have. Similarly, Staw

(1984) suggested that working quality might be affected when executives experience deprivation. Moreover, Cowherd and Levine (1992) concluded that paying compensation more equally could significantly affect lower-level executives' working productivity because this is a controlled input. Executives who have experienced inequity may try to change their objective situations, and they are more likely to decrease their inputs than to increase their outcomes because it is easier for them to control their inputs. Pay equity in compensation can influence the executives' cohesiveness and then influence the cooperation between executives. Inequity would create interpersonal resentment, which may damage the relationship between executives and thus reduces their collaboration (Deutsch, 1985; Levine, 1991). Thus, teamwork theory suggests that smaller compensation gaps will enhance executives' willingness to cooperation and reduce the probability of relative deprivation.

3. Sample and methodology

3.1 Sample Source

The analysis of executive compensation and firm performance utilizes the WRDS Compustat (Execucomp). The sample is drawn from firms listed from 1992-2014. In this database, we use "ticker" as identification of the firms and "tdc1"(the total compensation, including salary, bonuses, the total value of restricted stock granted, the total value of stock options granted, long-term incentive payouts and all other total annual compensation) to measure compensation.

We also obtain monthly return data and monthly factor data from CRSP database and Fama-French Portfolios and Factors database of WRDS, which is applied to measure the

abnormal return of each firm in each period. Meanwhile, we obtain company financial statistics such as sales and industry classification from the WRDS Compustat database. We combine the total direct compensation, monthly return data and annually financial statistics for each company using “ticker” as firm identification. We also filter the data by sorting out companies that have incomplete information such as unavailable total compensation or monthly return data and companies that have fewer than five top executives. At last, we construct our final data sample consisting of 327415 firm-month observations, representing 3385 listed firms from 1992-2014.

3.2 Methodology and hypotheses

3.2.1 HHI and alpha

The five highest paid executives are considered as the top management team (top five). The Herfindahl-Hirschman Index (HHI) according to the following formula measures compensation dispersion,

$$HHI = \sum_1^5 \left(\frac{\text{each executive's } tdc1}{\text{sum of all five executives' } tdc1} \right)^2$$

We calculate the yearly HHI for each company. We also calculate the average HHI of all the firms in each year to see the trend of the HHI and the average HHI of all the firms in all the years in each industry to see the industry indicator. At last, for each year, we divide the HHI based on the empirical distribution to five groups (group 5 with the highest HHI and group 1 with the lowest).

As for firm performance, we choose abnormal return as the measurement. To calculate abnormal return, we use Fama and French four-factor model as follows,

$$R_i - r_f = \alpha_i + \beta_1 \times (R_m - r_f) + \beta_2 \times \text{SMB} + \beta_3 \times \text{HML} + \beta_4 \times \text{UMD} + \varepsilon_i$$

where R_i is the raw return of the firm, r_f is the risk-free rate, R_m is the return of the market, SMB stands for "Small Minus Big", which is the average return on the three small market capitalization portfolios minus the average return on the three big market capitalization portfolios, HML stands for "High Minus Low", which is the average return on the two value portfolios minus the average return on the two growth portfolios, UMD stands for "Up Minus Down", which is the average return on the previous 12-month return winners portfolios minus the average return on the previous 12-month loser portfolios. By applying monthly data into this model and run a regression for each firm in each year, we could get the abnormal return (alpha) of each firm in each year. After matching HHI and annually financial statistics for each company, we finally got 24323 firm-year observations, representing 2488 listed firms from 1992-2014.

3.2.2 Regression model

The research on the relation between executive compensation dispersion and firm performance that considered a series of firm characteristics is based on the regression model shown below,

$$\alpha_i = \beta_0 + \beta_1 \times \text{HHI}_{i-1} + \beta_2 \times \text{SIZE}_i + \beta_3 \times \text{ROA}_i + \beta_4 \times \text{Lev}_i +$$

$$\Sigma\beta_i \times \text{Industry indicators}_i + \Sigma\beta_f \times \text{Firm indicators}_i + \Sigma\beta_t \times \text{Time indicators}_i + \varepsilon_i$$

where α_i is the abnormal return computed from the Fama and French four-factor Model, HHI_{i-1} is the index measuring top executive compensation dispersion last year, SIZE_i is the market value of the firms, ROA_i is the return on asset of the firms, Lev_i is the leverage ratio, which is long-term debt on shareholder's equity, β_i , β_f and β_t are coefficients associated with indicators for industry, firm and years, ε_i is a zero mean error

term which is uncorrelated with the independent variables presented in the regression model. In the regression model, we choose HHI of last year because the total compensation is distributed at the end of each year. Therefore, we could only get HHI at the end of year as well. Moreover, how the total compensation of top five executive team dispersed will influence the strategy and the way the company work then certainly influence the abnormal return next year.

4. Descriptive statistics

4.1 HHI

We use HHI to describe whether the top five executives' compensation is diversified or concentrated.

We calculate the average HHI across all firms in each year to see the trend of the HHI.

The results are shown in the graph below.

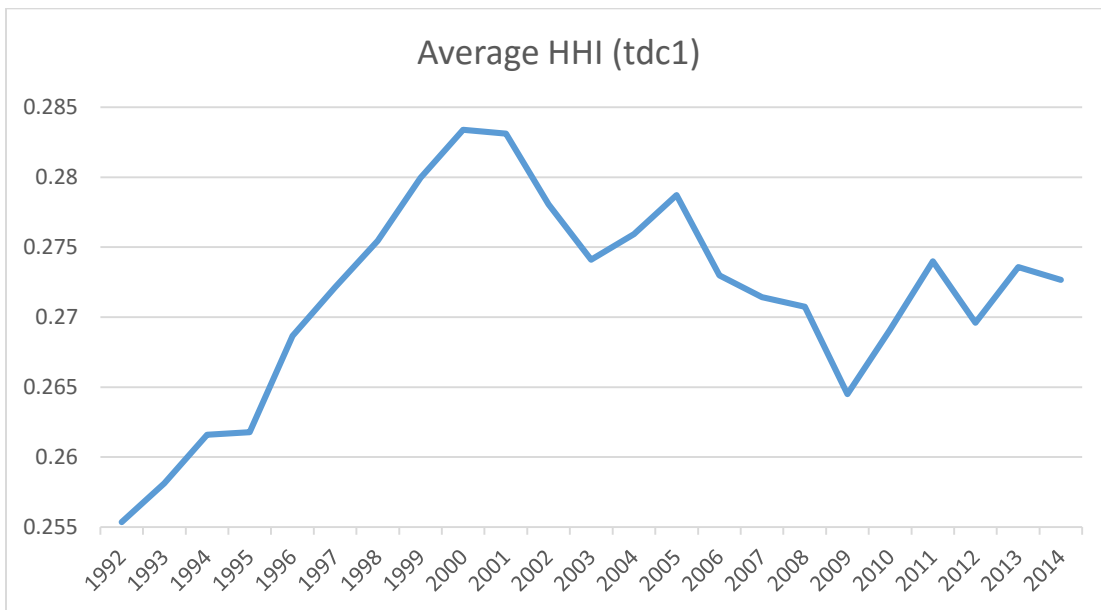


Figure 1: The plot shows change in the average Herfindahl-Hirschman Index (HHI) of the total direct compensation (compustat item tdc1) of the top five executives in a company.

According to Figure 1, the HHI changed a lot in the last 20 years. The latest big drop happened in 2008-2009, which may resulted from the financial crisis. In this period, top executives were probably hit harder that lower level executives, because it is common for top executives to get a higher portion of their income from pay-for-performance measures. We also calculated the average HHI of all the firms in all the years in each industry to see the general difference of HHI caused by industry indicator.

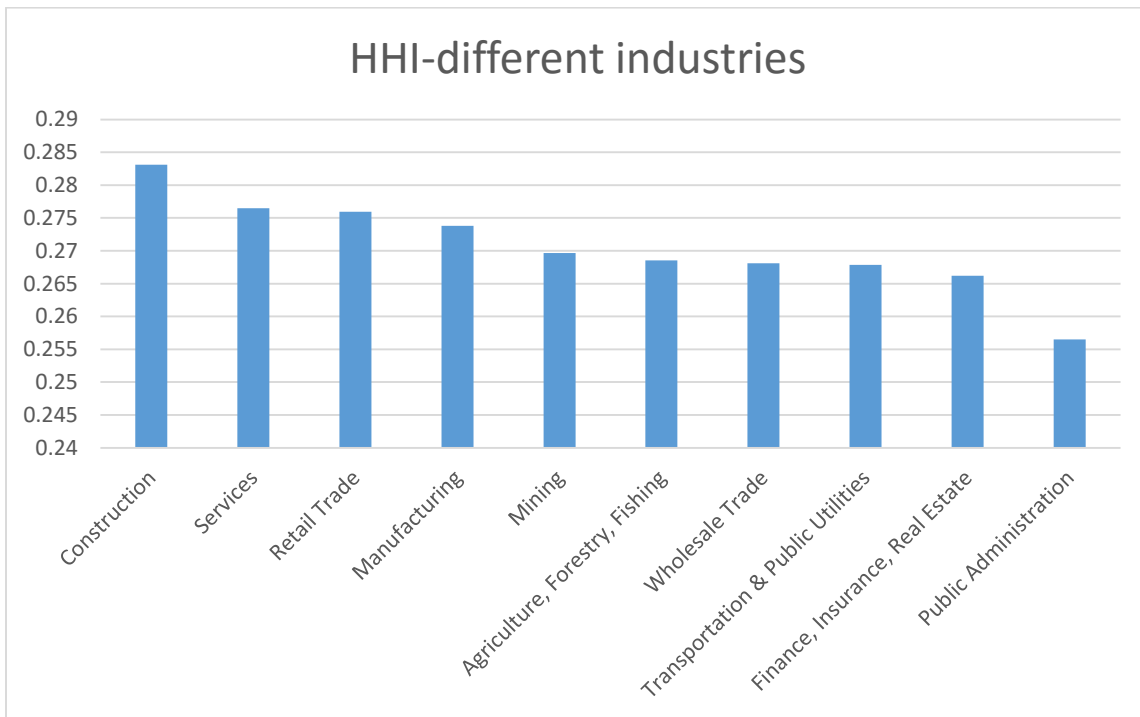


Figure 2: The plot shows Herfindahl-Hirschman Index (HHI) of different industries. As we can see, construction has the highest HHI whereas public administration has the lowest HHI.

4.2 Abnormal return

In this section, we compute the abnormal return (measured by alpha) in different HHI group and run the t-test between the adjacent two HHI groups. The results are shown in table 1&2.

	abnormal return
HHI group 1	0.27
HHI group 2	0.28
HHI group 3	0.31
HHI group 4	0.45
HHI group 5	0.62

Table 1: This table shows the abnormal return (measured by alpha) of different HHI group.

	P-value
t-test between HHI group = 1&2	0.6923
t-test between HHI group = 2&3	0.2064
t-test between HHI group = 3&4	0.0000
t-test between HHI group = 4&5	0.0000

Table 2: This table shows the results of the t-test between the adjacent two HHI groups.

As we could see in table 2, the means of alpha is significant different between HHI group 3 and group 4, HHI group 4 and group 5 in 1% level. Thus, we could assume that HHI has influence on the abnormal return when HHI is higher than some level. We will discover more in the following regression.

5. Regression

Independent variables	Y = alpha (abnormal return)					
	(1)	(2)	(3)	(4)	(5)	(6)
HHI	0.192 (0.41)	0.239 (0.51)	0.218 (0.46)	0.323 (0.66)	0.368 (0.75)	0.343 (0.70)
SIZE				-0.000000799 (-0.66)	-0.000000388 (-0.32)	0.000000860 (0.69)
ROA				3.238*** (13.33)	3.245*** (13.36)	3.262*** (13.44)
LEV				-0.00138 (-1.59)	-0.00136 (-1.57)	-0.00135 (-1.55)
Industry controlled	NO	YES	NO	NO	YES	NO
Firm controlled	NO	NO	YES	NO	NO	YES
Year controlled	NO	YES	YES	NO	YES	YES
_cons	0.285* (2.16)	31.73** (2.99)	40.81*** (3.79)	0.136 (0.99)	35.14** (3.20)	45.69*** (4.09)
Adj. R-squared	0.0000	0.0005	0.0016	0.0078	0.0086	0.0097
N (Observations)	24300	24300	24300	22436	22436	22436

Table 3: The independent variable is the abnormal return, which is calculated from Fama and French four-factor model. HHI group is the number from 1 to 5 standing for the group of HHI we divided previously for each firm. SIZE is the logarithm of the market value of the firms. ROAi is the return on asset of the firms. Levi is the leverage ratio, which is long-term debt on shareholder's equity. Firm control in column is according to permno. Industry control is according to 2-digit SIC code. Time control is according to year. 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

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

In column (1), the result shows a positive correlation between alpha and HHI but unfortunately not at a significant confidence level. Therefore, there is not enough evidence to say with higher dispersion, which means top managers earn much more than lower managers, the company tends to outperform.

In column (2) and (3), we also include industry- time fixed effect and firm- time fixed effect respectively. The test results demonstrate stronger positive correlation between alpha and HHI but again not at a significant confidence level in both models. After omitting the effects of industry and time or firm and time, the positive relationship between top executives' compensation dispersion and firm performance become stronger but still not significant.

In column (4), we add SIZE, ROA and LEV as control variables in the regression model and the results are still the same; there is an insignificant positive relationship between abnormal return and HHI. ROA has a significant positive impact on abnormal return at 99% confidence level, which is consistent with better performing firms being associated with larger dispersion. The other control variables, LEV and SIZE have negative relationship with abnormal return but they are both not significant.

In column (5) and (6), we include the same industry- time fixed effect and firm- time fixed effect respectively, and the results are almost the same as we get in column (4), except for even stronger positive relationship between top executives' compensation dispersion and firm performance.

6. Alternative method

An alternative approach, that may be considered better, is to see if investing in high HHI company produces a profitable trading strategy. Suppose we decide to invest in all firms that have a certain range of HHI (the group of HHI we divided previously for each firm), we will have a portfolio that will be updated once a year (December). We can calculate the equal weight (value weight) return of this portfolio moving forward compared to investing in another HHI group portfolio. In this case we are comparing the return of five well-diversified portfolio (each portfolio should yield a zero alpha because all idiosyncratic risk is diversified away). Assume we invest one dollar in each portfolio in Jan 1st, 1992. The five different portfolio will give us the following amount in Dec 31st, 2014.

Portfolio Approach

HHI group	Equal Weighted Return	Value Weighted Return
1	1.249094	1.125281
2	1.25585	1.13656
3	1.264989	1.145363
4	1.28097	1.151401
5	1.337	1.173235

Table 4: The HHI group 1 to 5 stand for the group of HHI we divided previously for each firm. 1 stands for the lowest HHI and 5 stands for the highest. Equal Weighted Return is the return calculated by giving the same weight, or importance, to each stock in a portfolio. Value Weighted Return is the return of a portfolio whose individual components are weighted according to their market capitalization.

As shown in table 4, the higher the HHI group, the higher the overall equal weighted return and value weighted return of the portfolio. The results confirm the positive relationship between top executives' compensation and HHI.

7. Limitation and Conclusion

7.1 Limitation

First, all the companies in the sample are U.S. listed companies and the data of them is only from 1992-2014. Therefore, as in any other analysis, results are sample specific. More important, in the regression model we only add certain control variables, but there may be some other potential factors contributing to the abnormal return. Therefore, the main limitation is that we do not know whether HHI is the reason for the finding or some other unobservable or observable characteristics that we do not use. Thus, omitted variable bias is the major concern in the study.

7.2 Conclusion

This paper examines the correlation between top five executives' compensation dispersion and firm performance. According to our regression results and the portfolio approach, we find a positive correlation between compensation dispersion and firm performance. But unfortunately the positive correlation is not in a significant confidence level. Therefore, there is no enough evidence supporting of tournament theory over teamwork theory or the other way around.

We also find that ROA has a significantly positive correlation with firm performance. This indicates that no matter in what industry or firm, increasing ROA is likely to create higher abnormal return.

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